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SUPPORTING AMERICAN JOBS AND THE ECONOMY THROUGH EXPANDED ENERGY PRODUCTION: CHALLENGES AND OPPORTUNITIES OF UNCONVENTIONAL RESOURCES TECHNOLOGY

HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY AND ENVIRONMENT

OF THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ONE HUNDRED TWELFTH CONGRESS

SECOND SESSION

THURSDAY, MAY 10, 2012

Serial No. 112–84

Printed for the us the Committee on Science, Space, and Technology

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CONTENTS

May 10, 2012

	Page
Witness List	2
Hearing Charter	3

Opening Statements

Statement by Representative Andy Harris, Chairman, Subcommittee on Energy and Environment, Committee on Science, Space, and Technology, U.S. House of Representatives	16
Written Statement	17
Statement by Representative Paul D. Tonko, Acting Ranking Minority Member, Subcommittee on Energy and Environment, Committee on Science, Space, and Technology, U.S. House of Representatives	17
Written Statement	19

Panel One Witnesses:

Hon. Charles McConnell, Assistant Secretary for Fossil Energy, U.S. Department of Energy	
Oral Statement	22
Written Statement	24
Ms. Anu Mittal, Director, Natural Resources and Environment, U.S. Government Accountability Office	
Oral Statement	28
Written Statement	30
Discussion	46

Panel Two Witnesses

Ms. Samantha Mary Julian, Director, Office of Energy Development, State of Utah	
Oral Statement	59
Written Statement	61
Mr. Jim Andersen, Chief Executive Officer and President, U.S. Seismic Systems, Inc.	
Oral Statement	64
Written Statement	66
Mr. Cameron Todd, Chief Executive Officer, U.S. Oil Sands, Inc.	
Oral Statement	73
Written Statement	75
Mr. Tony Dammer, Member, Board of Directors, National Oil Shale Association	
Oral Statement	79
Written Statement	81
Discussion	90

Appendix: Answers to Post-Hearing Questions

Hon. Charles McConnell, Assistant Secretary for Fossil Energy, U.S. Department of Energy	101

Page

Ms. Anu Mittal, Director, Natural Resources and Environment, U.S. Government Accountability Office 115

Ms. Samantha Mary Julian, Director, Office of Energy Development, State of Utah 119

Mr. Jim Andersen, Chief Executive Officer and President, U.S. Seismic Systems, Inc. 124

Mr. Cameron Todd, Chief Executive Officer, U.S. Oil Sands, Inc. 126

Mr. Tony Dammer, Member, Board of Directors, National Oil Shale Association 131

Appendix 2: Additional Material for the Record

Letter from Members of Wyoming House of Representatives to Bureau of Land Management 134

"Water on the Rocks": A Presentation by Western Resource Advocates 137

Letter from Denver Board of Water Commissioners to Subcommittee on Interior, Environment, and Related Agencies, Committee on Appropriations 152

Letter from Rocky Mountain Farmers Union to Subcommittee on Interior, Environment, and Related Agencies, Committee on Appropriations 154

Oil Shale Fact Sheet from the Wilderness Society 155

Utah's Economic Development Plan from Governor Gary R. Herbert 157

Energy Initiatives and Imperatives: Utah's 10-Year Strategic Energy Plan 185

Draft Programmatic Environmental Impact Statement: Possible Land Use Plan Amendments for Oil Shale and Tar Sands (May 4, 2012) (Utah) 233

Oil Shale: A Century of Failure; Report by Checks and Balances Project, April 2012 279

Not Ready for Prime Time: Prepared by Checks and Balances Project 288

Resolution of Mesa County, State of Colorado 295

Mesa County News Release, April 19, 2012, and Resolution No. 2012-12 300

Economic Impact of Failure to Implement Legislative Mandates of Sec 369, Energy Policy Act 2005, a White Paper by Anton Dammer, M.S., and James Bunger, Ph.D. 306

Letter to the Subcommittee from Dr. Dag Nummedal, Director, Colorado Energy Research Institute, and Dr. Jeremy Boak, Director, Center for Oil Shale Technology and Research, Colorado School of Mines 315

U.S. Department of Energy, Office of Naval Petrolum and Oil Shale Reserves, November 2008, "Strategic Plan: Unconventional Fuels Development Within the Western Energy Corridor" 320

SUPPORTING AMERICAN JOBS AND THE ECONOMY THROUGH EXPANDED ENERGY PRODUCTION: CHALLENGES AND OPPORTUNITIES OF UNCONVENTIONAL RESOURCES TECHNOLOGIES

THURSDAY, MAY 10, 2012

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, DC.

The Subcommittee met, pursuant to call, at 9:33 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Andy Harris [Chairman of the Subcommittee] presiding.

RALPH M. HALL, TEXAS
CHAIRMAN

EDDIE BERNICE JOHNSON, TEXAS
RANKING MEMBER

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Subcommittee on Energy & Environment

Supporting American Jobs and the Economy Through Expanded Energy Production: Challenges and Opportunities of Unconventional Resources Technology

Thursday, May 10, 2012
9:30 a.m. to 12:00 p.m.
2318 Rayburn House Office Building

Witnesses

Panel One

The Honorable Charles McConnell, Assistant Secretary for Fossil Energy, U.S. Department of Energy

Ms. Anu Mittal, Director, Natural Resources and Environment, U.S. Government Accountability Office

Panel Two

Ms. Samantha Mary Julian, Director, Office of Energy Development, State of Utah

Mr. Jim Andersen, Chief Executive Officer and President, U.S. Seismic Systems, Inc

Mr. Cameron Todd, Chief Executive Officer, U.S. Oil Sands, Inc

Mr. Tony Dammer, Member, Board of Directors, National Oil Shale Association.

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

HEARING CHARTER

Supporting American Jobs and the Economy Through Expanded Energy Production: Challenges and Opportunities of Unconventional Resources Technology

Thursday, May 10, 2012
9:30 a.m. -12:00 p.m.
2318 Rayburn House Office Building

PURPOSE

On Thursday, May 10, 2012, at 9:30 a.m. in Room 2318 of the Rayburn House Office Building, the Subcommittee on Energy and the Environment of the Committee on Science, Space, and Technology will hold a hearing titled, *"Supporting American Jobs and the Economy Through Expanded Energy Production: Challenges and Opportunities of Unconventional Resources Technology."* The purpose of the hearing is to examine challenges and opportunities associated with expanding development and use of unconventional oil and gas production technologies.

WITNESS LIST

Panel One

- **The Honorable Charles McConnell,** Assistant Secretary for Fossil Energy, U.S. Department of Energy
- **Ms. Anu Mittal,** Director, Natural Resources and Environment, U.S. Government Accountability Office

Panel Two

- **Ms. Samantha Mary Julian,** Director, Office of Energy Development, State of Utah
- **Mr. Jim Andersen,** Chief Executive Officer and President, U.S. Seismic Systems, Inc.
- **Mr. Cameron Todd,** Chief Executive Officer, U.S. Oil Sands, Inc
- **Mr. Tony Dammer**, Member, Board of Directors, National Oil Shale Association

KEY ISSUES FOR COMMITTEE CONSIDERATION

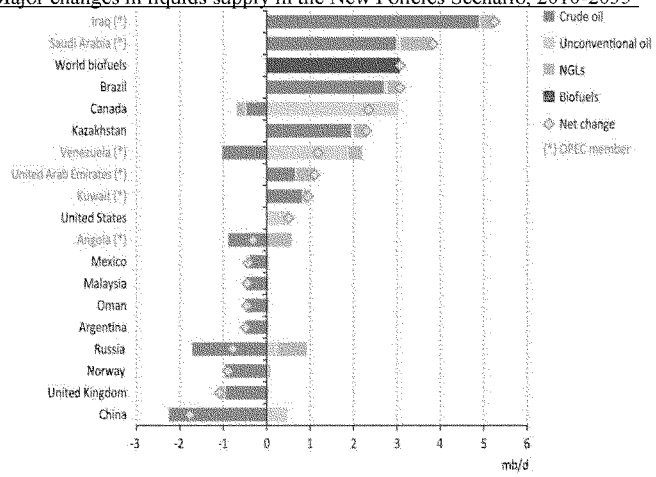
While unconventional energy resources are increasingly developed, key issues must be considered. Specifically:

- How can the environmental impacts associated with resource development be minimized, including water management and use?
- What targeted and appropriate research and development activities could be supported by the Federal government?
- What are policy barriers may impede unconventional oil and gas R&D?
- How can all stakeholders involved in the process cooperate on overarching strategies to expand unconventional resource production?

BACKGROUND

The world currently consumes approximately 87 million barrels of oil per day (MMbd), which is projected to increase to 99 MMbd in 2035, primarily driven by growth from non-OECD countries.[1] Currently, conventional oil production is the primary source of oil supply; however, the International Energy Agency (IEA) projects conventional crude oil production to decline to 68 MMbd in 2035. In order to meet projected demand, IEA projects production of unconventional oil, natural gas liquids (NGLs), biofuels, and other substitutes is anticipated to increase to 47 MMbd by 2035. (Figure 1)

Figure 1: Major changes in liquids supply in the New Policies Scenario, 2010-2035[2]



[1] International Energy Agency, "World Energy Outlook 2011," November 9, 2011. Executive Summary available at: http://www.worldenergyoutlook.org/media/weowebsite/2011/executive_summary.pdf

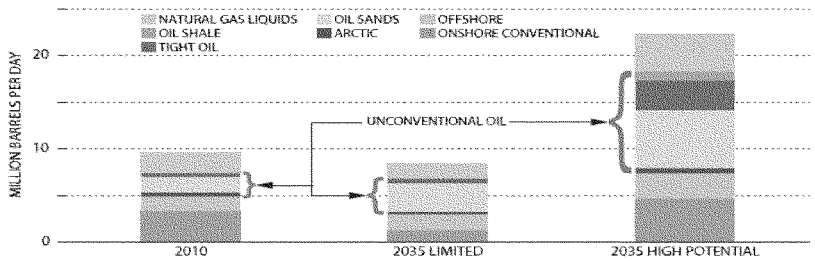
[2] International Energy Agency, "World Energy Outlook 2011: Key Graphs," November 2011. Accessible at: http://www.worldenergyoutlook.org/media/weowebsite/2011/key_graphs.pdf

In September 2011, the National Petroleum Council (NPC), a federally chartered advisory committee to advise the Secretary of Energy on matters relating to oil and natural gas, issued a report titled *"Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources."*[3] The report is a "comprehensive study to reassess the character and potential of North American natural gas and oil resources…"[4] The study identifies crude oil and natural gas resources and supplies and considers the prospects for North American oil development in light of the various challenges associated with different resource bases, including offshore, Arctic, onshore oil, unconventional oil, and pipeline infrastructure issues. (Figure 2) Within the various resource basis, the NPC estimates:[5]

- Currently technically recoverable in the Continental U.S. at nearly 60 billion barrels of oil;
- Arctic contains an estimated 100 billion barrels of recoverable oil;
- Alberta oil sands with a recoverable oil potential of more than 300 billion barrels;
- Onshore conventional oil estimated at 80 billion barrels,
- "Tight oil"[6] could produce an additional 34 billion barrels;
- Oil shale could yield resources estimated at 800 billion barrels.

Figure 2: National Petroleum Council Resource Estimated Potential Production.

Figure ES-6. More Resource Access and Technology Innovation Could Substantially Increase North American Oil Production



Notes: The oil supply bars for 2035 represent the range of potential supply from each of the individual supply sources and types considered in this study. The specific factors that may constrain or enable development and production can be different for each supply type, but include such factors as whether access is enabled, infrastructure is developed, appropriate technology research and development is sustained, an appropriate regulatory framework is in place, and environmental performance is maintained.

Note that in 2010, oil demand for the U.S. and Canada combined was 22.45 million barrels per day. Thus, even in the high potential scenario, 2035 supply is lower than 2010 demand, implying a continued need for oil imports and participation in global trade.

Source: Historical data from Energy Information Administration and National Energy Board of Canada.

[3] National Petroleum Council, *"Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources,"* September 15, 2011. Executive Summary accessible at: http://www.npc.org/reports/NARD-ExecSummVol.pdf

[4] National Petroleum Council, *"Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources,"* September 15, 2011. p. 46. Full Report accessible at: http://www.npc.org/Prudent_Development.html

[5] NPC "Prudent Development, p. 46.

[6] "Tight oil" is oil contained in traditional deposits, but could not flow through the tight formation rock, thus was traditionally inaccessible.

Resonrce Characterization and Potential Supply

The United States currently ranks first in the world in natural gas production and third in oil production.[7] This position as a leading global oil and gas producer can be credited in part to advances and breakthroughs in technology to facilitate the development of America's unconventional oil and gas resources. Given the variety, size, and scope of the unconventional deposits, advances in technology have increased recovery and output significantly increased U.S. resource estimates and future production potential.

Historically, conventional deposits have provided most of the oil and natural gas produced in the U.S. [8] Conventional resources are generally those resources that are recovered from a reservoir in which oil, natural gas, and water accumulate in a layered arrangement. Thus, unconventional resources can be defined as what they are not; they are those resources that cannot be produced, transported, or refined using traditional techniques. An unconventional deposit is one in which the distribution of oil and gas is throughout a geologic formation over a wide area, rather than within a discrete deposit. This category encompasses heavy oil, tight oil, oil shale, and oil sands, as well as shale gas and methane hydrates.

Types of Unconventional Oil and Gas Resources

"Heavy Oil"

Heavy oil, also referred to as bitumen, has a viscosity[9] and specific gravity[10] that is much higher than that of light crude. This resource typically contains high concentrations of sulfur and metals such as nickel and vanadium. In North America, this resource is most prevalent in a Canadian region termed the "heavy oil belt," and is similar to the production of oil sands in the area. Oil in place in this region is estimated at over 35 billion barrels, and in 2009, production was at 382,000 barrels per day (bpd).[11] Estimates of U.S. heavy oil resource in place are between 60-100 billion barrels, 2 billion barrels of which are proven reserves and another 20 billion may ultimately be recoverable. Most heavy oil resources in the United States are located in California and Alaska.[12]

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[7] CIA World Factbook. Accessible at: https://www.cia.gov/library/publications/the-world-factbook/rankorder/2173rank.html

[8] Whitney, Gene; Behrens, Carl E.; Glover, Carol. Congressional Research Service, "Us Fossil Fuel Resources: Terminology, Reporting, and Summary." November 30, 2010. Accessible at: Accessible at: http://budget.house.gov/UploadedFiles/CRS_NOVEMBER2010.pdf

[9] "Viscosity" is a property of fluids and slurries that indicates their resistance to flow, defined as the ratio of shear stress to shear weight.

[10] "Specific Gravity" is the dimensionless ratio of the weight of a material to that of the same volume of water.

[11] National Petroleum Council , Unconventional Oil Subgroup Working Paper: "Unconventional Oil". September 15, 2011. Accessible at: http://www.npc.org/Prudent_Development-Topic_Papers/1-6_Unconventional_Oil_Paper.pdf

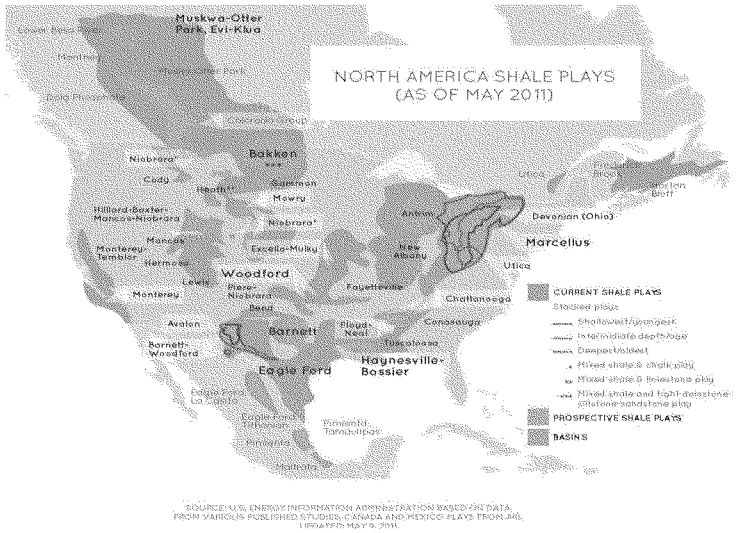
[12] Task Force on Strategic Unconventional Fuels, "Development of Aruerica's Strategic Unconventional Fuel Resources". Initial Report to Congress, September 2006. Accessible at: http://www.unconventionalfuels.org/publications/reports/sec369h_report_epact.pdf

"Tight Oil"

Tight oil, also referred to as shale oil, is produced using a combination of horizontal wells and fracturing to unlock hydrocarbons locked in low permeability and porosity siltstones, sandstones, and carbonates, or shale plays. Notable tight oil plays include the Bakken formation in North Dakota, Montana, and Saskatchewan; the Eagle Ford in southern Texas; the Cardium in Alberta; and the Miocene in California. Recent technological advancements have turned tight oil resources into one of the "most actively explored and produced targets in North America."[13]

Estimates of tight oil potential are significant. The NPC estimated a range of total resources from 5.6-10 billion barrels, with a potential high side estimate of 34 billion barrels. The Bakken field alone contains estimated recoverable resources ranging from 3.65 billion barrels to 4.3 billion barrels; the US Geological Survey (USGS) identified the Bakken as the largest continuous oil accumulation ever assessed by the agency.[14] Additionally, the report notes that these estimates may be conservative, as some plays are still in the nascent stages of discovery and the size of the resource may not be fully known. (Figure 3) There is also significant potential for technology and efficiency improvements to enhance and expand the amount of recoverable resources.

Figure 3: North American Shale Plays[15]



[13] NPC Unconventional Oil Resources Pg 84

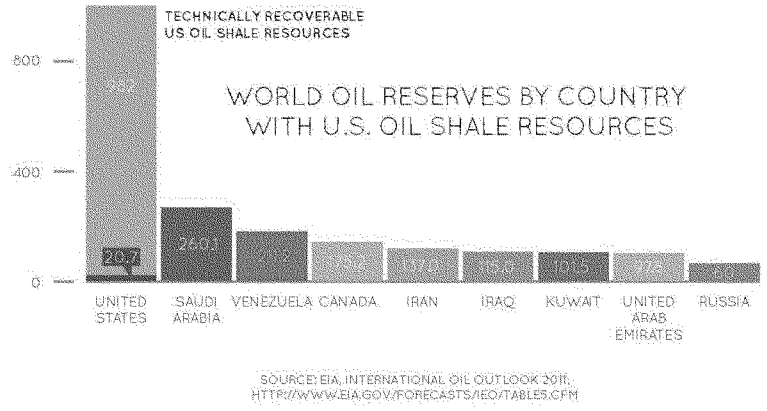
[14] The group based these estimates on published literature, reports from state and Federal government agencies, and industry information. References also include USGS reports, and a NETL/DOE report.

[15] Institute for Energy Research, *"Hard Facts: An Energy Primer,"* 2012, pp. 27. Accessible at: http://www.instituteforenergyresearch.org/hardfacts-uploads/NJI_IER_HardFacts_ALLpages_20120423_v8.pdf

"Oil Shale"

Oil shale refers to deposits in which the petroleum component, kerogen, has not been fully transformed into oil or gas; kerogen must be heated to transform it into an upgraded hydrocarbon. The geologic state of the resource does not permit it being pumped directly from the ground, and must either be processed above ground or in place (ex situ or in situ). The potential for oil shale production in the U.S. is sizeable at 6 trillion barrels of oil in place, mostly concentrated in the Green River Formation in Colorado, Utah, and Wyoming. However, only a fraction of the oil in place will be suitable for recovery. Nearly 80% of oil shale resources, including the richest, most-concentrated deposits, are located on Federal lands.[16] The remaining resources are owned by states, individuals, private companies, and tribes. Privately owned lease holdings are concentrated near the southern margin of the Piceance basin in Colorado, and could support commercial operations up to 400,000 bpd. In contrast, federally owned land could easily support a number of large projects with each lease supporting up to 300,000 bpd.[17] Oil shale has a limited production history in the U.S., and currently there is no commercial scale production of oil shale. (Figure 4)

Figure 4: World Oil Reserves[18]



[16] INTEK, Inc. prepared for the US Department of Energy, Office of Petroleum Reserves, "*Secure Fuels from Domestic Resources: Profiles of Companies Engaged in Domestic Oil Shale and Tar Sands Resource and Technology Development*". Fifth Edition, September 2011. Accessible at: http://www.unconventionalfuels.org/publications/reports/SecureFuelsReport2011.pdf

[17] Strategic Unconventional Fuels Task Force, "*Task Force's Strategy and Program Plan, 2007*," September 2007. Accessible at: http://www.unconventionalfuels.org/publications.html

[18] IER, Hard Facts, pp. 28.

"Oil Sands"

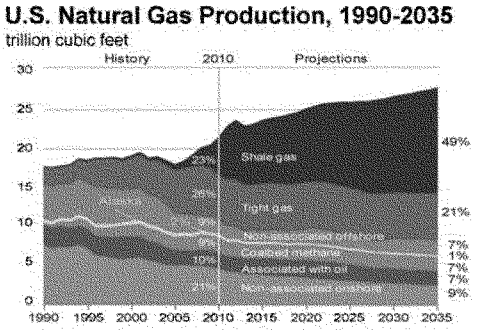
Oil sands are a mixture of sand and other rock materials that contain crude bitumen, thick viscous crude that can be in a near solid state at reservoir temperature. These resources are generally composed of "approximately 80-85 percent sand, clay or other mineral matter, 5-10 weight percent water, and anywhere from 1-18 percent weight percent crude bitumen."[19] Production of this bitumen, which is carbon rich, extra heavy, and contains contaminants such as sulfur, oxygen, nitrogen, and heavy metals, requires removing these contaminants and improving the value of the crude in order to meet pipeline density and viscosity requirements. Production technologies vary as to the location and characteristics of various deposits, and include mining and extraction technologies as well as in situ processes such as steam assisted gravity drainage, cyclic steam stimulation, and solvent injection, among others.

In North America, oil sands deposits have been identified in both Canada and the United States. In Canada, oil in place estimates for oil sands have been pegged at 1.8 trillion barrels, vaulting Canada into second place behind Saudi Arabia for total oil reserves.

The oil sands resources located in the United States differ in geological composition, continuity, and deposition from Canada's resources. Canada's oil sands are generally water wet and consolidated, while U.S. oil sands are generally hydrocarbon wet and unconsolidated. Currently, there is no commercial scale production from U.S. oil sands, though there are a handful of pilot scale projects. Despite the current lack of commercial production, estimates of U.S. oil sands in place are approximately 54 to 62.9 billion barrels spread across ten states, and about 11 billion barrels may ultimately be recoverable. The largest of these deposits are found in Utah, which contains approximately one-third of the domestic resource, estimated at 12 to 19 billion barrels located mostly on public land, both state and federal.[20] Large deposits also exist in Alaska, and the remainder of the resource is spread across Alabama, Texas, California, Kentucky, and other states.

"Shale Gas"

The Department of Energy's (DOE) Energy Information Administration's Annual Energy Outlook 2012, estimates that the U.S. possesses 2,214 trillion cubic feet (tcf) of technically recoverable natural gas resources. Of this total, natural gas from proven and unproven shale resources account for 542 tcf.[21]



Source: U.S. Energy Information Administration, AEO2012 Early Release Overview, January 23, 2012.

[19] NPC "Prudent Development," p. 34.

[20] INTEK, Inc. prepared for the US Department of Energy, Office of Petroleum Reserves, "*Secure Fuels from Domestic Resources: Profiles of Companies Engaged in Domestic Oil Shale and Tar Sands Resource and Technology Development*". Fifth Edition, September 2011. Accessible at: http://www.unconventionalfuels.org/publications/reports/SecureFuelsReport2011.pdf

[21] EIA Energy in Brief "What is shale gas and why is it important?". April 11, 2012. Accessible at: http://www.eia.gov/energy_in_brief/about_shale_gas.cfm

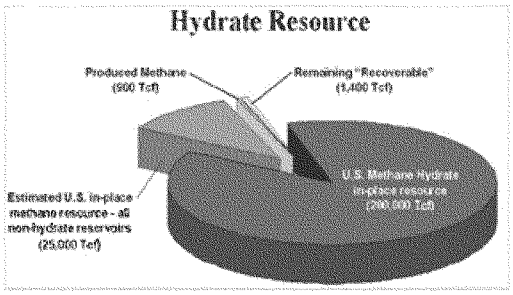
Shale gas refers to natural gas trapped in fine grain sedimentary rock formations characterized by low permeability and porosity. These resources have become accessible over the last decade due to the combination of advances in horizontal drilling and hydraulic fracturing. Natural gas production from shale account for 23% of total U.S. production, up from less than 1% in 2000, and is projected to account for 49% of total production by 2035.

"Methane Hydrates"

Methane hydrates are another potential source of increased natural gas production that will require research and technology development to produce. Methane hydrate "is a cage-like lattice of ice inside of which are trapped molecules of methane, the chief constituent of natural gas."[22] By warming or depressurizing the resource, it can be processed to natural gas. It is estimated the global volume of naturally occurring methane hydrates far exceeds the current natural gas resource estimates.[23] (Figure 5)

Methane hydrates deposits in the U.S. can be found in Outer Continental Shelf and under the Alaskan permafrost, and much of the research has focused on developing resource estimates for the Gulf of Mexico and Alaska's North Slope. According to estimates by the then-Minerals Management Service (now Bureau Ocean Energy Management, Regulation, and Enforcement) the Gulf could contain 11,000 to 43,000 tcf of methane in place. The USGS assessment of the North Slope estimated approximately 85 tcf of technically recoverable methane.[24] Additionally, the USGS estimates total in place methane hydrates resources in the U.S. are about 320,000 tcf.[25]

Figure 5: Total Hydrate Resource[26]



[22] US Department of Energy, Office of Fossil Energy, "*Methane Hydrates-The Gas Resource of the Future*," accessible at: http://www.fossil.energy.gov/programs/oilgas/hydrates/index.html

[23] US Department of Energy, National Energy Technology Laboratory, National Methane Hydrates R&D Program, "*All About Hydrates-Estimates*," accessible at: http://www.netl.doe.gov/technologies/oil-gas/FutureSupply/MethaneHydrates/about-hydrates/estimates.htm

[24] US Department of Energy, National Energy Technology Laboratory, "Energy Resources Potential of Methane Hydrates". February 2011. Accessible at: http://www.netl.doe.gov/technologies/oil-gas/publications/Hydrates/2011Reports/MH_Primer2011.pdf

[25] Collett, Timothy, USGS, "*Natural Gas Hydrates—Vast Resources, Uncertain Future*," March 2001. Accessible at: http://pubs.usgs.gov/fs/fs021-01/fs021-01.pdf

[26] DOE National Energy Technology Laboratory, *"All About Hydrates – Estimates."* Accessible at: http://www.netl.doe.gov/technologies/oil-gas/FutureSupply/MethaneHydrates/about-hydrates/estimates.htm

Department of Energy Unconventional Oil and Gas Programs

The United States has long recognized the potential of unconventional oil and gas resources. For example, President Taft created the Office of Naval Petroleum and Oil Shale Reserves (NPOSR) in 1912 to serve as a strategic resource in the event of war or national emergency for the U.S. Navy.[27] The office manages an oil field technology testing center that aims to address "technical and environmental issues associated with the production, distribution, and use of the nation's energy resources."[28]

DOE's Office of Fossil Energy (FE) manages research, development, and demonstration (RD&D) activities for oil and gas technologies. Specifically, FE's Office of Oil and Natural Gas "supports research and policy options to ensure environmentally sustainable domestic and global supplies of oil and natural gas."[29] The National Energy Technology Laboratory (NETL) serves as the lead FE RD&D facility and manages much of FE's oil and gas technology research.

Table 1 – Department of Energy Unconventional Oil and Gas Funding Levels (In Millions)

Program	FY 2011 Current	FY 2012 Enacted	FY 2013 Request	FY 2013 House Energy & Water Appropriations Mark
Naval Petroleum and Oil Shale Reserves	$20.9	$14.9	$14.9	$14.9
Unconventional FE Technologies	$0	$5.0	$0	$25.0*
Natural Gas Technologies	$0	$5.0	$12.0	$10
Gas Hydrates	$0	$10.0	$5.0	$5.0

*House Appropriations Committee recommends $25 million "to be used to support both research to improve the economics of oil production from shale oil, as well as to reduce the health, safety, and environmental risks associated with shale oil extraction."[30]

Federal Unconventional Oil Research and Development Activities

Efforts to economically produce various sources of unconventional oil and gas were underway through much of the last century.[31] For example, the U.S. Department of Interior (DOI)

[27] US Department of Energy, Office of Fossil Energy, "*The Naval Petroleum and Oil Shale Reserves- 90 Years of Ensuring National Security*," accessible at: http://www.fe.doe.gov/programs/reserves/npr/npr-90years.html
[28] US Department of Energy, Office of Fossil Energy, U.S. Petroleum Reserves, "Naval Petroleum Reserves – Profile," Updated December 22, 2011. Accessible at: http://fossil.energy.gov/programs/reserves/npr/
[29] U.S. Department of Energy, Office of Oil & Natural Gas, updated May 7, 2012. Accessible at: http://www.fossil.energy.gov/programs/oilgas/index.html
[30] House Appropriations Committee Report, "Energy and Water Development Appropriations Committee Report, FY 2013." P. 97. Accessible at: http://appropriations.house.gov/UploadedFiles/EW-FY13-FULLCOMMITTEEREPORT.pdf
[31] INTEK, Inc., Prepared for the US Department of Energy, Office of Petroleum Reserves, "*Oil Shale Research in the United States: Profiles of Oil Shale Research and Development Activities in Universities, National Laboratories,*

conducted oil shale research activities during the 1940's. The oil crisis of the 1970's renewed calls for unconventional oil and gas research programs and the DOI instigated an oil shale leasing program to provide land for RD&D activities. When the oil crisis subsided, DOE reduced many of its unconventional oil and gas research programs.

Recently, significant technology advances and high crude oil prices have regenerated interest in unconventional fuels production. The development of horizontal drilling permitted the use of hydraulic fracturing to produce shale oil and gas. Shale oil production enabled the development of the Bakken fields in North Dakota. North Dakota is now the third largest oil producing state, producing over 550,000 bpd, up from 45,000 bpd in 2007. [32]

DOE currently conducts research and development activities to produce methane hydrate gas. On May 2, 2012, DOE, in partnership with ConocoPhillips and Japan Oil, Gas and Metals National Corporation, announced the completion of a successful field test of technology in Alaska to extract natural gas from methane hydrates.[33]

Energy Policy Act of 2005

Section 369 of the Energy Policy Act of 2005 (EPACT 05) contains provisions to facilitate the development of unconventional fuels.[34] The law states:

(1) "United States oil shale, tar sands, and other unconventional fuels are strategically important domestic resources that should be developed to reduce the growing dependence of the United States on politically and economically unstable sources of foreign oil imports;
(2) The development of oil shale, tar sands, and other strategic unconventional fuels, for research and commercial development, should be conducted in an environmentally sound manner, using practices that minimize impacts; and
(3) Development of those strategic unconventional fuels should occur, with an emphasis on sustainability, to benefit the United States while taking into account affected States and communities."[35]

EPACT 05 directed Bureau of Land Management (BLM) to begin leasing federal lands for the purpose of oil shale and tar sands research and development activities. The first round of research, development, and demonstration leases were awarded in 2006, and another round of leases were offered in 2009, but are yet to be awarded.

Strategic Unconventional Fuels Task Force

EPACT 05 also created a Strategic Unconventional Fuels Task Force composed of the U.S. Secretaries of Energy, Interior and Defense, the Governors of Colorado, Kentucky, Mississippi,

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and Public Agencies," Third Edition, September 2011. Accessible at: http://www.unconventionalfuels.org/publications/reports/Research_Project_Profiles_Book2011.pdf

[32] North Dakota Oil & Gas Industry "Facts and Figures," Updated April 12, 2012Accessible at: http://www.ndoil.org/image/cache/Facts_and_Figures_2012_4.12.pdf

[33] NETL Publications, Press Release, "*U.S. and Japan Complete Successful Field Trial of Methane Hydrate Production Technologies*," May2, 2012. Accessible at: http://www.netl.doe.gov/publications/press/2012/120502_us_and_japan.html

[34] P.L. 109-58

[35] Ibid.

Utah, and Wyoming, and three representatives of local governments in affected areas.[36] The Task Force was charged with making recommendations "regarding promoting the development of the strategic unconventional fuels resources within the United States."[37]

The task force submitted an initial report, as required, to the President and Congress in 2006, followed by a three volume strategy and program plan in 2007. Annual reports from 2008 and 2009 followed; however, despite the legislative requirement that annual reports be provided for each of the five years following the initial report, there were no annual reports for 2010 or 2011. According to its website, "The Task Force is presently considering what its future role should be." [38]

Resources addressed by the task force include oil shale, coal-derived liquids, heavy oil, tar sands, and enhanced oil recovery. The Task Force estimated the size and potential of these resources, and identified potential uncertainties or constraints to their development. Potential impediments identified were resource access, environmental and permitting timeline uncertainties, risky fiscal regimes, lack of demonstrated production technologies, and infrastructure constraints, among others. This report also provided initial recommendations on how to ameliorate uncertainties stemming from the identified constraints.

In the 2007 Strategy and Integrated Program Plan, these issues were examined by the Task Force in much more depth and detail. Major strategies were identified to accelerate the development of these resources and reap the public benefits associated with production while promoting environmental stewardship, mitigating adverse socio-economic impacts on states and localities, and maintaining governmental fiscal responsibility. This plan also included eight major recommendations, with associated steps and timelines for implementation.

1. Access to Resources on Public Lands: Provide an effective land tenure system;
2. Regulatory and Permitting: Provide an inclusive regulatory system and review process that encourages expeditious development;
3. Economic: Create a fiscal regime that attracts necessary private development capital;
4. Technology: Craft a fast track program to attract investment while maintaining fiscal responsibility;
5. Public Infrastructure: Create an integrated local and regional infrastructure plan to support efficient development and reduce duplicative investments;
6. Socio-Economic: Establish a program for development, planning, funding, and training that mitigates adverse local impacts and maximizes state and local employment and economic growth;
7. Government Organization: Ensure that appropriate organization structures exist at state local and federal levels that will promote and accelerate development in a reasoned, efficient way;

[36] Strategic Unconventional Fuel Task Force, Task Force Members, Accessible at: http://www.unconventionalfuels.org/members.html
[37] P.L. 109-58.
[38] Strategic Unconventional Fuels Task Force. http://www.unconventionalfuels.org/home.html

8. International Partnerships: Initiate partnerships that advance and accelerate understanding and development of unconventional resources and technologies. [39]

The Task Force found that, "if pursued aggressively by government and industry, domestic unconventional fuels could exceed 7 MMbd by 2035."

State and International Unconventional Energy Initiatives

The states with the highest concentration of oil shale and oil sands resources are Utah, Colorado, and Wyoming. In these states, a substantial amount of the resource exits on public lands, and thus fall within the purview of state and federal governments.

Utah

In Utah the federal government owns and manages approximately 60% of surface lands and even more of the mineral estate. In order to address this and other issues facing energy development, in 2010 Governor Herbert created the Utah Energy Initiative, a 10 year strategic energy plan designed to foster energy development while preserving quality of life[40]. A task force was appointed to develop this plan, which was completed in March 2011. Several key recommendations were aimed at encouraging development of the state's unconventional resources. Notably, the plan called for the creation of an effective strategy to encourage energy development on public land. Access to public lands for energy development was further recommended as a priority for the Governor's Public Lands Policy Coordination Office.

Additionally, the Governor's Energy Plan advocated strengthening the state's role in energy technology research and development, and created a new Energy Research Triangle Initiative amongst the state's three research universities, coordinated by the Governor's Energy Advisor. Other recommendations included coordination and transparency in the regulatory and licensing process through establishing a single point of contact for energy developers for information on state and local permit requirements, creation of a coordinating council of state agencies to collaborate on energy development, and process improvements in agencies that regulate the energy industry.

Colorado

In Colorado, the Governor's Energy Office recommended the development of an energy policy for the State, with a target completion plan to coincide with the 2013 legislative session. Additionally, in an effort to better coordinate and foster collaboration between state and local jurisdictions, Governor Hickenlooper established a task force to identify mechanisms to avoid duplication or conflicting regulations and help foster a climate that encourages responsible oil and gas development.[41]

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[39] Strategic and Unconventional Fuels Task Force, "*Strategy and Program Plan, Volume I: Preparation Strategy, Plan, and Recommendations,*" September, 2007. Page I-69. Accessible at: http://www.unconventionalfuels.org/publications/reports/Volume_I_IntegratedPlan%28Final%29.pdf

[40] "*Energy Initiatives & Imperatives: Utah's 10-Year Strategic Energy Plan,*" March 2, 2011. Accessible at: http://www.energy.utah.gov/government/strategic_plan/govenergyplan.htm

[41] Governor John W. Hickenlooper, Office of the Governor, State of Colorado. Executive Order B 2012-002, "*Creating the Task Force on Cooperative Strategies Regarding State and Local Regulation of Oil and Gas Development,*" February 29, 2012.

International Unconventional Oil and Gas Development

The United States is not alone in possessing unconventional resources or pursuing their development. Both Russia and Argentina possess substantial tight oil reserves, oil sands can be found in over 70 countries[42], and oil shale resources are widely distributed as well. Though the United States possesses the largest deposits of oil shale, China, Russia, the Congo, Brazil, Italy, Morocco, Jordan, and Estonia all contain estimated in place oil shale.[43] Active commercial production is occurring in Estonia, Brazil, and China, with total global production at 20,000 bpd. Jordan, Morocco, and Israel are not currently producing but are projected to do so in the future.[44]

Shale gas can also be found in over 30 countries around the world, with significantly large deposits in China, Argentina, Mexico, and South Africa. Only China is estimated to have larger technically recoverable reserves than the United States, at an estimated 1,275 tcf.[45] Methane hydrates can be found in deposits in the Polar Regions and along the outer continental margins across the globe. While much has been made of the size and distribution of the resource, efforts are still very much in the research and demonstration phase.

Unconventional Oil and Gas Technologies

A wide number of stakeholders are currently conducting various unconventional RD&D activities. As of September 2011, 34 companies[46] and 29 universities, national laboratories, and federal and state agencies were involved in oil shale and oil sands RD&D efforts.[47] The RD&D is focused on a number of areas such as:

- resource characterization;
- extraction methods, including in-situ processing;
- resource stimulation;
- environmental challenges, such as water consumption, groundwater protection and localized air quality.

DOE's Office of Petroleum Reserves publishes a thorough annual report profiling ongoing oil shale and oil sands research and technology projects.[48]

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[42] While found in 70 countries, the bulk of the resource lies in Canada and Venezuela.
[43] NRG Expert Energy Intelligence, March 30, 2012. Accessible at: http://www.nrgexpert.com/expert-briefing-shale-oil-research/
[44] Boak, Jeremy, "*Oil Shales Making Cautious Progress*," August 2010. Accessible at: http://www.aapg.org/explorer/2010/08aug/emd0810.cfm
[45] U.S. EIA, "*World Shale Gas Resources: An Initial Assessment of Regions Outside the United States,*" April 2011. Full Report accessible at: http://www.eia.gov/analysis/studies/worldshalegas/pdf/fullreport.pdf
[46] Unconventional Fuels Task Force "Secure Fuels from Domestic Resources."
[47] Unconventional Fuels Task Force "Profiles of Oil Shale Research and Development Activities Universities, National Laboratories, and Public Agencies."
[48] For a full listing of research projects see the Strategic Unconventional Fuels Task Force Publication site at: http://www.unconventionalfuels.org/publications.html

Chairman HARRIS. The Subcommittee will come to order.

Good morning, and welcome to this morning's hearing entitled "Supporting American Jobs and the Economy Through Expanded Energy Production: Challenges and Opportunities of Unconventional Resources Technology."

Two weeks ago, the Science, Space, and Technology Committee heard from expert witnesses about America's vast untapped unconventional energy resources. The amount of energy under own soil is striking. With continued technological advances and the right policies to enable access to these resources, America could become the global leader in energy production for the next generation and beyond.

For example, the Green River Basin located in Colorado, Utah, and Wyoming may contain up to three trillion barrels of oil—more potential oil than the rest of the world's current oil reserves combined. If this energy, which is overwhelmingly on federal lands, is made available, I am confident American ingenuity will find ways to responsibly explore and produce this resource.

Portions of the United States are already experiencing the significant economic benefits of unconventional energy production. North Dakota's unemployment rate is now the lowest in the Nation due to the shale oil revolution. The State's top economic challenge is not job creation, but rather finding workers to fill the thousands of job openings created by the energy boom—a problem most States would love to have. The Federal Government should afford other States the opportunity to replicate this success story through aggressive pursuit of leasing, permitting, and technological opportunities.

Unfortunately, when it comes to unconventional energy, President Obama talks the talk more than he walks the walk. Beginning with his State of the Union speech earlier this year, the President has touted the historical contributions of the Department of Energy's fossil energy research programs, while his annual budget request to Congress repeatedly calls for elimination of the very same program. And while the President regularly boasts of his support for an "all of the above" energy strategy, his Administration appears more focused on producing new regulations and restrictions than it is on producing more oil and gas. For example, the President has unleashed 10 different federal agencies in pursuit of potential regulations on hydraulic fracturing.

Similarly, the President's campaign Website includes an "all of the above" energy page that neglects to even acknowledge the fuel providing 45 percent of the United States' electricity: coal. It is clear the President continues to pick his preferred energy technologies at the expense of the free market and consumer need and choice.

Perhaps most incredibly, just three days after his State of the Union speech declaring his commitment to this all of the above energy strategy, the President's Interior Department effectively reduced lands available for oil shale development by 75 percent, putting over 1.5 million acres off limits not only to exploration and production, but also to research and development.

This morning, I am interested in examining the impact of the Administration's anti-fossil fuel policies, as well as exploring what

targeted research questions DOE can and should address to facilitate the further development of America's unconventional energy resources.

I also look forward to hearing how innovative companies are enabling more efficient and environmentally sound development of America's unconventional oil and gas resources.

I thank the witnesses for appearing before the Subcommittee.

[The prepared statement of Mr. Harris follows:]

PREPARED STATEMENT OF SUBCOMMITTEE CHAIRMAN ANDY HARRIS

Good morning and welcome to this morning's hearing entitled "Supporting American Jobs and the Economy Through Expanded Energy Production: Challenges and Opportunities of Unconventional Resources Technology."

Two weeks ago, the Science, Space, and Technology Committee heard from expert witnesses about America's vast untapped unconventional energy resources. The amount of energy under our own soil is striking. With continued technological advances and the right policies to enable access to these resources, America could become the global leader in energy production for the next generation and beyond.

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I also look forward to hearing how innovative companies are enabling more efficient and environmentally sound development of America's unconventional oil and gas resources.

I thank the witnesses for appearing before the Subcommittee, and I now recognize Ranking Member Tonko for his opening statement.

Chairman HARRIS. I now recognize Ranking Member—I am sorry. Mr. Tonko is—I guess you are the Ranking Member for today, the substitute Ranking Member, for his opening statement.

Mr. TONKO. Thank you, Mr. Chair.

Today's hearing is focused on another unconventional fossil resource that we have heard about many times in the past decades. Every time oil prices have spiked or that we have become concerned about a major disruption in our oil supplies, oil shale gets a new look. Why we continue to use public funds to pursue this energy source is truly a subject for research, I believe. The oil companies and the Federal Government have poured millions of dollars into research, demonstration projects, and subsidies to find an economically viable way to develop this resource. Yet it is still years, if not decades, away from being economically, technologically, and environmentally viable.

Oil shale should not be confused with shale oil. Shale oil is being commercially produced along with shale gas in various places around our great country. Through application of conventional fracturing processes, oil is released from shale formations and then pumped to the surface. Oil shale, on the other hand, is essentially a rock that must be heated at extremely high temperatures for long periods of time before the hydrocarbons within it are indeed released. The magnitude and severity of the impacts on land, water, and other natural resources required to turn rock into oil are only part of the reasons that these resources have never been commercially viable. They should serve as our cue to look beyond oil.

I have listened as many of my Republican colleagues questioned the wisdom and need for public investments in renewable energy resources, either through support of research or through tax incentives. But when it comes to offering subsidies to one of the wealthiest and most profitable industries in the world—the oil industry—their generosity knows no bounds. When I look at the potential for oil shale, I can only wonder why we should be throwing more hard-earned taxpayer dollars after bad.

Even though gas prices have recently come down a bit, our constituents still feel the pain at the pump and know that it is a just a matter of time before another price spike hits. The public is tired of seeing an increasing portion of their paycheck go to the most profitable companies in the world, along with outsized portion of their tax dollars in the form of tax breaks for the oil and gas industry.

Subsidizing oil shale has never lowered gasoline prices or led to our energy independence. I do not believe it ever will. In spite of years of government support for research and development since the early 1900s, this resource has proven to be much more bust than boom. The high cost of delivering this energy will inevitably translate into high retail prices for refined products. It is time we took a different path and invested in alternative energy sources. The oil industry has the financial resources to pursue this further if they believe it is viable.

As our witness from the Government Accountability Office, the GAO, will outline from their investigation, there are things the Federal Government can do to better understand the range of uncertainties regarding the impacts of oil shale development. Among these, understanding the impacts on water quality and quantity stand out as the biggest concerns. The legendary water battles in the West are not about protecting ecosystems, though that is a worthwhile cause. These battles are about economics.

There is no greater indicator of a region's economic potential, its ability to sustain human life and industry, than its access to clean water. It is hard for those of us from relatively water-rich States to understand what it means for a region whose annual rainfall can be measured in single digits in a good year. But for most Westerners, it is a sixth sense.

I happen to be from an area of the country that is blessed with abundant, high-quality water resources. Given the current and looming shortages of water in many areas of the West, I cannot imagine why we would consider trading water, a renewable, vital resource for which there is no substitute, for a non-renewable resource that we can only obtain with very costly, highly damaging, and destructive methods. Land and water are not, or should not, be treated as disposable goods.

The Interior Department released a draft Programmatic Environmental Impact Statement that was not only appropriately cautious, but reflected the reality of the technological immaturity of the oil shale industry. The Department of Interior is charged with managing the Nation's lands for the benefit of all the public in a manner that keeps faith with generations to come. These lands support hunting, fishing and recreation of all types. They serve as protection for watersheds that recharge groundwater supplies and feed streams and rivers that support agriculture, ranching, power production and countless other businesses. The people engaged in these economic activities in Colorado, Utah, and Wyoming also deserve consideration.

A number of groups representing these interests have voiced their concerns about leasing public lands for oil shale development, and about its impact on water resources in particular. I am attaching several of their past communications on this subject to my testimony today.

We should not sacrifice sustainable communities and livelihoods in an attempt to mimic Earth's geologic process of converting rock into oil. Can we really ask the public to once again believe that we are going to secure our energy future this way? Perhaps our witnesses this morning can convince me otherwise, but I believe we can make far better investments with public funds by increasing energy efficiency and expanding our use of renewable energy supplies.

I thank our witnesses for being here this morning, and I look forward to hearing their testimony.

With that, I yield back, Mr. Chair.

[The prepared statement of Mr. Tonko follows:]

PREPARED STATEMENT OF ACTING RANKING MEMBER PAUL D. TONKO

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I thank our witnesses for being here this morning. I look forward to hearing your testimony,

Chairman HARRIS. Thank you very much, Mr. Tonko.

If there are Members who wish to submit additional opening statements, your statements will be added at this point.

At this time, I would like to introduce our witnesses for the first panel. The first witness is Mr. Charles McConnell, Assistant Secretary for Fossil Energy at the U.S. Department of Energy. Prior to joining DOE, Mr. McConnell served as the Vice President of Carbon Management at Battelle Energy Technology. He also spent 31 years with Praxair in various positions in the United States and Asia, including Global Vice President. He previously held a number of advisory positions, including chairmanships of the Gasification Technologies Council and the Clean Coal Technology Foundation of Texas.

The second witness on the first panel will be Ms. Anu Mittal, Director, National Resources and Environment of the U.S. Government Accountability Office. Ms. Mittal has been with the GAO since 1989, during which time she has led a variety of reviews of federal programs related to land management, water resources, oceans and fisheries, environmental restoration, energy, defense cleanup, housing, food safety—you are busy—science and technology and agriculture issues.

Thank you for appearing before the Subcommittee today. As our witnesses should know, spoken testimony is limited to five minutes each, after which the Members of the Committee will have five minutes each to ask questions.

Before I recognize Mr. McConnell, I want to again express what has been a recurrent theme, the displeasure with DOE's habitually late communications to Congress and to this Subcommittee and Committee. The testimony for this morning's hearing, I don't know if you realize this, Mr. McConnell, your testimony was due Tuesday morning at 9:30. That is the standard operating procedure for the Committees. We didn't receive it until 7 o'clock last night. At 7 o'clock last night, we were in session debating and voting until midnight. Obviously, Members did not have time to review your testimony, as we are entitled to under our rules. This extreme tardiness is the rule rather than the exception coming out of DOE. Whether it is delivering testimony or responding to letters from me and other Committee members and questions for the record, DOE is almost always embarrassingly late. Mr. McConnell, I trust that you will communicate this frustration back to Secretary Chu and his team and commit to delivering all follow-up materials associated with this hearing to the Subcommittee in a timely fashion.

With that, I now recognize Assistant Secretary McConnell to present his testimony. You are recognized for five minutes.

STATEMENT OF HON. CHARLES MCCONNELL, ASSISTANT SECRETARY FOR FOSSIL ENERGY, U.S. DEPARTMENT OF ENERGY

Mr. MCCONNELL. Chairman Harris, Ranking Member Miller and Members of the Subcommittee, I appreciate the opportunity to discuss the role that the Office of Fossil Energy continues to play in the development of the Nation's unconventional fossil resources.

Expanding production of American energy resources is a key part of President Obama's "all-of-the-above energy" strategy that includes renewables, nuclear and fossil resources. Very recently, the President laid out a specific goal to reduce the imports of oil by a

third over the next ten years. Reducing our imports will have the important impacts of improving our energy security, balance of trade, generating new jobs and growing our economy, and we are in the progress of making that goal.

Over the past few years, crude imports have dropped from 70 percent to 50 percent, while natural gas today is at an abundant and unprecedented price point, driven by expanded production of shale gas, and an abundance currently has U.S. storage capacity at near capacity.

America is sitting on one of the largest gas finds in the world as well as the globe that we live in today. The benefits are game changing. EIA estimates that in the current rate of consumption, the Nation has a 90-year supply of domestic economically recoverable natural gas. If anybody needs proof that domestic energy production can spark a renaissance in American manufacturing, increase exports, and create more jobs, just look at the impact of shale gas on the industries across the country. A recent announcement in the global companies such as Shell and Dow, perfect examples of that.

The American Chemistry Council estimates $16 billion of capital investment, $132 billion in economic output, 17,000 new high-paying jobs and 395,000 nore jobs tangential to the chemical industry. Other industries such as the electric power industry, steel industry, and heavy manufacturing will all benefit from this expanded supply of domestic natural gas.

We are poised to do some great things for our energy and economic security, but to get those benefits, we will have to do it right. We will have to do it right the first time, and you don't get do-overs in this business. A sustainable future requires sustainability in the way we do our work and how the work is performed.

DOE has played a critical role in that development for years. Between 1978 and 1992, the Department invested $137 million in early research on innovative shale gas technologies that led to investments by independent oil producers. Today our research on unconventional resources is being conducted against the backdrop of industry's rapidly evolving exploration and production practices. While these advances are exciting, but there are also challenges. Hydraulic fracturing processes have received a great deal of attention, and people in communities want the confidence that the expansion of the E&P is sustainable. These are primary technical challenges, and if they receive the proper focus, sensible focus, they can be addressed.

So going forward, the expertise of our natural gas technologies program is being refocused to help launch an R&D initiative with the EPA and the Department of Interior to address the potential environmental health and safety impacts of natural gas drilling practices, particularly hydraulic fracturing. This effort is being driven by the Secretary of Energy Advisory Board recommendations focusing on shale gas safety as well as the President's new interagency working group on unconventional domestic gas resources, and we have recently cemented this with an interagency MOU. FE's role in this initiative will be to conduct R&D to ensure the development of sustainable fracturing technologies and techniques such as cementing, well bore integrity, and water usage,

and let me add that while this R&D is focused on shale gas, many of the technologies can be applied and will be applied to shale oil production, particularly in areas such as the Bakken.

In addition to shale, U.S.-led technology advances are making it possible for us to explore other unconventional resources. A prominent example of this is Fossil Energy's methane hydrate research process. Recently we conducted an unprecedented test of technology on the North Slope of Alaska that was able to extract a steady flow of natural gas from methane hydrates. This is a combination of cooperative work with the country of Japan, ConocoPhillips, and a collaborative effort with DOE and Fossil Energy to cost share. This isn't a subsidy to oil and gas, but it is a critical research done in the early stages of a critical market where resource discovery is necessary. Our methane hydrates research represents the critical ground floor that could provide a return on investment similar to that of our early shale gas, and we are just getting started.

Additionally, the Department is focused on enhanced oil recovery using carbon dioxide from coal-fired power plants with enhanced oil recovery utilizing CO_2, putting the CO_2 in the ground and producing oil, and safely, and long-term permanently storing that CO_2 for environmental benefits so we get both the benefit economically as well as environmentally.

Thank you. I look forward to taking your questions.

[The prepared statement of Mr. McConnell follows:]

Statement of
Charles D. McConnell
Assistant Secretary for Fossil Energy
U.S. Department of Energy
Before the
Subcommittee on Energy and the Environment
Committee on Science, Space, and Technology
U.S. House of Representatives

May 10, 2012

Chairman Harris, Ranking Member Miller, and members of the Subcommittee, I appreciate the opportunity to discuss the role that the Department of Energy's Office of Fossil Energy continues to play in the safe and responsible development of the Nation's unconventional fossil resources.

As you know, in March 2011, the President laid out a specific goal for our Nation: to reduce imports of oil by a third over the next 10 years. This is a goal that we can and must achieve. Reducing our imports will reduce our vulnerability to international oil prices, and create new jobs. And the development of all sources of American energy – including unconventional oil and gas – will support this goal.

In fact, we are already making progress. Since 2008, U.S. oil and natural gas production has increased each year. In 2011, U.S. crude oil production reached its highest level in eight years. Natural gas production grew in 2011 as well – the largest year-over-year volumetric increase in history. Overall, oil imports have been falling since 2005, and our dependence on imported oil declined from 57 percent in 2008 to 45 percent in 2011 – the lowest level since 1995.

Challenges and Opportunities

The safe and responsible development of unconventional domestic natural gas resources production creates jobs and provides economic benefits to the entire domestic production supply chain, as well as to chemical and other manufacturers, who benefit from lower feedstock and energy costs. By helping to power our transportation system, greater use of natural gas can also reduce our dependence on oil. And with appropriate safeguards, natural gas can provide a cleaner source of energy than other fossil fuels. For these reasons, it is vital that we utilize our unconventional natural gas resources, while giving American families and communities confidence that natural and cultural resources, air and water quality, and public health and safety will not be compromised.

Indeed, this is a period of great opportunity for the prudent development of our Nation's oil and gas resources. Expanding production of American energy resources is a key part of President Obama's all-of-the-above energy strategy that includes renewables, nuclear *and* fossil resources. But to get these benefits we're going to have to do this right.

Proposed Research

As the United States continues to expand domestic natural gas and oil production, it is critical that the public have full confidence that the right safety and environmental protections are in place – guided by the best available science.

Historically, the Department of Energy has played a critical role in the development of technologies that have enabled the Nation to expand development of our energy resources. In fact, between 1978 and 1992, public research investments managed by the Department led to the breakthroughs in hydraulic fracturing and extended horizontal laterals that spurred private sector investments and industry innovation, unlocking billions of dollars in economic activity associated with shale gas. As the President noted in his State of the Union address and as others in industry as well as academia have confirmed, the domestic shale gas boom we see today demonstrates that government support can be critical in helping businesses get new energy ideas off the ground.

Today, we apply that lesson to other nascent technologies like wind and solar, and, within my office, to clean coal and other sources of clean domestic energy. For example, to support the economics of carbon capture and storage (CCS) technology – which captures CO2 from industrial facilities and power plants; compresses it to liquid form; transports it to an appropriate location; and then injects it into suitable geological formations for permanent storage underground – we are exploring ways to use the off-take from CCS projects to be treated as an asset instead of waste. To this end, the Department is including enhanced oil recovery utilizing carbon dioxide (CO_2-EOR) in its portfolio of CCS projects. Geologically complex oil reservoirs with large volumes of residual oil will benefit the most from next generation technology. DOE's role here is to move forward on the goals of the carbon capture program for lowering the cost of capture and continue to develop the technology and methods to measure, monitor, and verify that the carbon is sequestered in place. The fact that these projects can be done at lower cost makes them more attractive to the program, and related work on saline aquifers will continue.

Of course, just as we continue to support public research to explore new opportunities, we must address the technical challenges that remain with the resources being developed today. For instance, concerns about how to safely and prudently develop unconventional shale gas and tight oil resources have received a great deal of attention, and the Department, in collaboration with other Federal agencies, will conduct research to address those concerns and will quantify the risks inherent in the production of these resources. By doing so, we can help ensure that subsequent regulations at the State and Federal levels, as well as voluntary action by industry, will effectively mitigate the risks that have been scientifically quantified.

On April 13, 2012, the President signed an Executive Order creating a new Interagency Working Group to Support Safe and Responsible Development of Unconventional Domestic Natural Gas Resources. On the same day DOE, the Environmental Protection Agency, and the Department of the Interior's U.S. Geological Survey signed a related Memorandum of Agreement initiating a Multi-Agency Collaboration on Unconventional Oil and Gas Research.

FE's Natural Gas Technologies Program will be refocused to carry out this R&D initiative. The objective of this collaborative effort is to better understand and address the potential

environmental, health, and safety impacts of natural gas development through hydraulic fracturing. Through the collaboration, a robust Federal R&D plan will be developed, taking into account the recommendations of the Secretary of Energy Advisory Board (SEAB) Natural Gas Subcommittee. DOE's role in this initiative will focus on priorities identified by the interagency collaboration in a research plan to be formed over the next nine months within its area of core research competencies, including wellbore integrity, flow and control; green technologies; and systems engineering, imaging and materials. While this R&D is focused on addressing issues surrounding shale gas, many of the environmental mitigation efforts we are pursuing are also applicable to the growing shale oil production.

DOE Capabilities and Expertise

Practices employed by companies engaging in exploration and production evolve rapidly. An understanding of these technologies and practices is critical if the Federal Government is to accurately quantify the risks of these activities. DOE has research experience and capabilities in drilling, production, and environmentally sustainable technologies, as well as imaging, materials, earth science and engineering.

DOE capabilities include experience and expertise in quantifying, evaluating and mitigating potential risks resulting from the production and development of the shale gas resources, to include multi-phase flow in wells and reservoirs, well control, casing, cementing, drilling fluids, and ahandonment operations. DOE has experience in evaluating seal-integrity and wellbore-integrity characteristics in the context of protection of groundwater.

DOE has experience and expertise in the development of a wide range of new technologies and processes that reduce the environmental impact of exploration and production, such as flowback water treatment processes and water filtration technologies. Data from these research activities assists regulatory agencies in making a science-based cost-benefit analysis of requiring producers to adopt new technologies to mitigate environmental risks.

DOE specializes in the development of complex engineered systems, high speed computing and predictive modeling, and has experience in quantifying and mitigating low-frequency, high-impact risks. This includes evaluating human factors that potentially contribute to failures. DOE has developed and evaluated novel imaging technologies for aerial magnetic surveys for the detection of unmarked abandoned wells, and for detecting and measuring fugitive methane emissions from exploration, production, and transportation facilities.

DOE also has experience in understanding fundamental interactions caused during the drilling process, such as the "equation of state" research that investigates the relationship between pressure, temperature, and viscosity of multi-phase fluids at the high temperatures and pressures associated with deep drilling and hydraulic fracturing. DOE's experience in engineered underground containment systems for CO_2 storage brings capabilities that are relevant to the challenges of safe shale gas production, such as evaluating cement-casing integrity in corrosive environments.

Conclusion

The Department of Energy is committed to developing the science and technology that will allow the Nation to use its abundant fossil energy resources in a way that balances the energy needs for sustaining a robust economy with continued environmental responsibility. As we move forward on a multi-agency, collaborative research program with DOI and EPA into understanding and minimizing the unwanted consequences of unconventional fossil resource development, the Office of Fossil Energy will pursue its mission with the same commitment to excellence and innovation.

Mr. Chairman, this completes my prepared statement. I would be happy to answer any questions you or other members of the committee may have at this time.

Chairman HARRIS. Thank you very much.

I now recognize Ms. Mittal.

STATEMENT OF MS. ANU MITTAL, DIRECTOR, NATURAL RESOURCES AND ENVIRONMENT, U.S. GOVERNMENT ACCOUNTABILITY OFFICE

Ms. MITTAL. Chairman Harris and Members of the Subcommittee, I am pleased to be here today to participate in your hearing on unconventional oil and gas resources.

As requested, my statement will focus on oil shale and will highlight the opportunities and challenges related to the development of this unconventional energy resource. My statement is based on the findings of a report that we completed for this Committee in October 2010.

As you know, U.S. interest in oil shale has waxed and waned since the early 1900s because, over time, average oil prices have generally been lower than the threshold necessary to make oil shale development profitable. More recently, however, higher oil prices have renewed interest in domestic oil shale. The Federal Government is in a unique position to influence this development, because 72 percent of U.S. oil shale lies beneath lands managed by the Department of the Interior.

The Green River formation in Colorado, Utah, and Wyoming contains the world's largest deposits of oil shale. Being able to tap this vast amount of oil locked within this formation will go a long way to help to meet our future demands for oil. The U.S. Geological Survey, as you noted, estimates that the formation contains about three trillion barrels of oil, of which half may be recoverable. As you can imagine, having the technology to develop this vast energy resource will lead to a number of important socioeconomic benefits, including the creation of jobs, increases in wealth, and increases in tax and royalty payments for Federal and State Governments.

Along with these positive outcomes, there are a number of key challenges that also should be considered. First, there is the uncertainty surrounding the viability of current technologies. To date, no commercial-scale surface retort or in situ technology has been proven in the United States that is both economically and environmentally viable. According to some energy experts, the key to developing U.S. oil shale will be through an in situ process, because most of our richest oil shale is buried beneath hundreds of feet of rock, making mining difficult or impossible.

Second, developing oil shale poses significant environmental challenges for water quantity and quality, air quality, and wildlife. The water quantity and quality challenges are of particular importance, because developing oil shale will require significant amounts of water, which could pose problems in the arid West. Estimates of the quantities of water needed to support oil shale development vary significantly depending upon the assumptions that you use. However, it is expected that while the water is likely to be available for the initial development of the industry, the eventual size of the industry may ultimately be limited by the water availability. In addition, in the absence of effective mitigation measures, oil shale development could significantly impact water quality through

increased runoff of sediments, salts, and chemicals, decreased downstream flows, permanent groundwater impacts to aquifers and wastewater discharges to streams and rivers.

While large-scale oil shale development offers socioeconomic opportunities, it also poses certain socioeconomic challenges that also should not be overlooked. Oil shale development like other extractive industries can bring a sizable influx of workers who along with their families put additional stresses on local infrastructure. Development from expansion of extractive industries has historically followed a boom-and-bust cycle, making planning for growth difficult for local governments.

As we noted in our 2010 report, industry experts believe that the United States is currently at least 15 to 20 years away from developing a large-scale oil shale industry, but there are certain actions that federal agencies can begin to take now to proactively prepare for such an industry. These include improving collaboration between federal agencies on research and developing more comprehensive baseline information on the current ground and surface water conditions in the region. Such information will help position federal agencies to better monitor and mitigate the impacts of oil shale development if a viable industry should emerge.

In conclusion, Mr. Chairman, while there are potential opportunities for the development of oil shale, they must be balanced with the technological, environmental and socioeconomic challenges that are also present.

This completes my prepared statement. I would be pleased to answer any questions that you might have.

[The prepared statement of Ms. Mittal follows:]

United States Government Accountability Office

GAO

Testimony

Before the Subcommittee on Energy and Environment, Committee on Science, Space, and Technology, House of Representatives

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UNCONVENTIONAL OIL AND GAS PRODUCTION

Opportunities and Challenges of Oil Shale Development

Statement of Anu K. Mittal, Director
Natural Resources and Environment

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GAO-12-740T

May 10, 2012

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Highlights

Highlights of GAO-12-740T, a testimony before the Subcommittee on Energy and Environment, Committee on Science, Space, and Technology, House of Representatives

UNCONVENTIONAL OIL AND GAS PRODUCTION

Opportunities and Challenges of Oil Shale Development

Why GAO Did This Study

Fossil fuels are important to both the global and U.S. economies, and "unconventional" oil and gas resources—resources that cannot be produced, transported, or refined using traditional techniques—are expected to play a larger role in helping the United States meet future energy needs. With rising energy prices one such resource that has received renewed domestic attention in recent years is oil shale. Oil shale is a sedimentary rock that contains solid organic material that can be converted into an oil-like product when heated. About 72 percent of this oil shale is located within the Green River Formation in Colorado, Utah, and Wyoming and lies beneath federal lands managed by the Department of the Interior's Bureau of Land Management, making the federal government a key player in its potential development. In addition, the Department of Energy (DOE), advances energy technology, including for oil shale, through its various offices, national laboratories, and arrangements with universities.

GAO's testimony is based on its October 2010 report on the impacts of oil shale development (GAO-11-35). This testimony summarizes the opportunities and challenges of oil shale development identified in that report and the status of prior GAO recommendations that Interior take actions to better prepare for the possible future impacts of oil shale development.

View GAO-12-740T. For more information, contact Anu K. Mittal at (202) 512-3841 or mittala@gao.gov.

What GAO Found

In its October 2010 report, GAO noted that oil shale development presents the following opportunities for the United States:

- *Increasing domestic oil production.* Tapping the vast amounts of oil locked within U.S. oil shale formations could go a long way toward satisfying the nation's future oil demands. Oil shale deposits in the Green River Formation are estimated to contain up to 3 trillion barrels of oil, half of which may be recoverable, which is about equal to the entire world's proven oil reserves.
- *Socioeconomic benefits.* Development of oil shale resources could lead to the creation of jobs, increases in wealth, and increases in tax and royalty payments to federal and state governments for oil produced on their lands. The extent of these benefits, however, is unknown at this time because the ultimate size of the industry is uncertain.

In addition to these opportunities and the uncertainty of not yet having an economical and environmentally viable commercial scale technology, the following challenges should also be considered:

- *Impacts on water, air, and wildlife.* Developing oil shale and providing power for oil shale operations and other activities will require large amounts of water and could have significant impacts on the quality and quantity of surface and groundwater resources. In addition, construction and mining activities during development can temporarily degrade air quality in local areas. There can also be long-term regional increases in air pollutants from oil shale processing and the generation of additional electricity to power oil shale development operations. Oil shale operations will also require the clearing of large surface areas of topsoil and vegetation which can affect wildlife habitat, and the withdrawal of large quantities of surface water which could also negatively impact aquatic life.
- *Socioeconomic impacts.* Oil shale development can bring an influx of workers, who along with their families can put additional stress on local infrastructure such as roads, housing, municipal water systems, and schools. Development from expansion of extractive industries, such as oil shale or oil and gas, has typically followed a "boom and bust" cycle, making planning for growth difficult for local governments. Moreover, traditional rural uses would be displaced by industrial uses and areas that rely on tourism and natural resources would be negatively impacted.

GAO's 2010 report found that federal research efforts on the impacts of oil shale development did not provide sufficient data for future monitoring and that there was a greater need for collaboration among key federal stakeholders to address water resources and research issues. Specifically, Interior and DOE officials generally have not shared information on their oil shale research efforts, and there was a need for the federal agencies to improve their collaboration and develop more comprehensive baseline information related to water resources in the region. GAO made three recommendations to Interior, which the department generally concurred with and has already begun to take actions to address.

Chairman Harris, Ranking Member Miller, and Members of the Subcommittee:

I am pleased to be here today to participate in your hearing on the challenges and opportunities related to the potential development of unconventional oil and natural gas resources. As you know, fossil fuels are important to both the global and U.S. economies, and among other things, we rely on oil to fuel our transportation vehicles and on natural gas to a significant extent to heat and power our homes, businesses, and industries. For many years, the United States has relied heavily on imported oil and, to a lesser extent, imported natural gas, with domestic production largely limited to conventional oil and gas resources. However, in recent years, improvements in technology have allowed oil and gas operators to extract oil and natural gas from unconventional resources—resources that cannot be produced, transported, or refined using traditional techniques. Examples of unconventional resources include oil shale (a sedimentary rock containing solid organic material that can be converted into a petroleum-like oil when heated), shale oil and gas, natural gas hydrates (crystalline solids consisting of water, methane, and usually a small amount of other gases that form beneath permafrost and on the ocean floor), and tar sands (a combination of clay, sand, water, and bitumen, a heavy black viscous oil).

These unconventional oil and gas resources are expected to play a larger role in helping the United States meet its future energy needs. In recognition of this fact, the Departments of Energy and the Interior and the Environmental Protection Agency released a memorandum on April 13, 2012, announcing a collaborative interagency effort on unconventional oil and gas research. The memorandum states that the agencies will develop a multi-agency program focused on the highest priority challenges associated with safely and prudently developing unconventional resources.

My statement today is focused on oil shale development and will highlight several issues related to the opportunities and challenges related to oil shale development that we identified in an October 2010 report undertaken at the request of this committee.[1] In addition, I will highlight

[1]GAO currently has work ongoing on several topics related to other unconventional energy resources, namely shale oil and gas and issues related to federal and state agency regulation of unconventional resources.

the key actions that federal agencies can take to proactively prepare for the potential development of a future oil shale industry. Our October 2010 report was one of a series of reports that we have completed that examine the nexus between energy and water resources.[2] This 2010 report contains a detailed explanation of the methods used to conduct our work, which we performed in accordance with generally accepted government auditing standards.

Background

One unconventional energy resource that has received renewed attention in recent years in the United States is oil shale. Historically, interest in oil shale development as a domestic energy source has waxed and waned since the early 1900s, as average crude oil prices have generally been lower than the threshold necessary to make oil shale development profitable over time. More recently, however, higher oil prices have renewed interest in developing oil shale. The federal government is in a unique position to influence the development of oil shale because nearly three-quarters of the oil shale within the Green River Formation lies beneath federal lands managed by the Department of the Interior's (Interior) Bureau of Land Management (BLM). The Energy Policy Act of 2005 directed Interior to lease its lands for oil shale research and development. In June 2005, BLM initiated a leasing program for research, development, and demonstration (RD&D) of oil shale recovery technologies. By early 2007, it had granted six small RD&D leases: five in the Piceance Basin of northwest Colorado and one in the Uintah Basin of northeast Utah. The leases are for a 10-year period, and if the technologies are proven commercially viable, the lessees can significantly expand the size of the leases for commercial production into adjacent areas known as preference right lease areas. The Energy Policy Act of 2005 also directed Interior to develop a programmatic environmental impact statement (PEIS) for a commercial oil shale leasing program. During the drafting of the PEIS, however, BLM determined that, without proven commercial technologies, it could not adequately assess the environmental impacts of oil shale development and dropped from consideration the decision to offer additional specific parcels for lease. Instead, the PEIS analyzed making lands available for potential leasing

[2] GAO, *Energy-Water Nexus: A Better and Coordinated Understanding of Water Resources Could Help Mitigate the Impacts of Potential Oil Shale Development,* GAO-11-35 (Washington, D.C.: Oct. 29, 2010). Also see related GAO products at the end of this statement.

and allowing industry to express interest in lands to be leased. Environmental groups then filed lawsuits, challenging various aspects of the PEIS and the RD&D program. Since then, BLM has initiated another round of oil shale RD&D leasing and the lawsuits were settled.

Stakeholders in the future development of oil shale are numerous and include the federal government, state government agencies, the oil shale industry, academic institutions, environmental groups, and private citizens. Among federal agencies, BLM manages federal land and the oil shale beneath it and develops regulations for its development. The United States Geological Survey (USGS) describes the nature and extent of oil shale deposits and collects and disseminates information on the nation's water resources, which are a significant consideration for oil shale development in the West. The Department of Energy (DOE), advances energy technologies, including oil shale technology, through its various offices, national laboratories, and arrangements with universities. The Environmental Protection Agency (EPA) sets standards for pollutants that could be released by oil shale development and reviews environmental impact statements, such as the PEIS. Also, Interior's Bureau of Reclamation (BOR) manages federally built water projects that store and distribute water in 17 western states and provides this water to users, including states where oil shale research, development, and demonstration, is underway.

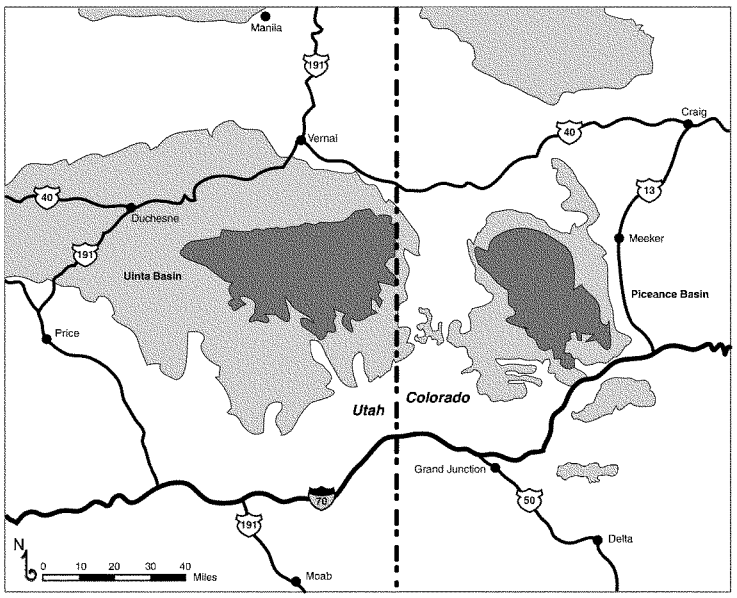
Opportunities Presented by Future Oil Shale Development

Our October 2010 report found that oil shale development presents significant opportunities for the United States. Potential opportunities associated with oil shale development include increasing domestic oil production and socioeconomic benefits.

- *Increasing domestic oil production.* Being able to tap the vast amounts of oil locked within U.S. oil shale formations could go a long way toward satisfying the nation's future oil demands. The Green River Formation—an assemblage of over 1,000 feet of sedimentary rocks that lie beneath parts of Colorado, Utah, and Wyoming—contains the world's largest deposits of oil shale. USGS estimates that the Green River Formation contains about 3 trillion barrels of oil, and about half of this may be recoverable, depending on available technology and economic conditions. The Rand Corporation, a nonprofit research organization, estimates that 30 to 60 percent of the oil shale in the Green River Formation can be recovered. At the midpoint of this estimate, almost half of the 3 trillion barrels of oil would be recoverable. This is an amount about equal to the entire world's

proven oil reserves. The thickest and richest oil shale within the Green River Formation exists in the Piceance Basin of northwest Colorado and the Uintah Basin of northeast Utah. Figure 1 shows where these prospective oil shale resources are located in Colorado and Utah.

Figure 1. Location of Oil Shale Resources in Colorado and Utah



Source: Adopted from BLM.

- Socioeconomic benefits. Development of oil shale resources could also yield important socioeconomic benefits, including the creation of jobs, increases in wealth, and increases in tax and royalty payments to federal and state governments for oil produced on their lands. Our October 2010 report did not attempt to quantify these potential socioeconomic benefits because of current uncertainty surrounding the technologies that might be used to develop oil shale resources, which would influence the ultimate size of a future oil shale industry.

Challenges Presented by Future Oil Shale Development

Our October 2010 report also found, however, that there are a number of key challenges associated with potential oil shale development in the United States, including: (1) uncertainty about viable technologies, (2) environmental impacts that affect water quantity and quality, air, and land, and (3) socioeconomic impacts.

- *Uncertainty about viable technologies.* A significant challenge to the development of oil shale lies in the uncertainty surrounding the viability of current technologies to economically extract oil from oil shale. To extract the oil, the rock needs to be heated to very high temperatures—ranging from about 650 to 1,000 degrees Fahrenheit—in a process known as retorting. Retorting can be accomplished primarily by two methods. One method involves mining the oil shale, bringing it to the surface, and heating it in a vessel known as a retort. Mining oil shale and retorting it has been demonstrated in the United States and is currently done to a limited extent in Estonia, China, and Brazil. However, a commercial mining operation with surface retorts has never been developed in the United States because the oil it produces competes directly with conventional crude oil, which historically has been less expensive to produce. The other method, known as an in-situ process, involves drilling holes into the oil shale, inserting heaters to heat the rock, and then collecting the oil as it is freed from the rock. Some in-situ technologies have been demonstrated on very small scales, but other technologies have yet to be proven, and none has been shown to be economically or environmentally viable at a commercial scale. According to some energy experts, the key to developing our country's oil shale is the development of an in-situ process because most of the richest oil shale is buried beneath hundreds to thousands of feet of rock, making mining difficult or impossible. In addition to these uncertainties, transporting the oil produced from oil shale to refineries may pose challenges because pipelines and major highways are not prolific in the remote areas where the oil shale is located, and the large-scale

infrastructure that would be needed to supply power to heat the oil shale is lacking.

- *Environmental impacts on water, air, and wildlife*. Developing oil shale resources poses significant environmental challenges, particularly for water quantity and quality but also for air and wildlife.

  - *Water quantity*. Oil shale development could have significant impacts on the quantity of surface and groundwater resources, but the magnitude of these impacts is unknown because of the technological uncertainties, and also because the size of a future oil shale industry is unknown, and knowledge of current water conditions and groundwater flow is limited. Developing oil shale and providing power for oil shale operations and other associated activities will require significant amounts of water, which could pose problems, particularly in the arid West where an expanding population is already placing additional demands on available water resources. For example, some analysts project that large scale oil shale development within Colorado could require more water than is currently supplied to over 1 million residents of the Denver metro area and that water diverted for oil shale operations would restrict agricultural and urban development. The potential demand for water is further complicated by the past decade of drought in the West and projections of a warming climate in the future. Current estimates of the quantities of water needed to support a future oil shale industry vary significantly depending upon the assumptions that are made. However, as our 2010 report noted, while water is likely to be available for the initial development of an oil shale industry, the eventual size of the industry may be limited by the availability of water and demands for water to meet other needs of the region. Oil shale companies operating in Colorado and Utah will need to have water rights to develop oil shale, and representatives from all of the companies with whom we spoke for our 2010 report were confident that they held at least enough water rights for their initial projects and will likely be able to purchase more rights in the future. Sources of water for oil shale will likely be surface water in the immediate area, such as the White River, but groundwater could also be used. However, as we reported in 2010, the possibility of competing municipal and industrial demands for future water, a warming climate, future needs under existing compacts, and additional water needs for the protection of threatened and endangered fishes, may eventually limit the size of a future oil shale industry.

- *Water quality.* While the water quantity impacts from oil shale development are difficult to precisely quantify at this time, hydrologists and engineers have been able to more definitively determine the water quality impacts that are likely because other types of mining, construction, and oil and gas development cause disturbances similar to impacts expected from oil shale development. According to these experts, in the absence of effective mitigation measures, impacts from oil shale development to water resources could result from (1) disturbances to the ground surface during the construction of roads and production facilities, which could result in the degradation of surface water quality from the related runoff of sediment, salts, and possible chemicals to nearby rivers and streams, (2) the withdrawal of water from streams and aquifers for oil shale operations, which could decrease flows downstream and temporarily degrade downstream water quality by depositing sediment during decreased flows, (3) underground mining and extraction, which would permanently impact aquifers by affecting groundwater flows through these zones, and (4) the discharge of waste waters from oil shale operations, which could temporarily increase water flows into receiving streams, thereby altering water quality and water temperature.

- *Air.* Construction and mining activities during the development of oil shale resources can temporarily degrade air quality in local areas. There can also be long-term regional increases in air pollutants from oil shale processing and the generation of additional electricity to power oil shale development operations. Pollutants, such as dust, nitrogen oxides, and sulfur dioxide, can contribute to the formation of regional haze that can affect adjacent wilderness areas, national parks, and national monuments, which can have very strict air quality standards. Environmental impacts could also be compounded by the impacts of coal mining, construction, and extensive oil and gas development in the area, and air quality appears to be particularly susceptible to the cumulative effect of these development impacts. According to some environmental experts that we spoke to for our 2010 report, air quality impacts may be the limiting factor for the development of a large oil shale industry in the future.

- *Wildlife.* Oil shale operations are likely to clear large surface areas of topsoil and vegetation, and as a result, some wildlife habitat will be lost. Important species likely to be negatively impacted from loss of wildlife habitat include mule deer, elk, sage grouse, and

raptors. Noise from oil shale operations, access roads, transmission lines, and pipelines can further disturb wildlife and fragment their habitat. Wildlife is also particularly susceptible to the cumulative effects of nearby industry development. In addition, the withdrawal of large quantities of surface water for oil shale operations could negatively impact aquatic life downstream of the oil shale development.

- *Socioeconomic impacts*. Large-scale oil shale development offers certain socioeconomic benefits outlined earlier, but it also poses some socioeconomic challenges. Oil shale development can bring a sizeable influx of workers, who along with their families, put additional stress on local infrastructure such as roads, housing, municipal water systems, and schools. As noted in our 2010 report, development from expansion of extractive industries, such as oil shale or oil and gas, has typically followed a "boom and bust" cycle, making planning for growth difficult for local governments. Furthermore, development of a future oil shale industry would have the potential to replace traditional rural uses by the industrial development of the landscape, and tourism that relies on natural resources, such as hunting, fishing, and wildlife viewing, could be negatively impacted.

Federal Agencies Can Proactively Take Actions to Prepare For Oil Shale Development

Our 2010 report noted that current federal research efforts on the impacts of oil shale development do not provide sufficient data for future monitoring and that there is a greater need for collaboration among key stakeholders to address water resources and research issues related to oil shale development. As noted earlier, the federal government is in a unique position to influence the development of oil shale because 72 percent of the oil shale within the Green River Formation lies beneath federal lands managed by BLM. In addition to its leasing of these lands, Interior has sponsored oil shale projects related to water resources—to develop a common repository of water data collected from the Piceance Basin and to begin monitoring groundwater quality and quantity within this basin using existing and future wells. The common repository project was funded jointly with Colorado cities and counties as well as with oil shale companies. DOE also plays an important role in developing these resources and has sponsored most of the oil shale research that involves water-related issues. DOE also provides technological and financial support for oil shale development, through its research and development efforts. However, our October 2010 report noted that Interior and DOE officials generally have not shared information on oil shale research and that there is a need for federal agencies to improve their efforts to

collaborate and develop more comprehensive baseline information on the current condition of groundwater and surface water in these areas. Such information will be important for understanding the potential impacts of oil shale development on water resources in the region.

To prepare for possible impacts from the potential future development of oil shale, which industry experts believe is at least 15-20 years away, we made three recommendations in our October 2010 report to the Secretary of the Interior. We recommended that the Secretary direct BLM and USGS to

- establish comprehensive baseline conditions for groundwater and surface water quality, including their chemistry, and quantity in the Piceance and Uintah Basins to aid in the future monitoring of impacts from oil shale development in the Green River Formation;
- model regional groundwater movement and the interaction between groundwater and surface water, in light of aquifer properties and the age of groundwater, so as to help in understanding the transport of possible contaminants derived from the development of oil shale; and
- coordinate with DOE and state agencies with regulatory authority over water resources in implementing these recommendations, and to provide a mechanism for water-related research collaboration and sharing of results.

Interior fully supported the concepts in the report and agreed with the need to answer the science questions associated with commercial oil shale production prior to its development. In addition, Interior indicated that it already had begun to take some actions in response to our recommendations. For example, Interior told us that USGS is undertaking an analysis of baseline water resources conditions to improve the understanding of groundwater and surface water systems that could be affected by commercial-scale oil shale development. In addition, Interior stated that BLM and USGS are working to improve coordination with DOE and state agencies with regulatory authority over water resources and noted current ongoing efforts with state authorities.

In conclusion, Mr. Chairman, while there are potential opportunities for commercial development of large unconventional oil and gas resources, such as oil shale, in the United States, these opportunities must be balanced with other potential technological, environmental and socioeconomic challenges. The recommendations in our October 2010 report on oil shale provide what we believe to be important next steps for federal agencies involved in the development of oil shale, particularly as it relates to water resources. By proactively improving collaboration between departments and state agencies and developing key baseline information the federal government can position itself to better monitor water resources and other environmental impacts should a viable oil shale industry develop in the future.

Chairman Harris, Ranking Member Miller, and Members of the Subcommittee, this completes my prepared statement. I would be pleased to respond to any questions that you may have at this time.

Contact and Staff Acknowledgments

Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this testimony. For further information about this testimony, please contact Anu K. Mittal, Director, Natural Resources and Environment team, (202) 512-3841 or mittala@gao.gov. In addition to the individual named above, key contributors to this testimony were Dan Haas (Assistant Director), Alison O'Neill, Barbara Timmerman, and Lisa Vojta.

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Federal Oil and Gas: Interagency Committee Needs to Better Coordinate Research on Oil Pollution Prevention and Response (GAO-11-319, March 25, 2011).

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Department of the Interior, Bureau of Land Management: Oil Shale Management—General (GAO-09-214R, December 2, 2008).

Advanced Energy Technologies: Budget Trends and Challenges for DOE's Energy R&D Program (GAO-08-556T, March 5, 2008).

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Chairman HARRIS. Thank you very, very much, and we will begin the questioning. The Members will be recognized for five minutes, and I recognize myself first.

Mr. McConnell, as you know, the President has recently talked, as I said in my opening statement, about this "all of the above" energy strategy, so I am going to ask you just a few questions about what the Administration means by all of the above. First of all, is gas production from methane hydrate one of the components of "all of the above"?

Mr. MCCONNELL. Yes.

Chairman HARRIS. Okay. Can you just explain why for the last three fiscal years, then, the Fossil Energy budget request has proposed to eliminate the program, Fiscal Year 2010, 2011 and 2012?

Mr. MCCONNELL. I can't speak to those previous years, but I can tell you, the budget request for 2013 has it in there. Last year, we did work on methane hydrates with funding that was provided through the Office of Science, recently conducted a test——

Chairman HARRIS. I know you mentioned that. Thank you very much, and I appreciate the change of heart, believe me.

Now, is oil shale part of the "all of the above" strategy?

Mr. MCCONNELL. Oil shale is certainly a part of the "all-of the above" strategy.

Chairman HARRIS. And what is the Administration doing to actively support the development of oil shale?

Mr. MCCONNELL. Much of the work that we are doing in the unconventional processing work that we are doing all provides a lot of the baselines for that industry, as well as the hydraulic fracturing that is going on in natural gas as well as tight oil that is going on in that area as well.

Chairman HARRIS. But with regard specifically to oil shale, what is the level of investment that the Administration is proposing?

Mr. MCCONNELL. We don't have a specific line item in this year's budget request.

Chairman HARRIS. Do you have any idea about how much out of the—the DOE has a several billion dollar budget. How important are they looking for the future, toward the future for oil shale? Is it $5 million, $10 million, $15 million?

Mr. MCCONNELL. In this year's budget request, it was zero.

Chairman HARRIS. Oh, zero? Oh, okay. It doesn't sound like much active support. But what about oil sands? Is oil sands part of the "all of the above" approach?

Mr. MCCONNELL. It is part of the "all of the above" approach, and it is also part of what we are constantly looking at and part of our overall process.

Chairman HARRIS. Is that also line item zero in the DOE budget?

Mr. MCCONNELL. We have a number of line items that aren't specifically identified by the market segments you are identifying, but in terms of the key technologies and the cross-cutting research that goes on from technologies that apply to many of the markets that you are mentioning.

Chairman HARRIS. Perhaps you can follow up with some more detail. We will have some follow-up questions.

The DOE has, you know, requested, as you said, I think, $12 million in the budget to, I think you called it R&D initiative, but what

it sounds like is, you know, understand and minimize the potential environmental, health and safety impacts of shale gas. I mean, most people would realize this is the prelude to regulation basically. Is there any research that you are doing that might actually help increase production?

Mr. MCCONNELL. There sure is.

Chairman HARRIS. Okay.

Mr. MCCONNELL. It would be well bore integrity. We are looking at processes in terms of extraction, and we don't draw a distinction between sustainability and extraction techniques. We see it as one and the same because it has to be done right the first time with a sustainable impact.

Chairman HARRIS. Right, and done right the first time, you are aware that, for instance, hydraulic fracturing has been done 1.2 million times in the United States, right, with no documented evidence of contamination of drinking water ever?

Mr. MCCONNELL. That is correct.

Chairman HARRIS. That sounds not only done right the first time, it sounds like done right 1.2 million times, but anyway, we are going to have a difference of opinion on that, probably.

Now, in 2007, the Department of Energy's Strategic Unconventional Fuels Task Force published a strategy and program plan that included numerous recommendations on how the Federal Government could support unconventional energy, development of unconventional energy. Is the DOE implementing any of the recommendations made by that task force back in 2007?

Mr. MCCONNELL. We are working, continue to work year over year with the RPSEA organization following that—following those sets of recommendations.

Chairman HARRIS. What progress has been made on the specific recommendation to "provide an effective land tenure system" for access to resources on public lands?

Mr. MCCONNELL. That is a question I can't answer. I don't know the answer.

Chairman HARRIS. Perhaps you could, you know, get the answer and provide it in writing.

What progress has been made on the recommendation "to provide an inclusive regulatory system and development process that encourages expeditious development and a predictable schedule for permitting and approvals"? Is the Administration doing anything to encourage a predicable schedule for permit approvals?

Mr. MCCONNELL. That is not something in Fossil Energy that I am aware of directly, and I will have to provide that to you as well.

Chairman HARRIS. Thank you. And do you know if the task force is still actively meeting and producing work products? Is that task force still having meetings?

Mr. MCCONNELL. It does meet from time to time, regularly—I can't speak to how often it has met, but it has had routine meetings over the past several years.

Chairman HARRIS. And the last one being what do you think?

Mr. MCCONNELL. Don't know the answer to that.

Chairman HARRIS. Okay. Maybe you can get that answer to us also. Well, thank you very much.

I now recognize Mr. Tonko for five minutes.

Mr. TONKO. Thank you, Mr. Chair.

In this Committee, we have spent a lot of time debating the appropriate role of government in the development of energy technologies. My Republican colleagues seem steadfast in their resolve that anything beyond basic research, whether it is applied research, demonstration, or financing amounts to government interference in the free market, somewhat of a picking winners and losers and crowding out private investment. However, this appears to only apply when maligning clean energy technologies, and their commitment to these principles quickly disappears when it comes to supporting increasing taxpayer funds to develop technologies for the oil and gas sector. That said, I am willing to acknowledge that there may be areas within fossil energy research space where a little government research could be helpful.

With that in mind, Ms. Mittal, your report includes some recommendations for research areas. Could you expand on that, please, and address why you think these areas are particularly well suited for government involvement?

Ms. MITTAL. When we looked at gaps in research for oil shale, we heard from federal as well as State and academic researchers a consistent message that there were two areas in which there were gaps. One was that there was insufficient information and data on groundwater and surface water baseline information in the region that there was not enough information right now on the conditions of groundwater and surface water in the region. Therefore, when an oil shale industry develops, you will not know what the baseline conditions are, so it will be impossible to determine what the impacts of the industry are, so we need to do more research and get good information on both quantity and quality impacts, information on quantity and quality of the groundwater and surface water.

The other area is that we need to develop more information on how groundwater and surface water interact with one another, and this will help develop models that will allow us to determine how contaminants are transported from groundwater to surface water and vice versa, and those are two areas that were identified for needing more federal research.

Mr. TONKO. Thank you very much, and to our Assistant Secretary, the Department made a recent announcement regarding its work on methane hydrates. Can you please provide some detail on that, and in particular, discuss how it fits into what you would consider to be the right problem space for government research programs in fossil energy?

Mr. MCCONNELL. Well, in any kind of early emerging technologies, government assistance is required to help promote and stimulate industry involvement. A good example of that would have been in the early 1970s when hydraulic fracturing for natural gas actually began, and again, that just wasn't the government investing money, but it was a combination of government and industry partnering, and George Mitchell and the Woodlands a long, long time ago was very interested in moving forward but needed some help, and the government and Mitchell Energies moved forward with those initial—that work, and it has borne quite a bit of fruit since then.

I think methane hydrates is a good analogy to that situation. It was—it is a unique and emerging type of technology in industry for natural gas conducted on the slopes of Alaska, and it also was a partnership between ConocoPhillips, the Japanese government as well as the Department of Energy, and I think any one of these emerging technologies, early on, a good measure of industry interest is their willingness to cross-share and partner, and that is the way that kind of research can be conducted and be most beneficial. We had the work done in Alaska. It was very successful. We were highly encouraged by the results we saw, and in any type of research program, it sets the baseline for what we hope will be continued work in that area and continued involvement that we can bring forward, and again, in partnership with industry and others that are willing to partner in the effort. So like any good strategic process, you do some things. You find out what you learn and then grow from there, and we are certainly enthused about what we have seen.

Mr. TONKO. And in terms of comparing that with the potential DOE role in developing technologies for other unconventionals such as oil shale, would you contrast that for us?

Mr. MCCONNELL. Well, I don't know that there is any contrasting. I think the most important thing we do at Fossil, I believe, is to be very close to industry's interests and development so that we can stay close to their enthusiasm, and we talk a lot about technical recovery, and then we talk about economic recovery, and I think industry is a far better gauge of what emerging technologies they would like to spend time on and actually develop, and in the case of what you are describing, for us to find industry partners that are willing to do the cost sharing, to be involved and cooperatively develop this research, what it does is, it is a real bellwether for industry's level of enthusiasm at the time that they are involved, and we will stay very close to that.

Mr. TONKO. Thank you very much.

I yield back, Mr. Chair.

Chairman HARRIS. Thank you very much.

I now recognize the gentleman from California, Mr. Rohrabacher, for five minutes.

Mr. ROHRABACHER. Thank you very much.

"All of the above," really, we have a problem with that and I have a problem with that, and I just do not believe that the President has been forthright in discussing his energy policy with the Congress. We have seen that in this Committee where we have seen what appears to be purposeful deployment of regulatory bodies to stop certain types of production, especially fracking, which seems to be a—which seems to be something that is actually greatly expanding the energy available to the United States. So that gives us some concern. That isn't necessarily something that you would be involved in.

I think that we—do you agree that we have reached a technological stage that we could become energy self-sufficient within a decade?

Mr. MCCONNELL. I wouldn't debate that with you, but I think it is really important that we have energy security. I think that is a little different than energy independence, but maybe we are just

making a fine point of a word. I don't know. I think is important that we be energy secure.

Mr. ROHRABACHER. But are we technologically capable of that now?

Mr. MCCONNELL. Well, I will give you an example. We talked earlier about hydraulic fracturing, and I mentioned sustainability, and in fact, we have fracked a lot of wells for a lot of years. There is no question about that. I think it is also fair to say that in our society today, there are a lot of questions about fracturing, about the impacts in local communities, et cetera, and it is not just issues associated with groundwater, but it also has to do with seismic effects, it also has to do with wastewater disposal, wastewater treatment, all of the issues that are really important to sustainability.

Mr. ROHRABACHER. Do you think it also has to do with a mindset that what is formally described as Luddite mindset that has been beaten into kids' heads at our universities that a habitat for a squirrel is more important than energy for American homes?

Mr. MCCONNELL. I wouldn't subscribe to that. I don't think that at all. As a matter of fact, I think it is really important that it do be deemed sustainable and a big part of our future, and that is what——

Mr. ROHRABACHER. You don't think that anti-energy attitude has had some impact on the Administration and the production of energy in our country?

Mr. MCCONNELL. I can't comment to that. I can tell you it hasn't had any effect on what we are doing at Fossil Energy.

Mr. ROHRABACHER. Let me just note that we have had the ability in a number of areas. I have supported energy research into solar, for example, over the years, and it wasn't up until about a year and a half ago, there were no permits issued by the Federal Government to move forward with solar energy plants in the desert—none. And in fact, Mr. Chairman, I had to actually introduce legislation to sort of "goose" the system into letting people go on these vast stretches of desert that we have and set up a solar plant, and do you know how many solar plants have been issued permits now in the last year and a half?

Mr. MCCONNELL. I don't know the answer to that, sir.

Mr. ROHRABACHER. I think it is six, but let us just note that we are way behind the curve because the technology was there and has been there to try to build a solar plant in the desert, yet up until a year and a half ago there were zero solar plants in the desert, and you look back and I think it an overvalue being placed on habitat for insects and lizards rather than electric power for the homes of human beings.

What about— let me get to methane hydrates. It is another one I supported early on over the years. Has there been any progress with methane hydrate other than Alaska? There are methane hydrate potentials, for example, in the ocean.

Mr. MCCONNELL. There are indeed, and as part of the unconventional strategy going forward, we are doing some very early work in that to make assessments of resources and overall impact, yes.

Mr. ROHRABACHER. Has there been any—assessment of resource is one thing, development of technology is another. Have there been

any technological steps forward in trying to utilize ocean-based methane hydrates?

Mr. MCCONNELL. We haven't conducted any demonstration projects, if that is your question.

Mr. ROHRABACHER. One last note. For the amount of energy that is being produced and consumed by the American people, the amount of research money that is spent by the Federal Government into that particular area, wouldn't you say that oil and gas actually produces a huge amount of our energy that we consume and that it is actually per amount of energy that we use from that source the amount of research actually is less than in other areas?

Mr. MCCONNELL. Well, from our standpoint, we recognize that both oil and gas as well as coal is an incredibly big part of our future. I think what we want to be sure we do is not fall into the trap of looking at how much we are using today and having that be equivalent to how much we are spending on research. A lot of the emerging technologies that we are spending our money on at a federal level as well as with industry is important in that regard. So yes, I think it is a big part of our future and it will be a big part of Fossil Energy's strategy.

Mr. ROHRABACHER. Thank you very much, and we just hope that the President is serious and it is reflected in the policies that go through his Administration about this idea of "all of the above," because America, nothing would be better for our economy than for us to quit sending that money overseas and spending it right here. Thank you very much.

Mr. MCCONNELL. I couldn't agree with you more.

Chairman HARRIS. Thank you very much.

The gentleman from New Mexico, Mr. Luján, is recognized for five minutes.

Mr. LUJÁN. Mr. Chairman, thank you very much.

Mr. Chairman, I was really encouraged when I read the hearing charter, "Supporting American Jobs in the Economy through Expanded Energy Production: Challenges and Opportunities of Unconventional Resources Technology," but I was a bit disappointed when reading through the charter and through the testimony that was filed with us, that I didn't see any mention of fuel production from algae or that we were going to be able to talk about the energy that could be produced from battery storage. And I say that, Mr. Chairman, because there have been recent reports that have been put out that talk about the research and development that is taking place through the Department of Defense with unconventional energy production so that we can save soldiers' lives when we fully appreciate the amount of lives that have been lost through the transport of fuel that is developed from petro products or the weight of those batteries that they have to carry in those packs to be able to develop any generation or communication aspects.

But with that being said, Mr. Chairman, I still am encouraged at the conversation that we are having today, and I hope that we can take that conversation up as well because it is an important one as we talked about, "all of the above" opportunities through the expansion of research and development.

Pertaining to oil shale development and water concerns in the West, I appreciate the sensitivities that are being brought in that

area. Coming from the high desert, although I have six beautiful ski areas in my district, you can imagine that the snowpack isn't always what it should be, and this year as we talk about the readjudication of water from the Colorado and the way that it is going to impact the West, what that means to water flows, commerce, opportunities, food production in the West is something that I am very sensitive to.

And so, Ms. Mittal, being from the Southwest where water is so scarce, I would appreciate you going into some more detail on the potential impact of oil shale development on water quality, on quantity, and how research and development might lead to other opportunities as we talk about the amount of water that is necessary in these areas.

Ms. MITTAL. One of the things that our 2010 report noted was that right now it is very difficult to assess or measure the quantity impacts of oil shale development, and that is for three primary reasons. One is that we don't have a good sense of what the baseline conditions of groundwater and surface water is, as I mentioned earlier. The other issue is that there is a lot of uncertainty related to the technology, so we don't know how much water is actually going to be used by the technology. It is very, very uncertain. And the third issue is that there are a lot of uncertainties related to climate change, how much water is going to be needed in the future in that region from growing population, from compacts. There are water compacts that are going to require certain demands, that are going to place certain demands on the water in the Colorado River region. There are going to be other uses of water. So there are a lot of uncertainties right now that make it very difficult to actually quantify the impacts of oil shale development on water resources in that area.

Mr. LUJÁN. I appreciate that. Although myself and my colleagues may not agree on what is causing some of the drought conditions that we are experiencing, the reality is that I have ranchers back in New Mexico that have sold off entire herds because there is less water, and I hope that we can all agree on the reality that there is less water out there and that we need to be mindful of that.

Mr. McConnell, one thing that I don't believe that we do a good enough job of is explaining to the American people that there is a difference between oil shale and shale oil. But I want to concentrate my efforts on oil shale. The way that I understand it is, it is a rock and that there is an element in there, if I pronounce it correctly, kerogen, that has to be heated up, so we have to heat this rock up that is down below. How would you propose that we heat that rock up? You know, does it take a long match? How are we able to reach down there to heat that rock up so we can get this energy coming out of that? What kind of heat do we need?

Mr. MCCONNELL. Well, most of the technologies that are looked at—and again, there is a suite of technologies that can be employed, but it is really an in situ process in which you need to get the fuel source into that area to be able to do that heating as you described it. There are a number of different technologies that are being looked at, but again, this is a very early emerging industry and I wouldn't say there is a business-as-usual case for exactly what you are describing.

Mr. LUJÁN. I appreciate that.

Mr. Chairman, thank you very much and look forward to the next round of questions with the next panel. Thank you.

Chairman HARRIS. Thank you.

I now recognize the other gentleman from Maryland, Mr. Bartlett, for five minutes.

Mr. BARTLETT. Thank you very much.

I was reading the other day a report that indicated that the gas in the Marcellus shale was the equivalent of 3.4 billion barrels of oil. Is that the number that you have heard? Is that in the ballpark?

Mr. MCCONNELL. Equivalencies sometimes can be tricky, but I would agree with what you are talking about, yes.

Mr. BARTLETT. Now, underlying the Marcellus shale is a bigger footprint of Utica shale, which contains oil. This same report said that there was 4–1/2 billion barrels of oil in the Utica shale. Is that a number that you think is in the ballpark?

Mr. MCCONNELL. A large number, yes, sir.

Mr. BARTLETT. Okay. Every day the world uses 84 million barrels of oil. That means in 12 days, the world uses a billion barrels of oil. So this 4–1/2 billion barrels of oil, which you said was huge will last the world 52 days. That doesn't seem to me to be a really big deal, just 52 days.

Methane hydrates have been mentioned. There are potentially huge energy stores in methane hydrates.

Let me mention something else where there are huge potential energy resources. That is the tides. The Moon lifts the whole darn ocean what, two, three, four feet a day? I carry two buckets of water, that is heavy. That is an awful lot of energy. Why aren't we getting more energy out of the tides? It is for the same reason we aren't getting any energy, much of any energy out of methane hydrates because it is very dispersed. It has got to be concentrated before you can really capitalize on it. I think it will be a long time before we get much energy out of methane hydrates, although the potential energy there, I think, exceeds most other energy sources, does it not? It makes a potentially huge energy reserve in methane hydrates.

The oil shales, 1–1/2 trillion barrels of potentially recoverable oil. Shell Oil Company has tried twice there and they have given up. Oil at $80 barrel was not high enough that it was recoverable.

But let us imagine that we can get a trillion and a half barrels of oil from the oil shales. You know, it is awfully easy when you are dealing with big numbers to slip a zero or two, so I want you to check the numbers with me. Is 1,500 billion a trillion and a half?

Mr. MCCONNELL. I am going to take you word for it that it is. I am not quite sharp enough to answer your question, sir.

Mr. BARTLETT. I think that 1,500 billion is a trillion and a half, and if that is true, and I now do some arithmetic, I find that if we are able to develop this trillion and a half barrels of oil from the oil shales, that it will last the world, I think, 40 or 50 years. A little over four years ago, I let a CODEL to China. Nine of us went to talk about energy, and the Chinese began their discussion of energy by talking about post oil. Clearly, there will be a post-oil world. The first prominent person I know of to recognize that was

Hyman Rickover, and if you want to read a very fascinating speech, it was lost for a number of years, just Google for Rickover and energy speech, and his speech given the 15th day of May 1957 in St. Paul, Minnesota, will come up, and he made a very interesting observation. He said in the 8,000-year recorded history of man, the age of oil would be but a blip. He had no idea how long the age of oil would last. Now we know, the age of oil is going to last about 300 years. We are 150 years into the age of oil and we are not running out of oil, by the way. What we are running out of is our ability to produce it as fast as we would like to use it. There is way more oil out there to be pumped than all the oil that we have pumped, but the challenge is pumping it as fast as we would like to use it.

Now, if we develop all of that oil and it lasts us just 50 years, I have got great-grandkids. What are they going to do in 50 years?

Thank you very much, Mr. Chairman, and I yield back.

Chairman HARRIS. Thank you very much.

They are calling us for votes, but I think we can get a couple more Members' questions in before we have to go. I now recognize Mr. McNerney, the gentleman from California, for five minutes.

Mr. MCNERNEY. Thank you, Mr. Chairman.

Mr. McConnell, how would you compare hydro fracking technology to oil shale technology, both in terms of the economics and impacts on local environment?

Mr. MCCONNELL. Well, maybe first of all, think about it in terms of where we are on the technical scale or the really—it is often called the TRL, or technical readiness. In terms of hydraulic fracturing and what is going on in the Marcellus and other areas across the country, that technology has been noted, as it has been performed for a number of years, recently come into a lot of prominence because of the high cost of natural gas just three or four years ago. We were all very concerned that we as a Nation were going to have to import natural gas, and we were able to take this technology, put it in play and utilize it. And from the standpoint of the Marcellus and many of the numbers that you quoted about availability of resources, etc., oftentimes the first call on that is considered to be technically recoverable hydrocarbon. But it is not really technical recovery, but it is really economically recoverable. And so we have got vast quantities of additional hydrocarbon resource that with the price points being what they need to be and with the technology evolving to where it can go, it really then opens up large additional volumes.

The hydraulic fracturing activity has been performed for years and years, but of course, we continue to look at the impacts of it not just from standpoint of the fracturing itself but the wastewater disposal, the seismic activity, all of the other things that many of the people in our country are concerned about.

Contrast that with the oil shale that you mentioned. It is much, much less far along on its technical scale of capabilities. A lot of the initial resource assessments have been performed. The volumes and the capabilities are vast. If you look at where we are today in terms of crude oil and the capacity that we have in this country in our domestic imports of it, I know that industry will continue to look at it as a next best opportunity to move forward to. But

today it doesn't have economic recoverability, and because of that, there hasn't been a draw by industry at this point to get into it in the same way that we have done with hydraulic fracturing for natural gas.

Mr. MCNERNEY. Thank you. Would you comment on energy return on investment as applied to oil shale? Are you familiar with that term?

Mr. MCCONNELL. Well, I can give you just a statistic from the National Energy Technology Laboratory. Over the past 20 years, we have done some analysis. For every dollar that the taxpayers put in, we have got about $13 of return back in terms of jobs and economic impact and other things that have contributed to our economy. The statistics that I quoted earlier, the rather modest investment that was done in hydraulic fracturing for natural gas today is paying enormous dividends and we are enjoying that and the American chemical industry, and we will likely be using more and more natural gas in electric power generation, etc., as we move forward.

In the oil shale today, a lot of the initial work that we are doing again in assessments and looking at the potential for it, I don't know that we are far enough along to actually put a return on investment just yet.

Mr. MCNERNEY. Well, by energy return on investment, I mean energy in versus energy out. So energy out is a numerator; energy in is the denominator. If you have any comment on that, or Ms. Mittal, if you have a comment on that?

Ms. MITTAL. We didn't look at the actual amount of energy. What we were told is that it does require a lot of energy, especially the in situ process because you have to heat the rock for large periods of time to very high temperatures. It is a very high-energy-intensive process.

Mr. MCNERNEY. So it is likely to have a small energy return on investment in terms of the way I just defined it?

Ms. MITTAL. It could, but we don't have the actual numbers.

Mr. MCNERNEY. Thank you, Mr. Chairman. I will yield back.

Chairman HARRIS. I thank you very much.

I recognize the Chairman of the Committee, the gentleman from Texas, Mr. Hall.

Chairman HALL. Mr. Chairman, I thank you, and I am really a little confused right now. I heard something that really sounded good to me, that one of our leaders said this country needs an "all-out," "all-of-the-above" strategy that develops every available source of American energy. Of course, I jumped up and down and clapped my hands and re-read it, listened to it, say it one more time. I found out it was Mr. Obama that said that in the State of the Union speech. And other than prayer, energy is probably the most important word in the dictionary to any youngster that is in high school or early college right now.

And it is very difficult to square that statement with the Administration's actions. For example, the budget proposes to eliminate a $50 million R&D program aimed at expanding safe production of oil and gas. This program, which I created in the Energy Policy Act of 2005, several Presidents have tried to knock it out, supports development of next-generation technologies important to ensuring

domestic production of oil and gas and it is maintained and even increased. It was simple. We knew the energy was there, but we couldn't get it to the top of the water. We traded to universities the technology, traded the same very energy that they are going to get for us by giving us the technology to get it. It is an easy way to get technology without pledging or paying out money direct here too. It was a deal and it has worked. I don't understand why anybody wants to knock it out, because the program was highlighted by the Department of Energy's own advisory board as an effective program that should be enhanced and supported. I really don't—Mr. McConnell, if the President really wants to identify every single way to lower gas prices and increase energy production over the long term, why is he trying to eliminate the R&D program?

Mr. MCCONNELL. I don't believe he is trying to eliminate the R&D program. I think——

Chairman HALL. What is he trying to do then? Tell me. Explain to me. I don't understand that. Where do you get that?

Mr. MCCONNELL. What we are trying to do is take the resources that we have got available and with the fiscal means that we have available, and one of the things I said when I took this job is, I would do the best we could to get the most impact with the resources we had available to us, and that is what we are doing.

Chairman HALL. You have got a lot of resources up in ANWR and all of you say don't drill on little ANWR. There is just 19 million acres in little ANWR. All we want to drill on is 2,000 acres. Maybe 40 years of energy there. How in the world can you square what you are testifying to here? And you know you are under oath right now, don't you?

Mr. MCCONNELL. Yes, sir, I do.

Chairman HALL. Then go ahead and explain to me. I will just note for the record that in the State of the Union speech, the President said, and I quote, "It was public research dollars that helped develop the technologies to extract all this natural gas out of shale rock," and it is troubling that he is suggesting the Federal Government made hydraulic fracturing possible, while at the same time trying to kill R&D within the same program, and he said he deserves credit for the current oil and gas boom. This is a program that is working, that has worked with several universities and it's paying off. Why would anybody want to knock it out? And I will say this in deference to your President. My President tried to knock it out too, President Bush before he left office. We had a vote on the Floor. Overwhelmingly, they knew this program was working. I don't understand why anybody would want to knock out something that is working when we have the greatest need in the world for more energy.

Mr. MCCONNELL. I can't comment on what you are saying in terms of giving you a reason for what other people may view or how people want to see something go down. I guess what I will say is that the research and the focus in the areas that we have identified in hydraulic fracturing to continue that research, to put in a budget request for this year. We are enthused about it, and we will continue to work hard at all the things that you are talking about using the resources that we have got available and the manner in which we can most effectively employ them.

Chairman HALL. Well, your views on hydraulic fracturing has been turned back and your spear blunted, witness after witness after witness. Even your own witnesses, the EPA's witness have sat there and admitted that what they are saying about fracturing and the danger it has done to drinking water, you had to go all the way to Wyoming to kind of drag up something that could hit fracturing. I don't understand that. Actually I will just say for the record that the State of the Union speech, the President said it was public research dollars that helped develop the technology to extract oil and natural gas out of the shale rock. It is very troubling that he is suggesting the Federal Government made hydraulic fracturing possible, while at the same time trying to kill R&D with the same program he said deserves credit for the current oil and gas boom. How do you react that he is campaigning one way and saying something and doing something else?

Mr. MCCONNELL. Federal research dollars originally back in the 1970s were leveraged with industry enthusiasm, George Mitchell and the Woodlands and the work that was done with industry, and in fact, hydraulic fracturing was pioneered by the Department of Energy's work along with industry.

Chairman HARRIS. Thank you.

Chairman HALL. Yes, sir, it was a different Department of Energy than what you folks are running over there now, though.

I yield back my time.

Chairman HARRIS. Thank you very much, Mr. Chairman.

The gentlelady from California, Ms. Woolsey, has been very patient. We are going to recognize her and then we are going to walk fast over to vote.

Ms. WOOLSEY. You can't answer this question, but my question is—well, he left. I can't imagine why I love our Chairman so much after that group of questions. You can't answer that because you don't know, but we just think he is great, but not today, I don't.

Mr. McConnell, our colleagues, as you have heard today and over time, have been arguing that more taxpayer resources need to be transferred from work on emerging alternative energy technologies and into technology development for oil and gas. So regardless of one's priorities in that regard, there is such a question about the relative impact of limited federal dollars in all of these sectors and whether a major increase in oil and gas research funding translates into real benefits for the industry or consumers. So what happens if we increase the oil and gas research program? Will it be a big or a small improvement? And is the oil and gas industry actually beating down your door asking for more research money? And where do we get the biggest bang for our buck on this?

Mr. MCCONNELL. Well, I think that is a great question because really what it does is, it speaks to the pulse in the industry and what industry is looking at. I think the signals that come from the Federal Government in terms of funding, willingness to support activities and focus on research that industry is interested in, they get signals from budget, but they also get signals from the capabilities and competencies that exist within the Department of Energy. We have received a number of enthusiastic support signals from industry. Those in the natural gas industry, the leaders in those industries are incredibly driven by wanting to ensure that sustain-

able processes for this, not just in the seismic—or the hydraulic fracturing but in the wastewater disposal, in the seismic impacts, in the communities. They all want this to be a sustainable, long-term industry, and the ability for us at the Department of Energy to work with the Department of Interior, to work with EPA from an interagency standpoint, to do things going forward in a sensible manner so that industry can have the confidence that this Administration is going to move it forward in a confident manner, to make it a sustainable industry. I think the President has been pretty clear about the fact that he wants that to happen. He has certainly been clear to us at the Department of Energy of what we are supposed to do.

Ms. WOOLSEY. So what is the Department of Energy thinking about drilling and exploration for gas and oil off of, for example, the northern California coast, which I represent, that should be a sanctuary and probably will never be drilled but if it was, it would take all kinds of expensive research to make any of this worthwhile. But is there any way that we can prove that that isn't worth the pennies we would—well, the thousands of dollars we would—millions invest in order to get pennies worth of energy?

Mr. MCCONNELL. We don't have any plans to do either at this point. That is not on our short-term strategic plan, and the focus that we have with the resources we have is not oriented in that area.

Ms. WOOLSEY. Okay. Thank you. And I think because of that, I am going to yield back so we can go vote. Thank you so much.

Chairman HARRIS. Thank you very much.

I want to thank the panel for their valuable testimony, the Members for their questions. The Members of the Committee may have additional questions for you, and we will ask you to respond to those in writing. The record will remain open for two weeks for additional comments from the Members.

I am going to dismiss the first panel. We will recess until five minutes after the last vote, which should be about 20 minutes from now, to go ahead with the second panel. Thank you very much to the first panel for being with us this morning. The Committee stands in recess.

[Recess.]

Chairman HARRIS. Thank you very much. I want to thank the second panel for your patience with us, and I will call the Committee to order.

The first witness in our second panel is Ms. Samantha Mary Julian, Director of the Office of Energy Development for the State of Utah. Previously, she served as the Energy and Natural Resources Cluster Director for the Governor's Office of Economic Development. Ms. Julian is responsible for the promotion of Utah's state energy policy, coordinating with the Governor's energy advisor to implement the Governor's energy goals and objectives, seeking federal grants and participating in federal programs and making administrative rules.

Our next witness is Mr. Jim Andersen, President and CEO, U.S. Seismic Systems. Mr. Andersen began his career as an engineering officer on U.S. Navy nuclear submarines and went on to hold a variety of engineering and senior management positions in engineer-

ing-intensive, high-technology companies, including Westinghouse, White Hall Hydroscience, Litton Industries, and Northrop Grumman.

Our third witness is Mr. Cameron Todd, CEO of U.S. Oil Sands, Inc. Prior to joining U.S. Oil Sands, Mr. Todd worked five years with Conoco Oil and Gas Limited, where he had the executive role of Senior Vice President, operating refining and marketing. He has had an extensive and successful career in the domestic and international oil and gas industry, with over 30 years of experience in all facets of the business.

Our final witness on the second panel is Mr. Tony Dammer, Member, Board of Directors, National Oil Shale Association. Mr. Dammer is an independent consultant specializing in oil shale and other unconventional fuels development. From September 2008 to February 2012, he was Senior Vice President of Red Leaf Resources, a Utah-based oil shale technology and resource development company. He joined Red Leaf Resources after 28 years of federal service in the U.S. Department of Energy, Office of Naval Petroleum and Oil Shale Reserves. For the last 20 of those years, he served as the Director of the office, responsible for the management and operation of six reserves in California, Wyoming, Colorado, and Utah.

As our witnesses should know, spoken testimony is limited to five minutes each, after which the Members of the Committee will have five minutes each to ask questions.

I now recognize our first witness on the second panel, Ms. Julian, to present her testimony.

STATEMENT OF MS. SAMANTHA MARY JULIAN, DIRECTOR, OFFICE OF ENERGY DEVELOPMENT, STATE OF UTAH

Ms. JULIAN. Thank you, Chairman Harris, Ranking Member Tonko and Members of the Committee.

Utah is the epicenter of unconventional fuel development for the United States. Our office was created in 2011 with the Utah legislature seeing that there needed to be an "all of the above" approach to energy development. We are the voice for energy development responsibly through economic development and policy.

I am not here today to say that oil shale or oil sands will drop prices at the pump or immediately solve the country's dependence on foreign oil. I am here to say that despite the lack of efforts of some federal agencies, the unconventional energy industry is happening in Utah today and deserves support.

These developments are important, and the Federal Government needs to understand that these industries are commercially viable. Operators seek public land certainty and federal policy consistency.

Special interest groups often attack these industries claiming massive use of water that is otherwise unavailable in our State. In Utah, water is available for oil shale and oil sands development through existing water rights and general market system. Water is owned by the State and in trust of its citizens. It is subject to the water appropriation system and managed by the State Engineer. The process has been in place for over 100 years.

Utah also manages its lands to promote responsible development. It is the main source of our funding for our educational system, and our pupils and educators count on it.

As any operator will tell you, whether it is shale, sands, gas, oil, coal, working with the State is much more streamlined and consistently regulated.

Our oil sands technology zone is a way for Utah to lead in innovative and research and development efforts. It is a rent-free lease on a pre-permitted site adjacent to a sands mine, allowing proof of concept to remove technology risk for capital providers. Our alternative energy development incentive encourages responsible development, again, to fund our textbooks, our classrooms, and our students. It is a post-performance incentive for oil shale, sands, utility-scale renewable energy, and nuclear.

Governor Herbert's 10-year energy plan is the State's path forward for responsible energy development. It is about all approach diversified resources.

So how could the Federal Government contribute to expand production through R&D? The most consequential assistance the Federal Government could provide, and I repeat, the most consequential assistance the government could provide, is to assist the BLM in consistent—to be consistent with the Energy Policy Act of 2005. Secondly, current DOE procurement favors federal R&D providers. That is national labs over external providers of industry and universities. If funding decisions were, instead, calculated proportionately on GDP or ranking of energy production, Utah would increase from $3.5 million in funding to $60 million, or almost twentyfold. Proactive work by the BLM and DOE would positively affect our energy independence, security, and decrease our dependence on foreign oil.

We truly appreciate the support of Congress to make unconventional energy an R&D priority and help federal agencies understand that taking steps to ensure public lands certainty and federal policy consistency would create an energy game changer.

Thank you for the opportunity to speak today. I look forward to your questions.

[The prepared statement of Ms. Julian follows:]

Committee on Science, Space, & Technology
Energy & Environment Subcommittee
United States House of Representatives
"Unconventional Energy Development in Utah"
Testimony of Samantha Mary Julian
Director
Office of Energy Development
Thursday, May 10th, 2012

WRITTEN

Thank you Chairman Harris, Ranking Member Miller and members of the Committee. I am Samantha Mary Julian, Director of the Governor's Office of Energy Development for the State of Utah, the epicenter of unconventional energy development in the United States. Utah is proud of being a major energy producer (11th Crude Oil, 9th Natural Gas, 15th Coal). Our office was created to be the voice for responsible energy development within our State.

I am not here to say that oil shale and oil sands will drop prices at the pump and immediately solve our Country's devastating dependence on foreign oil. I am here to say that the responsible development of unconventional energy is happening today in Utah. Leading technology companies have settled in Utah, permits have been granted and efforts begun. Hundreds of millions of private dollars are being invested and jobs are being created as we speak. These critical resources in Utah are no longer on the horizon. The unconventional industry is operational in Utah and poised for continued growth.

These developments are important to note, as the federal Government needs to understand that these industries are commercially viable and proven. The BLM's 2012 PEIS (Programmatic Environmental Impact Statement) as well as the 2010 GAO report "Energy-Water Nexus" should have recognized that oil shale and oil sands technology is quite advanced, with completed pilot and demonstration projects. The fact is that both industries have been commercial outside of the United States for over 50 years, with the most obvious examples being in Estonia for oil shale and in Canada for oil sands. Operators and technology from both countries are now in Utah and continually seeking public lands certainty and federal policy consistency.

The size of the oil shale and oil sands resources are so large it is difficult to comprehend. The United State Geologic Survey[1] estimates that within Utah's Uintah Basin alone there is the equivalent of over 1.32 Trillion barrels of oil. Simply put, this is more than the entire reserves of OPEC and enough to supply the United States with over 100 years of oil consumption.

Special interest groups often attack these industries claiming massive use of water that is anyways unavailable in our State. Not only do we fervently believe and assert that water is available for oil shale and oil sands development, but water is owned by the State in trust for its citizens, and as such it is subject to the State water appropriation system managed by the Utah State Water Engineer. Water is available both through existing water rights and through the general market system. The

[1] *Assessment of In-Place Oil Shale Resources of the Green River Formation, Greater River Basin in Wyoming, Colorado and Utah,* United States Geologic Survey, June 2011

state can and will, consistent with the authority of the State Water Engineer, process applications to approve or transfer water rights for oil shale, oil sands or any other use. This process is well known and has been in place for over a hundred years.

In addition, advances in technology should lay to rest false estimates from f GAO's Energy-Water Nexus[2], BLM's 2012 PEIS and special interest groups. The EcoShale technology from Red Leaf Resources utilizes low temperatures for heating and requires no process water[3]. Enefit's Enefit280 oil extraction process uses no water[4]. Every oil sands company proposing operation in Utah recycles its process water.

We were asked to speak specifically about the challenges associated with the federal government's involvement in unconventional energy. These challenges are critical as approximately 75% of oil shale and tar sands resources are under federal lands. This request is timely; as right now would be optimum timing for Secretary Salazar and the BLM to take steps forward in implementing policies and practices that support Congress's mandate in the 2005 Energy Policy Act to establish a commercial leasing program for oil shale and tar sands. We are extremely concerned with this and ask the Committee to do everything in its power to encourage the current administration to embrace legislation passed by Congress.

Despite the lack of efforts of some federal agencies, the unconventional energy industry is alive and growing in Utah. Red Leaf Resources, a Utah technology company has just entered into a $200 million Joint Venture with the French oil company TOTAL and received mining permits for its first project. Mr. Cameron Todd from US Oil Sands has successfully raised significant funds and just testified about his efforts in our State. These two leading projects are both on State land and this is no coincidence. Utah actively manages its lands to promote the responsible development of its energy resources as it produces the main source of funding for our schools. Simply put, Utah educators and students depend on responsible energy development. As any operator will tell you-coal, oil, gas, wind, solar, shale, sands, etc- working on State land is not only more clearly streamlined but consistently regulated. We are very proud of this in Utah.

Besides making land available for responsible development, the State is leading additional efforts at providing pathways for responsible unconventional energy development. One of these efforts is an 'Oil Sands Technology Zone', where technology companies and entrepreneurs are given a rent-free lease on a 'pre-permitted' site adjacent to an active oil sands mine. This facilitates the technological advancement of sometimes nascent bench-scale technology and allows for 'proof-of-concept' at a level sufficient enough to remove technology risk for capital providers. We hope that this will enable the identification and successful development of the most environmentally friendly, economical oil sands technology in the world.

In addition, the State has created an Alternative Energy Development Incentive which is managed through our office. Unlike similar policy tools, this incentive was not created to make winners out of uneconomic energy resources. This incentive was created to encourage responsible energy development as Utah's education system relies on it for funding classrooms and textbooks. It was created to make Utah the epicenter of unconventional energy and we believe it is. Through this incentive, a significant portion of State tax liability is refunded to responsible energy developers,

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[2] http://www.gao.gov/assets/320/311896.pdf
[3] http://www.icse.utah.edu/assets/archive/2011/assets/pdfs/red_leaf_nelson_2011_ucf.pdf
[4] https://www.energia.ee/en/oil/international/enefit

including oil sands and oil shale producers. This incentive is based on previous tax payments and thus incentivizes meaningful development of resources at a commercial scale at no risk to the State.

Perhaps the most important effort made by the State to develop a pathway for responsible unconventional energy development is Governor Gary R. Herbert's 10 Year Strategic Energy Plan. This plan is the product of stakeholders throughout industry, government, academia, environmental concerns and other important viewpoints. This massive undertaking aligned all relevant parties to identify goals and recommendations to provide a pathway for the responsible development of Utah's energy resources.

The third topic we were asked to speak on was how the federal government could contribute to expand production through support for research and development. I will repeat that the most consequential assistance that the federal government can provide is to assure that BLM is consistent with what Congress has already mandated. There is, however, strong opportunity for the federal government to provide support on the R&D side as well. The current DOE procurement processes favor internal government R&D providers (national labs) over external providers (industry & research universities). If funding decisions were instead calculated proportionally (at a minimum) to a States GDP or energy production ranking, the R&D resources of Utah's leading industry and research universities would increase from ~$3.5M to over $60M. Given that Utah's industry and universities are a clear leader in unconventional energy R&D this would elevate the support for oil shale and oil sands from the federal government almost 20 fold. In the words of DOE Undersecretary Arun Majumdar, "the road to a secure future is to invent locally, make locally and sell globally." Increasing Utah's share of R&D funding to represent its size and that fact that Utah is an energy producing state would mean additional resources to concentrate on Utah's critical unconventional resources, i.e. 'inventing locally'.

I will conclude my comments by again requesting that Congress leverage its overwhelmingly bipartisan support for the Energy Policy Act of 2005. You instructed BLM in section 369 to create a commercial leasing program. Proactive work by BLM would positively affect our energy independence, national security, and decrease our dependence on foreign oil. Utah, as a robust and business friendly State, is successfully fostering this crucial industry. We would truly appreciate the support of Congress to make unconventional energy an R&D priority and to help federal agencies understand that taking steps to ensure public lands certainty and federal policy consistency would create an energy game changer. Thank you for your time and offering me the opportunity to speak today.

Chairman HARRIS. Thank you very much.

I now recognize Mr. Andersen for five minutes to present his testimony.

STATEMENT OF MR. JIM ANDERSEN,
CHIEF EXECUTIVE OFFICER AND PRESIDENT,
U.S. SEISMIC SYSTEMS, INC.

Mr. ANDERSEN. Thank you very much, Chairman Harris, Members of the Subcommittee.

I have a little bit different presentation, and I am going to show some charts and hopefully this technology will work right.

So what I am here to talk about is, we have developed a revolutionary sensing technology that we believe will solve many of the environmental problems associated with unconventional oil and gas development, primarily for hydrofracking. The sensors are all fiber optic, no electronics or copper in the well, and they replace the 50-year-old sensor technology that has been used in the industry that really isn't up to speed with these new extraction techniques, and I will talk a little bit about that.

Not to go into a lot of technical mumbo jumbo, just a real simple "how does it work." You know, we have two things. We have a box we call an optical interrogator. All the smarts are in that box, and lasers, electronics and all that, and then we have a fiber optic cable which we drop down the well. The fiber optic cable has no electronics, no circuit boards or any power that goes down the well. That makes it very reliable and inexpensive. How it works, we send laser-like pulse down the cable. When the reflection comes back, the information we are looking at is in that reflected pulse. Very, very simple.

So just so you don't think that this is smoke and mirrors, in my prior life I used to run the division of Litton Industries and was responsible for fiber optics there, and we put the fiber optic sensor system on all the *Virginia*-class submarines. The contract was valued at over $450 million, had the electronics inside the submarine, fiber optic sensors outside the hull, and it turned out to be a very, very reliable system. It is now on the order of a dozen submarines, and reliability record is outstanding.

A lot of the team members that used to work for me at Litton are now at my company, and we have commercialized it, made it less expensive and more reliable for commercial applications, and also we develop our own IP, but we have also licensed some of the technology from Northrop Grumman.

So here is our premise. The existing equipment for frack monitoring is just too expensive and the performance is marginal, and when I say expensive, I use an example that, you know, to drill a well to produce shale, it costs about $5 million. To install sensors and the cost of sensors is another $5 million. People just don't do it, and plus the performance is poor so there is really no motivation.

We also believe that, you know, it is not just the sensing system but how much it costs to install, and the main driver to that is the cost of drilling the wells to install it. We have been working with the Department of Energy and they have done some studies and

shown if you have very sensitive sensors like we do, instead of going down and drilling down to, you know, 5,000, 6,000 feet, you could drill 500 or 600 feet. Great savings on installation also. We are trying to make this inexpensive so everybody will do it.

You know, frack monitoring, basically what you end up with instead of blindly pumping in fluid at high pressure and, you know, wondering if you are fracturing, you monitor it with sensors in the ground as you do the stage. You can see there are different colors and you block off a certain section, you frack it and do the next one, and you see what the extent of the fractures are. So you have a record, and if it starts going to places where you don't want, you could stop it. We believe 100 percent monitoring will solve the problems, and it is not just us. You know, the Secretary of Energy Advisory Board came out with some recommendations and they said you should have surveys carried out to ensure fracturing is limited to where you want it to occur. And they also have said we need additional studies to talk about shale gas leakage of water wells. We are also working with FTS International, a large company in the United States that does fracking and is developing systems to do 100 percent monitoring.

Here I will just talk about well casing leaks a little bit. You know, it is an important issue. My feeling is, it is designed to prevent communication between layers but, you know, these things happen, and the next chart will show that the problem with gas migration, people talk about it like it is a new thing. It has been around for over a decade. You know, they had studies in Canada that 45 percent of the wells are leaking. So my thought is, is rather than denying or saying does this leakage happen or not, we have technology that is cheap insurance, and you could check for it and make sure that if it does happen, you could fix it.

So summing up, there are several of the major areas of environmental concern that can be minimized via monitoring during and after the fracking process. This includes chemical contamination of the subsurface, aquifers, gas migration and even induced seismicity, and we have developed revolutionary fiber optic sensing technology to address the technical problems, such that you could do remediation before there is significant environmental damage.

And I thank you and I welcome your questions.

[The prepared statement of Mr. Andersen follows:]

Testimony of
Jim Andersen
President & CEO
US Seismic Systems, Inc.

House Science, Space, and Technology Subcommittee on Energy and Environment
Hearing

Supporting American Jobs and the Economy through Expanded Energy Production: Challenges and Opportunities of Unconventional Resources Technology

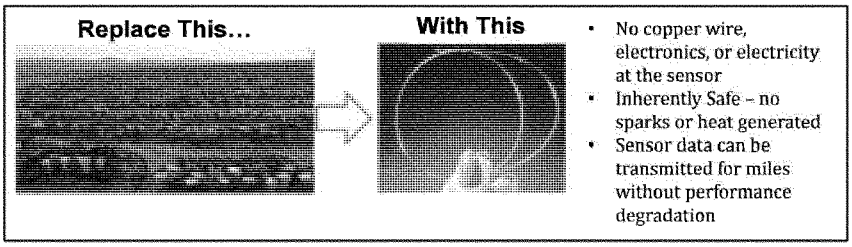
May 10, 2012

Introduction:

Chairman Harris, Ranking Member Miller, and other members of the Subcommittee, I am Jim Andersen, President and CEO of US Seismic Systems, Inc. (USSI). Thank you for this opportunity to testify today.

US Seismic Systems, Inc., (USSI) an Acorn Energy portfolio company (ACFN:NASDAQ) is a Delaware corporation headquartered in Chatsworth, California whose primary focus is to develop and manufacture sensor systems for the Oil & Gas sector based upon proprietary fiber optic technology. These sensors, which are powered only by light, are designed to replace the 50-year old copper wire-based sensor technology that is currently in widespread use within the oil Exploration and Production (E&P) industry. The existing 50 year-old sensor technology is too costly and unreliable to support the new oil and gas recovery techniques needed to meet the world's increasing demand. USSI's fiber optic sensor systems are designed to replace these legacy systems, with more reliable, more precise, less expensive, and inherently safe systems.

The USSI fiber optic sensor technology is revolutionary, with three patents issued, and ten patents pending. USSI's all-optical sensors represent a radical departure from today's electronic-based sensing systems; they function with no in-situ electronics, copper conductors, or electrical power. The USSI system eliminates the need for electronics, electrical connectors, batteries, and heavy copper cables in the field.



USSI's new fiber optic sensing systems provide users with a huge competitive advantage over those relying on electronic sensor technology. They will enable users to improve efficiency, increase output, and enhance safety, all at a lower cost. USSI has a world-class business and technical team, internationally recognized for their expertise in fiber optic sensors and related technology.

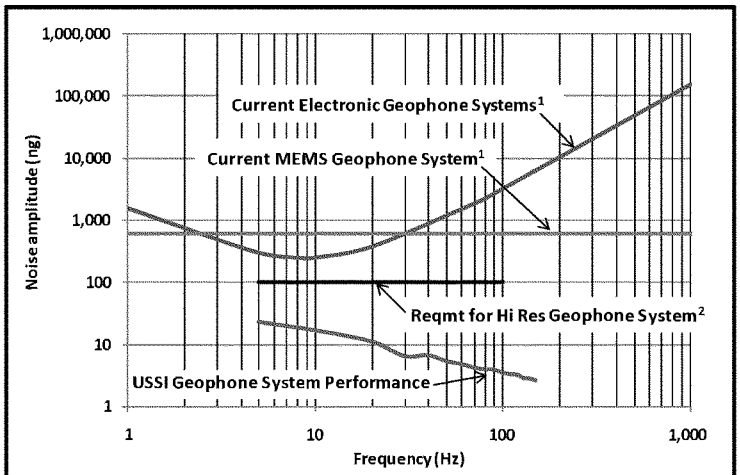
Environmental issues/concerns with the unconventional energy production process are threatening to derail the current revolution in the US energy market. USSI believes that we all must recognize that despite following all the best practices, problems can and do still occur, i.e., fractures can occur outside of the intended zones, and well casings do sometimes leak.

USSI believes it is better to install systems that can detect the occurrence of these potential problems, such that they can be corrected before significant damage occurs.

Overview of USSI Fiber Optic Technology

By way of overview, US Seismic Systems Inc. (USSI) has developed an Ultra-High Sensitivity (UHS) fiber optic seismic sensing system designed to replace the expensive, unreliable, bulky electronic geophones and equipment used in existing oilfield seismic monitoring systems with a high sensitivity, low cost, ultra-reliable fiber optic geophone system. The USSI system eliminates all in-situ electronics and electrical power cables, while providing superior signal to noise performance as compared to legacy systems.

For over S0 years, it has been generally accepted within the oil & gas industry that geophones represent the most effective and reliable approach for monitoring subsurface seismic activity. Conventional geophones consist of a magnet mounted inside a wire coil. Relative motion between the magnet and the wire coil produces an output that is proportional to the level of seismic activity. These geophones systems have performance that is marginal for today's new unconventional oilfield recovery methods and they are simply too costly. Since the USSI fiber optic geophone relies on a completely different technology than the magnet/coil geophone (laser light and optical fiber vs. electricity and copper wire), it is not subject to the same performance limitations. As a result, USSI is able to design and build fiber optic geophones with detection sensitivities more than 100 times higher than the conventional electronic geophones. ***As a matter of fact, the performance of the USSI fiber optic geophone is superior to the performance of the traditional geophones in every key category: sensitivity, noise floor, distortion, bandwidth, and dynamic range, and all at a lower cost.*** The major advantage fiber optic sensors have over conventional electronic-based sensors is the ability to separate the electronics (preamplifiers, filters, ADC, multiplexing electronics, etc.) from the sensor, taking the electronics out of the hostile sensing environment (downhole, ocean bottom, buried, etc.), allowing the electronics to reside in a benign controlled environment, where they are always accessible for repairs or upgrades.



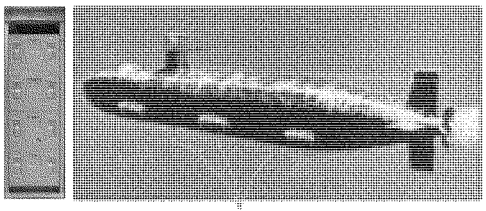
USSI Geophone System has the Lowest Noise Floor vs. all Competing Systems

1. **Geophone and MEMS Accelerometer Comparison at Spring Coulee, Alberta**, Canadian Society of Petroleum Geologists (CSPG), Canadian Society of Exploration Geophysicists (CSEG) and the Canadian Well Logging Society (CWLS) *Convention*, Calgary, Alberta 2009
2. **Characterization of a High Resolution Acquisition System For Marine Geophysical Applications**, Instrumentation and Measurement Technology Conference, Sorrento, Italy 24-27 April 2006

The chart above shows how the performance of the USSI fiber optic geophone compares with other oilfield geophone sensor technologies and with industry requirements. As can be seen in the chart, the USSI system has the lowest noise floor of all microseismic systems on the market. This translates into the ability to detect much quieter signals.

USSI's systems are based upon proven fiber optic technology originally developed for the US Navy's Virginia Class nuclear submarine LWWAA program. LWWAA is the largest fiber optic sensor system in production, valued at over $450M. While I am now USSI's CEO, I previously started and led Litton's (now NG) Fiber Optic Strategic Business Unit that designed and manufactured the LWWAA system. Key members of the LWWAA team are now at USSI. USSI has commercialized the technology for improved reliability and lower cost.

US Navy's Fiber Optic LWWAA System

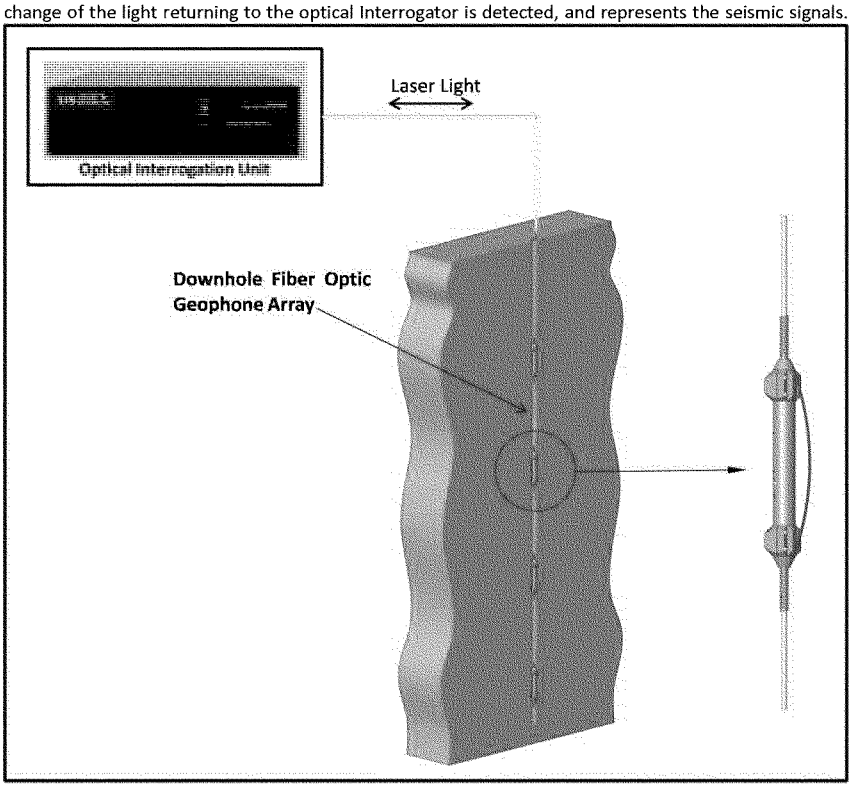


2700-channel electronics cabinet

LWWAA panels (450 sensors each) now in production on Virginia Class submarines

How does the USSI Fiber Optic Sensor Work?

The sensor in the USSI system is simply optical fiber. The optical fiber also serves as the transmission path to and from the fiber optic sensors. Engineers at USSI have developed proprietary techniques to package the optical fiber in ways that enhance its sensitivity to seismic signals. The system works as follows: Laser light from the Interrogator is launched down the optical fiber to the geophone array. Seismic disturbances cause the phase of the light going through the geophones to change. The phase change of the light returning to the optical Interrogator is detected, and represents the seismic signals.



The optical interrogator electronics includes a laser source with a phase modulator which imparts a high frequency carrier (modulation signal) onto the light launched down the fiber, as well as the receiver electronics for demodulating the reflected signals and translating them into a digital electronic signal. The fiber optic telemetry cable provides the data path to and from the individual sensors, and incorporates optical connection units that serve as the connection point for the individual geophones. The optical geophone converts the ground motion into an optical phase shift which is demodulated in

the interrogator. The remotely deployed fiber sensor/telemetry cable contains no electronics. All of the electronics resides in the interrogator.

Hydraulic Fracturing for Unconventional Resource Development Defined

Hydraulic fracturing is a well stimulation process used to release oil, natural gas, geothermal energy, and even water from "tight" underground formations to maximize the extraction of these resources. Hydraulic fracturing is used by the oil and gas industry to fracture low permeability, resource-bearing subsurface rock to allow oil or natural gas to move more freely from the rock pores to production wells that bring the oil or gas to the surface.

During hydraulic fracturing, frac fluid, consisting primarily of water with chemical additives, is pumped into a geologic formation at pressures up to 15,000 psi. The high pressure of the fluid, which is designed to exceed the rock strength, opens or enlarges fractures that can extend several hundred feet away from the well. After the fractures are created, proppants in the fluid are pumped into the fractures to keep them from closing when the pumping pressure is released. After the fracturing is completed, the downhole pressure of the geologic formation causes the injected fracturing fluids to rise to the surface where it is typically stored in tanks or pits prior to disposal or recycling. Since the flowback fluid may contain numerous contaminants, proper handling/disposal of the flowback fluid is required.

Importance of USSI's Fiber Optic Systems for Unconventional Energy Production

Currently, less than about 3 per cent of 20,000+ frac jobs performed annually in the United States are monitored. This monitoring process, called microseismic monitoring combines subsurface sensors with powerful data collection and analysis software, to record the myriad of tiny microseisms (or microearthquakes) that occur as fluid is pumped into a well bore, splitting or fracturing the subsurface rock formation holding the natural gas or oil. The individual locations of these microseismic events are then mapped to create an image of the fracture locations. As the name microseismic implies, these are small events, thus the need for the much higher detection sensitivity of USSI's fiber optic geophones.

Many leading producers will readily admit that increased monitoring will lead to reduced environmental impact and improvements in efficiency, however, based upon today's electronic sensor technology, it is simply unaffordable. The problem is that using today's electronic sensor technology, the cost of a system to provide the monitoring is approximately $5M, which is comparable to the cost of completing the well. This is cost prohibitive, especially at today's low gas prices. And, this cost does not include the drilling of instrumentation wells for the sensor arrays, or their installation. Fortunately, USSI's fiber optic sensor systems for microseismic monitoring are based upon proprietary fiber optic technology that is substantially less expensive. In full production we currently estimate, that USSI's microseismic systems will sell for approximately 10% of the cost of today's electronic systems. USSI is in discussions with the companies responsible for over 75% of the frac jobs performed annually in the US.

As is usually the case with the introduction of a new technology, a few forward looking companies looking to become industry leaders in the responsible and efficient development of our country's shale gas resources become the early adopters. Such is the case with FTS International www.ftsi.com (previously Frac Tech Services), a leading independent provider of well stimulation (hydrofracking) services for the oil and gas industry in the United States with a focus on environmentally friendly ways to do business - developing vital assets and promoting energy independence, while protecting natural resources. FTS International, one of this country's largest multi-stage, unconventional completion services companies, intends to work with USSI to develop a custom fiber optic microseismic monitoring

solution that will eventually enable FTSI to be the first to offer cost-effective monitoring of 100% of their frac jobs.

Why Increased Monitoring will Address the Major Environmental Concerns

Several of the major areas of environmental concern can be minimized via increased monitoring during and after the hydrofracking process, these include:

- Chemical contamination of subsurface fresh water aquifers
- Gas Migration
- Induced Seismicity

Chemical contamination of subsurface aquifers can be caused by either fractures/fissures occurring outside of the desired fracture zone, or leakage along the well bore due to a faulty casing/cement job. Both of these adverse events can be detected via low cost, passive downhole fiber optic sensors. Once detected, remediation efforts to correct the problem can be implemented.

Gas migration refers to gas entry into the cemented annulus (area between metal casing strings) creating channels with the potential to provide a gas/fluid flow in the annulus. Migrating gas can affect water supplies, as well as potentially accumulate inside or next to structures such as residences, businesses and farming operations. This could create a risk of a fire or explosion. Gas migration may become a threat to the health, safety and welfare of the public. Properly cementing and casing a well is very important to prevent gas migration. In May of 2011 researchers at Duke University released a study that found high levels of leaked methane in well water collected near shale-gas drilling and hydrofracking sites. The Duke researchers said that the presence of methane likely was due to its escape from faulty drill casings (gas migration). This peer-reviewed study was published in the Proceedings of the National Academy of Sciences.

USSI has developed a well bore leak detection system (patent pending) designed to detect leakage along the well bore surface casing. The system is based upon the USSI PipeSafe™ fiber optic leak detection system for natural gas pipelines.

Induced seismicity refers to earthquake activity that is the result of human activity. Numerous studies have indicated that induced seismicity can be caused by injecting fluid into the subsurface or by extracting fluids at a rate that causes subsidence and/or slippage along planes of weakness in the earth. Lawrence Berkeley National Laboratory is currently conducting extensive research into induced seismicity brought on by hydrofracking operations for both oil and gas extraction and enhanced geothermal activity, and believes that monitoring during the hydrofracking process will allow more precise control thereby minimizing induced seismic events.

Conclusion:

In conclusion, as I have described in my testimony today, USSI has developed revolutionary fiber optic sensing technology that can have a large potential impact on unconventional energy production. USSI acknowledges that even when following the best industry practices, unexpected problems may occur. Fractures can occur outside the desired zone, and documented cases of gas migration have been reported for years, even prior to the revolution in shale gas. Fortunately, the technology now exists to detect these problems such that remediation can be performed prior to the onset of significant environmental damage.

Again, thank you for the opportunity to testify today, and I look forward to answering any questions that you might have.

* * * * * * *

About the Author

Jim Andersen is President and CEO US Seismic Systems, a leading producer of fiber optic sensor systems for the Energy and Security markets. Jim started and headed Litton's Strategic Business Unit for Fiber Optic Acoustic Systems, which was recognized as the company's fastest growing business unit from 1995 to 2002. At Litton, he landed the first fiber optic sonar production contract on the new Virginia class submarines, valued at over $400M. Jim began his career as an Engineering Officer on US Navy Nuclear Submarines and went on to hold a variety of engineering and senior management positions in engineering-intensive high-technology companies, including Westinghouse, Whitehall/Hydroscience, Litton Industries and Northrop Grumman. Prior to that, Mr. Andersen held technical and executive positions in companies that developed systems for oil exploration and ocean applications. Mr. Andersen is a member of the Technical Committee of the Marcellus Shale Coalition and a past member of the Board of Directors of the Electro-Optics Alliance, a collaborative group of over 300 US Electro-Optics companies formed to maintain US leadership in Electro-Optics. He has written recent articles for numerous Oil & Gas publications including the **The Oil & Gas Journal**, **Hart's Exploration and Production**, **Offshore Magazine**, **Oil and Gas Reporter**, and **First Break** Magazine. He holds a Bachelor of Science in mechanical engineering from the United States Naval Academy and six US patents in sensing systems and optics.

About US Seismic Systems, Inc.

US Seismic Systems, Inc. designs, integrates, manufactures and sells fiber-optic sensing systems and solutions for the energy and defense markets. USSI utilizes all-optical fiber sensing technology for its state-of-the-art sensors. USSI's proprietary optical fiber and electronics combine to form the sensor system. It is designed to replace the legacy electronic-based sensor systems at a lower cost and with improved performance and reliability. For more information visit the USSI website at: www.ussensorsystems.com.

Chairman HARRIS. Thank you very much, Mr. Andersen. That is some fascinating technology.

I now recognize our third witness, Mr. Todd, to present his testimony.

STATEMENT OF CAMERON TODD,
CHIEF EXECUTIVE OFFICER,
U.S. OIL SANDS, INC.

Mr. TODD. Mr. Chairman and Members of the Committee, I thank you for the opportunity to address you today on vital matters of energy, environment, and the economy. My name is Cameron Toddm and I am the Chief Executive Officer of U.S. Oil Sands, a public company with a unique proven technology for the development of the U.S. extensive oil sand resources.

I am here today to explain that development of these valuable resources is not only economically viable and technologically proven, but also can be done in an environmentally responsible manner with significant economic benefit for the Nation.

U.S. Oil Sands has a proprietary technology using a renewable biosolvent to extract heavy oil from oil sand without the need for tailings ponds. This breakthrough is expected to revolutionize the development of oil sands, particularly in the United States where, in spite of extensive resources, there have been no commercial extraction projects to date.

The solvent we use is nontoxic and biodegradable, made from citrus peels. Over the last 10 years, our company has exhaustively tested and piloted our process. It greatly simplifies current approaches to development and allows them to be built on a smaller scale using modular phases.

Our company has been active in Utah for more than seven years and has invested more than $20 million developing the technology, acquiring lands, doing environmental reviews, in design, and initiating construction. Beginning later next year, expect to complete construction and initiate production on the first commercial oil sands extraction project in the United States. By that time we will have invested more than $50 million and employed hundreds of people.

Our process demonstrates the best environmental performance of any oil sand development to date. We recover 96 percent of the bitumen processed, the highest of any project. Since we produce clean sand without tailings ponds, we reclaim the mined area as we go. The process recycles 95 percent of the water used, and we use half the water of other projects. We use less than a third of the amount of energy and we have a lower greenhouse gas footprint than any project to date.

Our first project is modest, producing 2,000 barrels a day. Over the next 10 years, assuming fair access to lands, our company has expansion plans for 50,000 barrels per day. Over the project life, we expect to generate over 60,000 person years of direct employment, high-quality, permanent jobs. And they come at a time when the American economy has been hit with the worst recession in 75 years. We expect to pay more than $9 billion in taxes and royalties

and contribute more than $20 billion to the economy. And we will be saving the import of over $50 billion worth of foreign oil.

And while we may be first, U.S. Oil Sands is not alone. Other companies are pursuing exciting technologies, and new and environmentally responsible and economically attractive projects are coming.

So what is standing in the way? In short, federal policy. Even though most resources are on federal lands, it is no accident that 100 percent of our company, U.S. Oil Sands, leases are on State lands. The State is strongly supportive while the BLM essentially has a de facto moratorium on leasing and approval, this in spite of the instructions of Congress in the Energy Policy Act of 2005. The BLM is further proposing to reduce the lands available for development by nearly 80 percent because of their belief that commercial technologies do not exist, that only massive large-scale development would occur. It is not that these lands are conservation areas where development is prohibited. Quite the contrary, as conventional oil and gas, forestry, grazing, and mining are allowed, subject to normal approvals. It is only oil sand and oil shale leasing that is restricted.

Developers are not asking for unfettered access. Every project would still be subject to extensive scrutiny and approval, just as are conventional projects. We have already shown that small-scale phased development is possible, and that world-class environmentally responsible technologies are proven.

In conclusion, the oil sand resources of the western States are large and accessible. U.S. Oil Sands has developed a process to unlock these valuable resources in an environmentally superior manner. We expect our project on State lands to be in production next year. The process uses far less water, energy, surface area, and generates less greenhouse gas than any project to date. It generates clean tailings and requires no tailings ponds. Our company expects to generate tens of thousands of man-years of employment, billions of dollars of tax revenue, and contribute tens of billions of dollars to the economy. In exchange, we ask for no special treatment, no fuel subsidies and no grants. We simply suggest that Congress permit these developments on federal lands as mandated in the Energy Policy Act.

We at U.S. Oil Sands intend to implement our game-changing approach with or without access to federal lands. We have identified large resources on State lands and will develop them in concert with the State. We will apply our approach to resources in Canada and other parts of the world where large deposits exist. It would be a shame if the people of the United States were not able to enjoy the benefits of development of their own extensive resources, but such a great technology and such a win-win-win result with respect to energy, the economy and the environment, is too good to not to be applied to solve the energy challenges of the world.

Thank you.

[The prepared statement of Mr. Todd follows:]

Committee on Science, Space, and Technology
Subcommittee on Energy and Environment
United States House of Representatives

"Challenges and Opportunities of Unconventional Resources Technology"

Testimony of Cameron M. Todd
Chief Executive Officer
US Oil Sands Inc.

May 10, 2012

Mr. Chairman and members of the Committee, I thank you for the opportunity to address the committee today on vital matters of energy, environment and the economy. My name is Cameron Todd and I am the Chief Executive Officer of US Oil Sands. I am an engineer by training with more than 30 years' experience in the oil and gas industry, and have worked extensively in Canada, the United States and internationally. US Oil Sands is a public company with a unique proven technology for the development of Utah's extensive oil sand resources. I am here today to explain that development of these valuable resources is not only economically viable and technologically proven, but also can be done in in an environmentally responsible manner with significant economic benefit for Utah and the nation.

US Oil Sands has a proprietary technology using a renewable bio-solvent to can extract heavy oil from oil sand without the need for tailings ponds. This breakthrough is expected to revolutionize the development of bitumen resources, particularly in the US, where in spite of extensive resources, there have been no continuous commercial oil sand extraction projects to date.

The solvent we use is non-toxic and biodegradable, made from citrus peels. It has been widely used for decades in environmentally-friendly household and industrial cleaning products; however nobody had ever thought to use it in oil sand extraction. Over the last 10 years our company has perfected a proprietary method which has been exhaustively tested and piloted in the field. This process greatly simplifies the current approaches to development, and allows them to be built on a smaller scale with modular phases. This also allows for continued improvement of both technology and operating practice while minimizing environmental impact.

Our company has been active in Utah for more than 7 years and has invested more than 20 million dollars developing and proving our technology, acquiring and exploring lands, on environmental reviews, in design, and initiating construction. Beginning later next year we expect to complete construction and initiate production on what we believe will be the first

continuous commercial oil sands extraction project in the United States. By that time we will have invested more than $50 million dollars and employed hundreds of people.

These years of development and sizeable private capital investment have allowed our company to perfect a process which demonstrates the best environmental performance of any commercial oil sand development to date. Our process recovers 96% of the bitumen processed, the highest of any existing project. Since we produce clean sand without tailings ponds, we reclaim the mined area as we go instead of waiting until the end of the project as other processes do. This allows for a greatly reduced surface impact. Our first project is expected to operate an open mine site of only 30 acres, less than 1/20 of a square mile. By the time we need to access additional mine area, the original mine site is being filled back in. US Oil Sands process recycles 95% of the water used, the highest of any project to date. We use less than half the water of other mining processes and less than 1/3 the amount of energy of other bitumen producers (approximately 1/3 mcf of natural gas for each barrel of bitumen produced). Fuel used to produce a barrel equates to approximately 1/18 of the amount of energy contained in that same barrel. This also means that we have a lower greenhouse gas footprint than all other current oil sand projects, in fact less than many conventional oil projects. The oil we produce in Utah is sweet, meaning that it contains 90% less sulfur than is found in the Canadian oil sands. This makes it much easier to refine and therefore it generates much lower amounts of greenhouse gases at the refinery. In almost every regard, the environmental aspects of this process are best-in-class.

Our first project will be relatively modest, producing 2000 barrels per day of bitumen, as heavy oil processed in local refineries. Over the next 10 years, assuming fair access to resource lands, our company has expansion plans for the development of 50,000 barrels per day. Over the life of our development, we expect to generate over 60,000 person years of direct employment. These are high quality, full time, permanent jobs. And they come at a time when the American economy has been hit with the worst recession it has seen in the last 75 years. Over this same 10 year development period we expect to pay more than 9 billion dollars in taxes and royalties and contribute more than $20 billion dollars into the economy. And we will be saving the import of over $50 billion worth of foreign oil, a notable impact on both the balance of trade and the security of energy supply.

This only accounts for the economic impact expected directly from our own company and its employees and contractors. The indirect "spin-off" economic benefits and employment are several multiples more than these levels.

While we may be first, US Oil Sands is not alone in this endeavor. Other companies are pursuing new and exciting technologies which will bring additional environmentally-responsible and economically-attractive projects.

So what is standing in the way of such an important development in American energy supply? The largest impediment to the responsible development of these valuable resources is federal government policy. Even though 80-90% of the lands in this region are federal lands, it is no accident that 100% of US Oil Sands oil sand leases are on State lands. The BLM essentially has a de facto moratorium on leasing oil sands or oil shale and as on the approval of commercial projects. This, in spite of the instructions of Congress in the Energy Policy act of 2005, whereby the administration was directed to open these very lands to oil sand and oil shale development. The current administration is proposing to reduce the lands available for oil sand development by nearly 80% (from 431,000 acres originally proposed down to 91,000 acres). Purportedly this reduction is because of the belief that commercial technologies for development do not exist, that only massive large scale development would occur, and that the lands should be conserved.

It is not that these lands are conservation areas where development is prohibited. Quite the contrary, other development such as conventional oil and gas exploration, forestry activities, cattle grazing, and mining developments are allowed (subject to normal permitting and approval requirements). It is only oil sand and oil shale leasing that is restricted.

We are not asking for unfettered access. Every project would still be subject to extensive scrutiny and approval just as are conventional projects. We have already shown that small scale modular development is possible, and that world-class environmentally-responsible technologies are proven and already in development. Why would the federal government restrict enterprise from developing such a valuable resource, especially one that can be developed with such strong economic benefit and such sound environmental performance.

In conclusion, the oil sand resources of the western states are large and accessible. US Oil Sands has developed a process which unlocks these valuable resources in an environmentally-superior manner. We have a project on Utah state lands which we expect to be in production later next year. The process uses far less water, energy, surface area, and generates less greenhouse gas than any project to date. It generates clean tailings and requires no tailings ponds. Our company expects to generate tens of thousands of man-years of employment, billions of dollars of tax revenue, and contribute tens of billions of dollars to the US economy. In exchange we ask for no special treatment, no fuel subsidies and no grants. We simply suggest that Congress permit these developments on federal lands as mandated in the Energy Policy Act of 2005.

We at US Oil Sands intend to implement our game-changing approach with or without access to federal lands. We have identified a large amount of resources on State lands and will develop them in concert with the State. We also expect to be able to apply our approach to oil sand resources in Canada and in other parts of the world where large deposits exist. Of course it would be a shame if the people of the US were not able to enjoy the benefits of development

of their own extensive resources, but such a great technology and such a win-win-win result with respect to energy, the economy and the environment, is too good not to be applied to solve the energy challenges of the world.

Chairman HARRIS. Thank you very much.

Our final witness, Mr. Dammer, is now recognized for five minutes to present his testimony.

STATEMENT OF MR. TONY DAMMER, MEMBER, BOARD OF DIRECTORS, NATIONAL OIL SHALE ASSOCIATION

Mr. DAMMER. Thank you, Mr. Chairman and Members of the Committee. I thank you for the opportunity to appear today. I have worked on and off in the oil shale business for several decades. They kicked me out of Colorado in 1982 when Colony folded, so I have seen the ups and downs of the industry.

As been pointed out, oil shale development has had a long and tortured history which would take hours to relate, so I won't go over that in any detail here. But in 1982, Exxon abruptly closed its doors to the Colony project and, without warning, left the scene. That was referred to as Black Sunday. So the industry has been characterized by boom and bust, but not until almost 25 years later the passage of EPAct 2005, the Energy Policy Act of 2005, the government demonstrated any appreciable interest in the oil shale resource. High price of crude oil, coupled with concerns regarding energy geopolitics and increased dependence on imported oil from unfriendly, unstable sources, focused attention back on oil shale.

Today, there are several companies engaged in oil shale research and development in the United States in varying degrees of development. Some are small, their work limited to the laboratory. Others such as Shell, Exxon, AMSO, Red Leaf, Total, Shale Tech International, just to name a few, are actively testing their technologies in various stages of development in the field.

The secure fuels and domestic report, resources report published by the U.S. Department of Energy summarizes those technologies, those 32 separate companies working in oil shale and tar sand development in the United States. Most or all oil shale development companies and their profit and their profiles are summarized in *www.Unconventionalfuels.com*.

I have by no means covered the technical landscape regarding oil shale development, and I regret that time does not allow a comprehensive review of all the technologies. Advances that have taken place in the last five years are very large. Suffice to say that clean, safe and sustainable technologies are being advanced to develop oil shale resources. The passage of the Energy Policy Act of 2005 provided impetus for this program.

We talked a little bit about some of the key technical challenges that presents us. We talked a little bit about water. I have not read anything from any oil shale company that believes that they will exceed one barrel of water per three barrels of oil shale produced. A lot of the industries are water producers. I think there is a lot more known about water utilization than is generally understood by the public.

One of the greatest concerns has been the requirement of water development in the scarce area. I think that has been overstated. A far greater concern than the technical challenges faced by oil shale, the oil shale industry, are policy and regulatory inconsist-

ency and uncertainty. Since the passage of the Energy Policy Act of 2005, the Department of Interior has reversed itself on the initial Programmatic Environmental Impact Statement and changed the associated resource development plans. As we all know, oil shale regulations were overturned in 2008.

The Energy Policy Act, however, was a comprehensive piece of legislation designed not only to prepare for R&D and leasing regulations but also to plan for the orderly development of oil shale and tar sands in what is essentially the Green River formation of Colorado, Utah, and Wyoming. That planning responsibility was assigned to the U.S. Department of Energy under section 369(h) and (i). Section 369(h) of that Act directed the Secretary of Energy in cooperation with the Secretary of the Interior and the Secretary of Defense along with governors of affected States to establish a task force to develop a plan to accelerate the commercial development of strategic unconventional fuels and initiate a partnership with Alberta and nations with oil shale resources. The task force report with recommendations was completed and forwarded to the President and Congress in 2007. Section (i) of the Act directed the Office of Petroleum Reserves to coordinate and create and implement the implementation of a commercial strategic fuels program. If these sections of the Act were implemented and the unconventional fuels development program was initiated within DOE, uncertainty and inconsistency in policy would not exist today.

Unfortunately, there is little evidence that the recommendations of the task force or the establishment of an unconventional fuels program has occurred. My strong recommendation would be to implement the law as it was stated in the Energy Policy Act of 2005.

Mr. Chairman and Members of the Committee, thank you once again. I would be pleased to answer any questions.

[The prepared statement of Mr. Dammer follows:]

Written Testimony

Anton (Tony) R. Dammer

Independent Energy Consultant on Unconventional Fuels

Senior Vice President – Red leaf Resources, Inc. (Retired)

Director Naval Petroleum and Oil Shale Reserves, U.S. DOE (Retired)

U.S. House of Representatives

Science, Space, and Technology Committee

Energy and Environment Subcommittee

Introduction

Mr. Chairman and members of the Committee, I am Tony Dammer. I am an independent consultant currently working for Genie Energy Ltd. on an oil shale project in Mongolia. I recently retired from Red Leaf Resources, Inc., a small and successful oil shale technology and resource development company located in Utah. Previously I served as the Director of the Naval Petroleum and Oil Shale Reserves within the Department of Energy, retiring with 28 years of service in 2008. The office was responsible for the implementation and management of Sections 369 (h) and (i) of the Energy Policy Act of 2005 and produced all of the studies and analysis found at www.unconventionalfuels.com. Most notably, the office directed the activities of the Task Force on Strategic Unconventional Fuels which published the report America's Strategic Unconventional Fuels for the President and Congress, as directed by EPACT 05. I also represent the National Oil Shale Association as a member of the Board of Directors. (www.oilshaleassociation.org)

I thank you for the opportunity to appear today. I have worked on and off in the oil shale arena for several decades and it gives me great satisfaction to discuss some of the progress that has been made over the past several years and the opportunities that oil shale provides our country from both an energy and economic security standpoint. We should be cognizant that along with these substantial benefits, there are risks that all developing technologies face. It is my opinion that the industry as a whole has addressed those risks admirably and that the efforts of a large

number of companies, both here and abroad are performing the requisite research and development to create a safe and sustainable industry.

I have been asked to address four topics: (1) the status of oil shale exploration and production activities; (2) the development of key technologies, partnerships, and pilot activities; (3) key policy and technology challenges; and (4) recommendations on how the Federal Government could best help and enable.

Before beginning it is important to understand a few points regarding the oil shale resource. By definition, oil shale is a petroleum precursor, which is organic matter in the rock called kerogen. It is essentially an algae or marine based material that has not sustained the time and temperature to turn it into oil. Only applied heat will convert oil shale to crude oil and gas. What mother earth failed to accomplish with time, the application of man-made heat resolves. All oil shale extraction technologies, whether insitu (below ground) or exsitu (above ground), involve the application of heat to transform the kerogen to oil and gas. Kerogen oil begins to release from the rock matrix at an applied heat of about 650 degrees Fahrenheit. The intensity and duration of the application of heat to the rock has a large impact on the quality of the produced hydrocarbons.

Oil shale development has a long and tortured history, which would take hours to relate. Its development has run hot and cold over decades, in large part dependent on the availability and economics of conventional crude oil. In the United States, the Arab Oil embargo of the early 1970's initiated a resurgence of interest in oil shale, resulting in the Prototype Oil Shale Leasing Program in 1974. Four oil shale leases were awarded by the government, two in Colorado and

two in Utah, attracting $641 million in bonus payments. The Synthetic Fuels Corporation was established and Exxon and Unocal began massive oil shale development projects in Colorado. And as soon as the oil shale boom began to get traction it ended with the collapse of world oil prices brought on by massive production from Saudi Arabia. In 1982 Exxon abruptly closed its Colony project without warning in an event referred to as "Black Sunday".

Not until almost twenty-five years later and the passage of EPACT 05 did the U.S, Government demonstrate any appreciable interest in the oil shale resource. The high price of crude oil coupled with concerns regarding energy geopolitics and increased dependence on imported oil from unfriendly or unstable sources has focused attention back to the oil shale resource.

Today a variety of countries are actively interested in developing their oil shale resources. Oil shale is one of the most prolific hydrocarbon resources on earth. Massive deposits are found in a number of countries around the globe, including Australia, Brazil, China, Estonia, Israel, Jordan, and the United States, among others. Today, only China and Estonia produce oil shale commercially and only in relatively small quantities. The high price of oil, decline in world conventional oil reserves, and increasing competition for oil resources worldwide have drawn the interest of many countries and companies to this significant source of oil as the next generation of petroleum supply. Technologies developed in the United States hold the clear advantage in developing oil shale both domestically and internationally.

There are several dozen companies engaged in oil shale research and development in the United States, in varying stages of development. Some are small: their work limited to the laboratory. Others, such as Shell, Exxon, AMSO, Red Leaf, and Shale Tech International, to

name a few, are actively testing their technologies at various stages of development in the field. The Secure Fuels from Domestic Resources report published by the U.S. DOE summarizes the technologies of 32 separate companies working in oil shale and tar sands development in U.S. Most are oil shale research and development companies and their profiles are summarized in the aforementioned report found at (www.unconventionalfuels.com).

Shell, Exxon, and AMSO have BLM oil shale RD&D leases in the Piceance Basin of Colorado. To this date, Shell and Exxon have conducted most of their research on their own fee lands but are recently moving onto their leases. All three of these technologies are insitu (below ground heating).

AMSO, which is owned jointly by TOTAL and Genie Energy, has completed their heater and production well testing and is moving forward with a pilot test of their process.

Shell, perhaps the most advanced of the oil shale companies, has successfully recovered oil, proving their heater and production technology, verifying the viability of their insitu conversion process (ICP), and their freeze wall technology to isolate groundwater.

Exxon plans to move its Electrofrac insitu process to its BLM R&D lease. Successful tests conducted at their Colony mine indicate that the technology is ready for the next phase of R&D.

On the surface (exsitu) Shale Tech International has tested the Paraho II surface retort process in Rifle, Colorado and is completing a demonstration plant for Queensland Energy Resources Ltd in Australia. On its own, Shale Tech continues to operate its own R&D center and fully equipped pilot plant in Colorado to further develop the Paraho technology.

Red Leaf Resources, Inc. has developed and piloted an in-capsule technology that involved surface mining of shale deposits with a stripping ratio of no more than 1 to 1. Rubblized shale is placed in a fully sealed and oxygen-free capsule. Convective heat is circulated through the capsule by heating pipes and the kerogen oil is released from the shale at temperature and collected in an oil and gas recovery system. Following the success of their pilot plant, Red Leaf is in the engineering design stages for a commercial demonstration facility. They are in a joint venture with TOTAL.

There are a variety of other promising companies developing oil shale technologies that are not currently on the ground. Enefit American Oil, a subsidiary of the Estonian company Eesti Energia purchased 100% of the Oil Shale Exploration Company (OSEC) and controls the largest tract of private oil shale property in Utah. Their technology is based on a redesign of their Galator surface retort that is operational in Estonia. Enefit is very active internationally and has acquired concessions in Jordan. EnShale Energy, another Utah-based oil shale company, has acquired leases in Utah and has built a pilot plant to demonstrate the feasibility of this surface process.

I have by no means covered the technical landscape regarding oil shale development and I regret that time does not allow a comprehensive review of all the technological advances that have taken place in the last five-or-so years. Suffice to say that clean, safe, and sustainable technologies are being advanced to develop the oil shale resource. The passage of the Energy Policy Act of 2005 provided impetuous for this progress.

What are the key policy and technological challenges? The technological challenges are fairly straight forward and are being addressed by the participant industries. One of the greatest concerns has been the requirement for water in a development area with scarce water resources. The industry has developed processes that minimize water use. Water uses by different technologies are in the range of 1 to 3 barrels of water per barrel of oil produced. A number of technologies are net water producers. Similarly the impact of the industry on green house gas (GHG) emissions has been an issue. Produced GHG can be captured and used for beneficial uses or sequestration, as with any industry. Further, many of the technologies produce sufficient gas to supply the energy requirements of the process. There is a great deal of natural gas developed in this region both from conventional wells as well as the oil shale processes themselves. This greatly mitigates the need for coal generated power. There is also significant opportunity to utilize solar and wind power in this region of the United States. (www.oilshaleassociation.org)

Of far greater concern than the technical challenges faced by the oil shale industry are policy and regulatory inconsistency and uncertainty. Since the passage of the Energy Policy Act of 2005, the Department of the Interior has reversed itself on its initial Programmatic Environmental Impact Statement and changes to associated Resource Development Plans (RDP). In 2008 DOI issued commercial leasing regulations only to cancel them when suits were brought challenging the PEIS and the regulations. Another PEIS was scheduled and is currently under review and new regulations are scheduled for late 2012. For companies that plan to invest hundreds of millions of dollars, if not billions, this continued uncertainly is extremely limiting.

The Energy Policy Act of 2005 was a comprehensive piece of legislation designed not only prepare for RD&D and commercial leasing regulations but also to plan for the orderly development of oil shale and tar sands in what is essentially the Green River Formation of Colorado, Utah, and Wyoming. That planning responsibility was assigned to the U.S. Department of Energy under Sections 369 (h) and (i). Section 369 (h) of the Act directed the Secretary of Energy, in cooperation with the Secretary of the Interior and Secretary of Defense along with the Governors of effected States ***"to establish a Task Force to develop a plan to accelerate the commercial development of strategic unconventional fuels and initiate partnerships with Alberta and nations with oil shale resources".*** The task force report, with recommendations, was completed and forwarded to the President and the Congress in February 2007. Section (i) of the Act directed the Office of Petroleum Reserves to ***"coordinate*** **the** ***creation and implementation of a commercial strategic fuels program."*** If those sections of the Act were implemented and the unconventional fuels development program was initiated within the DOE, uncertainty and inconsistency in policy would not exist today. Unfortunately, there is little evidence that the recommendations of the Task Force or the establishment of an unconventional fuels program has occurred. My strong recommendation would be to implement the law.

Mr. Chairman and members of the Committee – thank you once again. I would be pleased to answer any questions.

I have submitted for the record: a White Paper Economic Impact of the failure to Implement Legislative Mandates of Section 369, Energy Policy Act of 2005, by Anton Dammer and Dr. James Bunger

Chairman HARRIS. Thank you very much for your testimony, and we will now begin the first round of questioning. I will recognize myself for five minutes.

Mr. Andersen, let me just ask you, your technology, was there any government involvement in the development of the technology?

Mr. ANDERSEN. Well, I talked about initially there was some government involvement in technology that was put on a submarine, but we took that and developed our own intellectual property, our own funding. We built some systems for the government, but the R&D for those was all internal.

Chairman HARRIS. Okay. And did you ever request any help from the Department of Energy or, you know, sought some of the funds from some of the programs we have been talking about today?

Mr. ANDERSEN. No, we haven't.

Chairman HARRIS. Okay. Now, Mr. Dammer, your testimony—I want to thank you for your testimony. You know, it was a little disturbing to me that, you know, the Department of Energy, you know, Mr. McConnell kind of admits that oil shale and oil sands are part of all of the above but they are not spending any money on it. They are not really doing anything. The task force that you mentioned that produced that report in 2007 did outline some impediments that are occurring or constraints that exist on development of oil shale. In your opinion, is the DOE or BLM really doing enough or doing anything to implement the recommendations of that task force or basically has it almost ground to a halt?

Mr. DAMMER. I can't really speak to what the Department of Interior is doing. Let me correct that. I know exactly what they are doing, and they really are on the regulatory side of this, and we have sort of jumped the gun on regulations, because as you have heard today, you have people questioning water usage, you have the carrying capacity of the western energy quarter, socioeconomic concerns. Those are the concerns that need to be addressed and addressed in a plan, and that was the purpose of section 369(h) and (i) was intended to do. They weren't intended to promulgate new regulations. That is the responsibility of the DOI. It was to put together a plan to reasonably develop these resources, and these resources stretch from Wyoming down through Colorado, and they do broach the Green River and the Colorado River. So there is all kinds of hydrologic issues, incidentally, some of which have been answered far better than the testimony by GAO.

Chairman HARRIS. Let me ask you, so—because my understanding that that—the oil shale, is it true that if you look at oil shale resources, that the United States really has more than the entire world's reserves, if we could unlock oil shale?

Mr. DAMMER. Many times over.

Chairman HARRIS. That is what I thought. So, you know, it is an interesting all-of-the-above strategy. That is all I can tell you.

I want you to directly comment on the use of water, because my understanding, the GAO report suggests that it takes five barrels of water to produce one barrel of oil. You say that more likely that it is one barrel of water for three barrels of oil. Is that because of advances in technology or the feeling that we can make those advances and that is a goal?

Mr. DAMMER. Well, I think the genesis of that statement is, is that companies like Shell, Exxon, Total, Red Leaf have been out on the ground for some period of time. A number of those projects have pilot projects. In the case of Red Leaf, we ran a pilot project so we know exactly how much water we were using, and we were using actually less than one barrel of water per barrel of oil shale produced. And most of that water was for domestic consumption and dust control. So there is a gap between what is going on in the industry and what is being talked about by these various reports and whatnot.

Chairman HARRIS. Thank you very much. As you said, the purpose of the Energy Policy Act was to try to answer some of those questions.

Mr. Todd, you know, thank you all the work the company has done. Just out of curiosity, were there—because you say you don't really want any loans or programs or grants or whatever, and that is kind of too bad because I think the money in your company would be much better than Solyndra, for instance, probably much better spent. What is the price per barrel that it is going to cost you ultimately when you begin this production? Can you give us an idea about what the price per barrel of producing is from the oil sands using your technology?

Mr. TODD. We estimate our operating costs at under $30 a barrel, and we estimate the economic limit to be about $50 a barrel priced to go ahead.

Chairman HARRIS. So even at today's relatively—I hate to say relatively depressed price of Midwest oil compared to the world but, you know, roughly $97, $96 a barrel, whatever it was in the last few days, it is economically—again, the Department of Energy testified it has to be economically viable, and clearly, that is economically viable in today's oil market.

Mr. TODD. Absolutely. Of course, one of the problems we have in oil sands side in the federal level is to lump oil sand and oil shale together. They are different resources. They are both very large. They both occur in the western States. That is about where the——

Chairman HARRIS. And they both start with "oil."

Mr. TODD. But the fact is that the technologies for developing oil sand have been well at play. Our company is a unique one, but in Canada, we are—we have got two million barrels a day. It is hardly unconventional anymore.

Chairman HARRIS. Yes. Thank you very much, and we will probably have a second round but I want to recognize Mr. Tonko for five minutes.

Mr. TONKO. Thank you, Mr. Chair.

Mr. Dammer, since oil shale companies have secured thousands of acres of oil shale resources in Utah and have apparently secured funding to move forward with a commercial oil shale development program on these lands, why do you think it necessary for the Federal Government to make millions of acres of federal lands available for commercial development since, (A) large amounts of federal lands have already been available for oil shale development; (B) millions of acres of oil shale resources in the West are already in the hands of private industry, none of which to date have been commercially developed; and (C) it seems that ample oil shale re-

sources have been acquired to move forward with the commercial program?

Mr. DAMMER. I think the short answer to that is the economics. The richest oil shale on earth is located in the Piceance Basin of Colorado. It is a relatively small area, but it is the area where the RD&D leases are located. That is where Shell, AMSO, Exxon, and Chevron want to deploy their in situ technologies, and the reason for that is, is that in that particular region, the pay zone in the middle of the Piceance Basin is 1,000 feet thick, all right, so there is about 1,000 foot of over burden and then there is about 1,000 foot of pay, a very, very high quality, consistent oil shale. So what they want to do is they want to put those electric heaters down into that very thick pay. Keep in mind, we would be heating that whole column of thousand foot, and the payoff for that is tremendous. Shell incidentally believes that they will produce a million to 1.2 million barrels per acre. There is no conventional oil play on Earth that is that productive and that concentrated. So that is the story with the Piceance Basin.

Mr. TONKO. And with the State and private lands that exists along with the proposed research leases in PEIS, are those not enough in terms of area or land space?

Mr. DAMMER. Well, they reduced the land space from two million to somewhere below 500,000 acres. The thought is no, that is not enough land.

Mr. TONKO. Even for research and commercial pilots?

Mr. DAMMER. For commercialization. The two million acres that were the preferred alternative in the original regulations were two million acres, so what has happened is that amount of land has been carved back to somewhere below 500,000 acres, and yes, the answer to your question is, that is not enough open land.

Mr. TONKO. Okay. In support of this discussion, I would ask that the Wilderness Society document outlining the private and state land leasing for oil shale be included, if we might, Mr. Chair, in the record?

Chairman HARRIS. Without objection.

[The information may be found in Appendix 2.

Mr. TONKO. Thank you.

And the oil shale industry has a very long history of grand failures, which have come at enormous cost to investors and to taxpayers and certainly the environment, yet today we are talking about it as this resource of the future, as if it is some new idea that has not seen a century of attempts with no return on investment. GAO just testified that their project to assess the water impacts of oil shale was complicated by the fact that the technologies were not mature enough to inform a precise assessment, yet here we are hearing that it is a proven commercial ready technology and all you need is the federal land to make it happen.

Mr. Dammer and Ms. Julian, what has changed to perhaps have us think differently here?

Mr. DAMMER. Well, I don't want to correct you, but I don't think we said that these were ready for commercial, to be commercialized. There is no commercial oil shale development project. But what I would say is that there has been a lot of private R&D that has gone into these technologies. Shell has spent hundreds and

hundreds of millions of private capital out on their site in Colorado. They have a very good idea of what their water usage is and their energy return on investment, as does Red Leaf Resources Incorporated, who has run a pilot. So——

Mr. TONKO. Has that research provided for any different approach or would it be the same—is it the same effort with the same potential impacts on water and the environment?

Mr. DAMMER. Well, I think the in situ technology and the Red Leaf technology, which is a modified in situ, is unlike any other kind of technology that you might hearken back to, to the 1980s where the surface retort was king and rumen pillar mining and surface mining were being considered. That is not to say that surface retorts haven't improved their technology remarkably, but this is not your grandfather's oil shale industry anymore. Just as with shale gas technology, 10 years ago—I have been in the oil and gas business for a long time. Ten years ago, people were saying you would never be able to deviate a well into a shallow conventional shale reservoir that is 10,000 feet deep and put out a long-reach horizontal well another 10,000 feet. People would have laughed at you. So, I mean, it is a technological play that is evolving, and it is evolving very fast.

Mr. TONKO. Thank you, Mr. Chair. I yield back.

Chairman HARRIS. Thank you very much. And again, we will have a second round here.

Ms. Julian, in your written testimony you state that "As any operator will tell you, coal, oil, gas, wind, solar, shale, sands, et cetera, working on state land is not only more clearly streamlined but consistently regulated." Could you please expand upon some of those lessons from Utah with regard to the permitting process or energy regulation with regards to state versus federal?

Ms. JULIAN. Sure. In the State of Utah, our regulatory policy is laid out pretty simply. We completely have everything out on the table and really want to be an expeditious, business-friendly process. It is not subject to interpretation as much federal regulation is, which creates a delay and turns it into a judiciary system. The process to improve everything from air and water permits to mining permits in the last three years, the timeline has decreased significantly where some permits can be done in 90 to 120 days. And some of the things that we do in the State of Utah is, we put all the regulators in the room together for an entire project, and we have them work it out together with the company all at the same time and say what are the timelines, what are the obstacles, what do we need to go through for this, and just getting them in the same room and having these predesigned meetings has cut down on all kinds of things that regulatory agencies go through on a federal level that turn into a judiciary-type situation where you have lawsuits delaying projects and perhaps losing private investment such that happens to the federal entities.

Chairman HARRIS. Thank you.

I would like to ask unanimous consent to enter into the record the following three documents from the State of Utah: the Utah's economic development plan, Utah's 10-year strategy energy plan that is called "Energy Initiatives and Imperatives," and Utah's response to the BLM's draft Programmatic Environmental Impact

Statement for Oil Shale and Tar Sands. So without objection, so ordered.

[The information may be found in Appendix 2.]

Chairman HARRIS. Thank you very much.

Specifically, you know, you discuss Governor Herbert's 10-year strategic energy plan. Are there any particular examples from the plan you would like to highlight with regard to regulations, streamlined development, coordination, long-term planning, anything that you would suggest to the Federal Government adopt some kind of similar strategies?

Ms. JULIAN. Sure. There were eight recommendations that came out of the plan from the task force. One of them was to increase transparency, to really look at the regulatory system, the licensing system, put it online, have people see exactly where it is at, and adjust the regulatory framework to technology, modernize it. Some of the things that we look at and the way that we look at regulatory processes are decades old. We haven't changed it. Technology has changed. Some of these processes were put in place before there were cell phones, before there was other messages—excuse me—methods of technology, and we haven't sped up the regulatory process to keep up with technology.

Chairman HARRIS. Thank you.

Now, Mr. Andersen, with regards to your technology, I understand that one of its usefulnesses actually can be to direct how the horizontal drilling occurs. Is that right? By detecting the—by doing—well, by seismic detections as you are drilling?

Mr. ANDERSEN. Oh, you could do that also. That is not one of the, I guess, parts that we are pushing here. But basically, you put a bunch of sensors in the ground and they triangulate on some event that is occurring and knowing exactly in three dimensions where it is, be it a fracture occurring or a drill progressing down, you know, as you drill a well.

Chairman HARRIS. And what you are suggesting is that the technology actually would enable to be more efficient with regards to the fracturing. Is that right? Because you would know exactly where it is occurring and when it is occurring and the extent of it and whether you are near where you shouldn't be?

Mr. ANDERSEN. Absolutely. One of the things I primarily talked about here was the environmental effects, but in reality, there is a big efficiency improvement. I was in a frack job down in Fayetteville shale about a year ago, and I was talking to the geophysicist during the frack monitoring, and, you know, I asked her, what is your interest in this, why are you monitoring and a lot of the other guys aren't? She says well, you know, we have a certain amount of acreage, we want to maximize how much we get out of that field. If we don't monitor, we have to guess how far we space the wells, because we are not sure where the fractures are occurring. So if you put it too close, you will have thief zones and the frack fluid would leak into a previous fracked area. So the point was, their thought was if they could get this done inexpensively, they would do this on all their frack jobs and it will allow them to get maybe 30 percent, 35 percent more out of the fields rather than leaving areas just untouched.

Chairman HARRIS. So in essence, that also relatively reduces the amount of—the environmental impact per, you know, million BTU of gas extracted from a gas well, for instance, right? Because you are extracting more from the same bore hole?

Mr. ANDERSEN. Exactly, and one other point is that, you know, I was talking—we had investor day at my plant yesterday and I was talking to one of our clients who, you know, does a lot of fracks, and he says, you know, typically you might do stages like six, eight stages, half of them may not produce, but you don't know because you are not monitoring it so you are not, you know, seeing the effects. So there would be a lot of efficiency improvements if you monitored 100 percent.

Chairman HARRIS. And the bottom line is, two years ago, that technology just didn't exist?

Mr. ANDERSEN. It did not exist. That is correct.

Chairman HARRIS. So, you know, as we look—and the whole purpose of the hearing is to look at research and development of unconventional oil and gas. I personally believe—and I am going to ask you whether you agree, but I suspect you do—that it is through technological improvement that we will actually improve and increase the amount of available unconventional oil and gas, and I think your product is a perfect example of how you do it through technology.

Mr. ANDERSEN. I agree 100 percent. If I may just real quickly, you know, they were talking in the 1970s that peak oil was reached, energy production was going down but then, you know, technology came along, hydro fracking, you know, and starting around 2008, it is going up. You know, technology has done that and what I am worried about is that whole revolution could get slowed down by people having concerns about the safety of it, and we can monitor that, and the technology exists to do that, and if some events start happening, they could be corrected before there is any significant environmental damage.

Chairman HARRIS. No, this is great. I am a firm believer in technology. I wish we had invited ATK, a company that has some presence in my district that you may or may not be familiar with, is doing the propellant fracturing. It eliminates the use of water, and, you know, they claim they can roughly double the yield of wells, of their test wells done with that technology. Now, you combine that with your—and all of a sudden, you know, we have got potentials that we knew nothing about two, three years ago, which is always exciting.

Yes, Mr. Todd, briefly, and then I am going to go to Mr. Tonko.

Mr. TODD. If you don't mind, I might build on the same point relative to water. The last company that I worked for, an in situ oil sand developer in Canada, we were the first company to use a new water recycling technology that had developed and acquired by GE. It was—it allowed us to get the highest water recycle that had ever been achieved in the oil sands to date. It was a technology that did not exist five years prior. It is now standard practice, and it couldn't have existed if we had to have the answer before we were allowed to get access to the resource. As you start on the projects and you start small, you identify the problems and the opportuni-

ties and technology works along with you. But if you have to solve it all before you get started, you can never get there.

Chairman HARRIS. Thank you very much.

Mr. Tonko.

Mr. TONKO. Thank you, Mr. Chair.

Ms. Julian and Mr. Dammer, there seems to be an apparent difference in public acceptance in Utah versus Colorado. Can you speak to that, please?

Ms. JULIAN. There is public opinion difference, definitely in Colorado versus Utah, and much of that is that some of the folks that are interested in oil shale development actually don't live in those regions or areas, and so they are worried about those particular concerns because they are not in the area, they are not aware of the jobs, the economic benefits to that community and the fact that it isn't just about water availability, it is how you use the water, and so Colorado and Utah do have somewhat of a difference. Even though Colorado has got a great resource, the State of Utah is open for business, and many oil shale and oil sands companies are coming over the border to do business with us.

Mr. TONKO. Mr. Dammer?

Mr. DAMMER. Well, I think that Utah has an entirely different attitude toward commerce and development than Colorado has. Colorado is very much more diverse. I got a letter, I guess it was last night, that said that a number of mayors had objected to the expansion of oil shale lands to two million and they were backing the 400,000-acre thing, and one of the objectors was from Carbondale. Well, Carbondale is southeast and halfway to Aspen. So there is a lot of recreational, there is a lot of retirement type of activity out in and around Rifle and the Piceance Basin, and I think one of the challenges for oil shale development is going to be, how are you going to responsibly and sustainably build that industry in that area. It is going to be different.

The other side of the coin is, is that three county commissioners, Mesa County, Garfield County, and Rio Blanco County, wrote the opposite letter saying that we represent the people of these counties and we support the two-million-acre thing. But what you see in Colorado that I don't think you see in Utah is, you see retirement communities that are not interested in mineral development. So you go into these towns and talk to people that have to ship their kids down to Aspen to serve Starbucks coffee to keep them in the area. They are interested in high-paying jobs. So it is a push and pull. I worked in Utah, and it is open for business. It is an entirely different environment.

Ms. JULIAN. I would——

Mr. TONKO. I am sorry.

Ms. JULIAN. I am sorry. I would also add to it that I think people don't realize that you can have both. You can have environmental sustainability and energy development. It is not mutually exclusive. These things can happen together. You can have prosperity and economic development and jobs, ripple effects into the school systems, and you can still have tourism, you can still have your endangered species and all of the species that go along with it, our plant life survive and thrive and you can still have other industries

such as agriculture and hunting. It can be done together. It is, again, not mutually exclusive.

Mr. TONKO. My understanding is that the processes used in Estonia have reaped massive environmental damage there. Would we use that same process here?

Mr. DAMMER. No, sir. I worked in Estonia for several years. You are exactly right. The old, antiquated surface retorts that they use there are pretty nasty business. They produce a lot of semicoke. You know, they call them the Estonian Alps. To the credit of Enefit, which is their—they have a U.S. subsidiary now called Enefit American Oil and they own land in Utah. They refined that retort. I can't tell you exactly all the technical details of it, but it is much improved. But you would never want the retorts that are operating in Estonia to come to the United States, as with the Chinese retorts, the Fushun retorts. Those are horrible, nasty things.

Mr. TONKO. Many of you have made reference to the technologies that produce water. What is the quality of this water compared to that which already exists on the surface?

Mr. TODD. In our case, the water is a fresh water that we produce. We don't actually discharge water. The water that we lose is essentially water that evaporates and is coating the sand grains and so it is like putting wet beach sand on the ground. It has got water entrained in it, and that is all the water that is used in our process.

Mr. TONKO. I believe I am out of time, so I yield back, Mr. Chair.

Chairman HARRIS. If you have an additional question, you can take a little extra time if you want to ask another question.

Mr. TONKO. If I could just ask Mr. Todd about the—in terms of commercial readiness, what is the difference between oil sands and oil shale?

Mr. TODD. There are many, many differences, and we can go back to the chemistry of it all, but oil sands have oil in them. It is oil that is ready to go into a refinery. And so when we produce our oil, it will go direct to refining. It does not require to be upgraded. It is not a kerogen. It is oil. It is heavier and it requires some technical dealing with viscosity. Those are chemical problems to be dealt with. The kerogen that—they both started off in the shale. All the oil and gas in the world started off in shale. The stuff that migrated out of the shale after it became mature became oil and gas, and the oil, if it came close to the surface as it has in Utah, and the surface was eroded away and that oil came into contact with the atmosphere, the light ends of the oil would run off and what would be left is very heavy, and that is why it is hard to get out of the ground. On the other hand, what is left in the shale is still needed to be cooked, but unfortunately, it wasn't left buried long enough and so now it needs to be cooked man-made to get it out.

So there are two completely different problems. One is the oldest oil in the world and one is the youngest oil in the world.

Mr. TONKO. Mr. Chair, in support of the discussion we have been having, I ask that the nine-page report by the Checks and Balances Project titled "A Century of Failure" be included in the record.

Chairman HARRIS. Without objection, so ordered.

[The information may be found in Appendix 2.]

Mr. TONKO. Thank you. And also a compilation of expert quotes titled "Not Ready for Prime Time" expressing opinions about the commercial readiness of oil shale, also prepared by the Checks and Balances Project, be included in the record.

Chairman HARRIS. Without objection, so ordered.

[The information may be found in Appendix 2.]

Mr. TONKO. Thank you, sir.

Chairman HARRIS. Thank you. I am going to ask unanimous consent to enter into the record three resolutions passed by the Board of County Commissioners for Garfield, Mesa, and Rio Blanco counties, Colorado, opposing the U.S. Bureau of Land Management's 2012 oil shale and tar sands Programmatic Environmental Impact Statement for lands administered by the BLM in Colorado, Utah, and Wyoming.

[The information may be found in Appendix 2.]

Chairman HARRIS. Additionally, I would ask unanimous consent to enter into the record two additional documents, a white paper co-authored by Mr. Dammer entitled "Economic Impact of Failure to Implement Legislative Mandates of Section 369, Energy Policy Act of 2005," and a letter from Dr. Dag Nummedal and Dr. Jeremy Boak with the Colorado School of Mines regarding unconventional oil and gas development. Without objection, so ordered.

[The information may be found in Appendix 2.]

Chairman HARRIS. I want to thank the witnesses for their valuable testimony, and their Members for their questions. The Members of the Committee may have additional questions for you, and we ask you to respond to those in writing. The record will remain open for two weeks for additional comments from Members.

The witnesses are excused. Thank you all very much for coming. The hearing is now adjourned.

[Whereupon, at 11:54 a.m., the Subcommittee was adjourned.]

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Department of Energy
Washington, DC 20585

July 20, 2012

The Honorable Andy Harris
Chairman
Subcommittee on Energy and the Environment
Committee on Science, Space, and Technology
U. S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

On May 10, 2012, Charles McConnell, Assistant Secretary, Office of Fossil Energy, testified regarding examining the challenges and opportunities associated with expanding development and use of unconventional oil and gas production technologies.

Enclosed are the answers to seven questions that you submitted for the hearing record.

If we can be of further assistance, please have your staff contact our Congressional Hearing Coordinator, Lillian Owen, at (202) 586-2031.

Sincerely,

Christopher Davis
Deputy Assistant Secretary
for Congressional Affairs
Congressional and Intergovernmental
Affairs

Enclosures

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QUESTION FROM CHAIRMAN ANDY HARRIS

Q1. Please provide an update on the status of the recommendations contained in the Strategic Unconventional Fuel Task Force's "Strategy and Program Plan."

What has the Department of Energy specifically done to address each of the challenges and recommendations contained in the plan?

A1. To address the challenges and recommendations of the Strategic Unconventional Fuel Task Force, the Department led an effort in 2007 and 2008 that resulted in the development, publication, and distribution of a Strategic Plan for Unconventional Fuels Development in the Western Energy Corridor. The Strategic Plan was developed jointly by an ad hoc group of representatives from the Department of Energy (including national laboratories), Department of Defense, Department of the Interior, affected state and local government entities, universities, and industry representatives from the U.S. and Canada. The Department has also been developing, publishing and distributing multiple reports that track research, development, and demonstration (RD&D) efforts in the private and public sectors in the U.S.; and participating in national and international oil shale conferences.

Department of Energy
Washington, DC 20585

July 20, 2012

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Chairman
Subcommittee on Energy and the Environment
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U. S. House of Representatives
Washington, DC 20515

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QUESTION FROM CHAIRMAN ANDY HARRIS

Q2a. Please provide an update on the activities of the Strategic and Unconventional Fuel Task Force. For example, how often does the Task Force meet and when was the most recent Task Force meeting? Is the Task Force producing reports as required by Section 369 of the Energy Policy Act of 2005?

Specifically, what is the Department of Energy's current role in the Task Force?

A2a. The Task Force met prior to January 2008 and approximately 10 times between January 2008 and the last meeting in April 2010. The Task Force completed a report, entitled *Initial Findings and Recommendations of the Strategic Unconventional Fuels Task Force* in September 2006. With assistance from the Department, the Task Force also completed a Strategy and Program Plan report, entitled *America's Strategic Unconventional Fuels*, in September 2007. These two reports fulfilled the Task Force's reporting responsibilities under section 369(h) of the Energy Policy Act of 2005 (EPAct 2005).

Additionally, pursuant to section 369(h)(5)(b) of EPAct 2005, the Department was required to "provide an annual report describing the progress in developing the strategic unconventional fuels resources within the United States for each of the five years following submission of the" Task Force's Initial Report. The Department accordingly submitted an annual report for 2008 on January 16, 2009 for the three-year period covering 2006 through 2008; and another annual report for 2009 was submitted on June 18, 2010.

The Department's current focus is primarily on safe and environmentally sustainable development unconventional natural gas, including shale gas, and methane hydrates. The Department does not have a current role with regard to the Task Force because all of the Task Force's reporting requirements pursuant to EPAct 2005 Section 369(h) have been met and the Task Force is not currently producing any additional studies; accordingly, the Department is not planning to submit additional annual reports.

QUESTION FROM CHAIRMAN ANDY HARRIS

Q2b. Please provide an update on the activities of the Strategic and Unconventional Fuel Task Force. For example, how often does the Task Force meet and when was the most recent Task Force meeting? Is the Task Force producing reports as required by Section 369 of the Energy Policy Act of 2005?

Why has the Task Force not issued an annual report, as required by law, since 2009? Is DOE committed to the Task Force completing the required reports?

A2b. The Task Force produced an Initial Report in September 2006. EPAct 2005 did not call upon the Task Force to produce additional reports. However, with assistance from the Department, the Task Force also completed a Strategy and Program Plan report in September 2007. Additionally, the Department submitted an annual report on January 16, 2009 for the three-year period covering 2006 through 2008; and another annual report for 2009 was submitted on June 18, 2010. The Task Force has not produced any additional studies since its last meeting in April 2010; and the Department is not planning to submit additional annual reports.

QUESTION FROM CHAIRMAN ANDY HARRIS

Q2c. Please provide an update on the activities of the Strategic and Unconventional Fuel Task Force. For example, how often does the Task Force meet and when was the most recent Task Force meeting? Is the Task Force producing reports as required by Section 369 of the Energy Policy Act of 2005?

Please provide a timeline to the Subcommittee for the Task Force to issue an updated Annual Report.

A2c. The Task Force's reporting requirements pursuant to EPAct 2005 Section 369(h) have been met; the Task Force has not produced any additional studies since its last meeting in April 2010; and the Department is not planning to update previous annual reports.

QUESTION FROM CHAIRMAN ANDY HARRIS

Q2d. Please provide an update on the activities of the Strategic and Unconventional Fuel Task Force. For example, how often does the Task Force meet and when was the most recent Task Force meeting? Is the Task Force producing reports as required by Section 369 of the Energy Policy Act of 2005?

Does DOE have plans to implement the recommended unconventional fuels strategy, proposed by the Ad Hoc Unconventional Fuels Working Group?

A2d. Our current focus is primarily on safe and environmentally sustainable development of unconventional natural gas, including shale gas, and methane hydrates.

QUESTION FROM CHAIRMAN ANDY HARRIS

Q3. How is the Department of Energy actively fulfilling its program responsibilities called for in Section 369 of the Energy Policy Act of 2005?

What plans does the Office of Fossil Energy have for further supporting oil shale development as part of the Energy Policy Act 2005?

A3. Our current focus is primarily on safe and environmentally sustainable development of unconventional natural gas, including shale gas, and methane hydrates. The Department's oil shale activities going forward include efforts to track RD&D in the public and private sectors; and to participate in oil shale conferences.

QUESTION FROM CHAIRMAN ANDY HARRIS

Q4. During the hearing, you stated that both oil shale and oil sands are part of President Obama's "all-of-the-above" energy strategy. If this is truly the case, why does the budget request for the Department of Energy's Office of Fossil Energy contain no funding for oil shale and oil sands research?

A4. America's abundant unconventional oil (including oil shale) and natural gas resources are critical components of our nation's energy portfolio. Their development enhances America's energy security and economy. However, there are significant technical and environmental challenges to the development of U.S. oil shale. The more difficult issues related to the commercialization of domestic oil shale appear to be related to high capital costs, uncertainties regarding oil shale development regulations, and most importantly, environmental considerations, rather than process-related technical challenges. Our current research focus is primarily on safe and environmentally sustainable development of low-carbon unconventional natural gas. This includes shale gas, and methane hydrates.

QUESTION FROM CHAIRMAN ANDY HARRIS

Q5. Please describe all activities specifically relating to oil shale development within Department of Energy's Office of Fossil Energy.

What is the Department of Energy specifically doing to address water-use issues associated with unconventional energy production?

A5. DOE's Office of Oil and Gas supports research and development (R&D) efforts addressing the water use, water re-use/recycling, wastewater treatment, and water resource management issues associated with the development of unconventional resources, including oil shale. Examples of such DOE sponsored projects specific to oil shale include: (a) the development and creation of an up-to-date Geographic Information System (GIS) database that will provide baseline water information needed to understand potential impacts of future oil shale development, which is being conducted by a team led by the Utah Geological Survey; and (b) development of a web-based water resource geospatial data gathering and analysis system to facilitate decision making for potential oil shale development, which is being conducted by the Colorado School of Mines.

QUESTION FROM CHAIRMAN ANDY HARRIS

Q6. In the Department of Energy's response to the Government Accountability Office report "*Energy-Water Nexus: A Better and Coordinated Understanding of Water Resources Could Help Mitigate the Impacts of Potential Oil Shale Development,*" DOE states, "the biggest obstacles to investment in the development of a viable oil shale industry in the US have not been the state of the technology, but rather the regulatory uncertainty, and lack of access to resources on Federal lands in the western US." Does DOE stand by this assessment? If so, what is DOE doing to help overcome these obstacles?

A6. The Department of Energy (DOE) believes the issues of regulatory certainty and access to resources will be resolved by ongoing Bureau of Land Management initiatives. In the meantime, DOE's main focus will be on safe and environmentally sustainable development of unconventional natural gas, including shale gas, and methane hydrates.

QUESTION FROM CHAIRMAN ANDY HARRIS

Q7. The House Appropriations Committee provides $25 million to the Department of Energy's Office of Fossil Energy for unconventional fossil energy research to support research to improve the economics of oil production from oil shale, as well as to reduce the health, safety, and environmental risks associated with oil shale extraction. Does DOE support this funding? If not, why not?

If Congress appropriates this funding, what targeted research areas would be the most impactful for the development of the United States' unconventional energy resources?

A7. The Department supports the President's Budget as submitted, which will focus primarily on safe and environmentally sustainable development of unconventional natural gas, including shale gas, and methane hydrates.

United States Government Accountability Office
Washington, DC 20548

June 7, 2012

The Honorable Andy Harris M.D.
Chairman
Subcommittee on Energy and Environment
Committee on Science, Space, and Technology
House of Representatives

Subject: GAO Response to Questions for the Record

We appreciate having had the opportunity to appear before the House Subcommittee on Energy and Environment on May 10, 2012, to speak about GAO's work on issues associated with oil shale development.

Enclosed are GAO's responses to the questions you submitted for the hearing record related to our testimony, *Unconventional Oil and Gas Production: Opportunities and Challenges of Oil Shale Development*, GAO-12-740T. If you or your staff have any further questions, please contact me at 202-512-3841 or mittala@gao.gov.

Sincerely yours,

Anu K. Mittal
Director, Natural Resources
and Environment

cc: The Honorable Brad Miller
Ranking Member
Subcommittee on Energy and Environment

Enclosure

U.S. HOUSE OF REPRESENTATIVES

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

Subcommittee on Energy & Environment

Hearing Questions for the Record

The Honorable Andy Harris

Supporting American Jobs and the Economy Through Expanded Energy Production:

Challenges and Opportunities of Unconventional Resources Technology

Ms. Anu Mittal

1. **A number of organizations, including the Department of Energy, have argued the water use assumptions contained in the Government Accountability Office report *"Energy-Water Nexus.: A Better and Coordinated Understanding of Water Resources Could Help Mitigate the Impacts of Potential Oil Shale Development"* were overstated. Given the development of new unconventional oil and gas production technologies, does GAO still support its previous water use estimates? Has GAO taken into account new industry estimates, or taken measures to revise the report?**

As we stated in our report, the water use estimates that we presented characterized what was known about the amount of water that may be needed for commercial oil shale development and reflected the most current data and information publicly available at the time of our review. We reported the entire range of reputable studies that were publicly available at the time without bias to illustrate the wide range of uncertainty in water needed to commercially develop oil shale. We discussed the completeness and accuracy of these studies in interviews with federal agency officials, state agency personnel involved in regulating water quality and quantity, oil shale industry representatives, and representatives of environmental groups. As a result, we continue to believe the water use estimates presented in our October 2010 report reflect what was known about the amount of water that may be needed for commercial oil shale development at the time. Since that time, we have not conducted additional analyses to reflect any possible changes or new estimates that may have been developed since this work was completed.

2. **The Department of Energy criticized GAO's characterization of the state of oil shale technology development,' stating "the Report gives the impression that all oil shale technologies are speculative, and that proving them to be commercially viable will be difficult, requiring a very long period of time, with uncertain outcomes. This is not an accurate representation of the state of the technologies, or of the expected timing of first commercial**

production. The Report should be revised to address these issues." Can you explain why GAO's assessment of the state of oil shale technology is at odds with DOE's?

a. What is GAO's position with respect to DOE's comments and recommendation to revise the report?

As we stated in our response to DOE's comments to our report, we disagreed with this characterization of our report. Our report clearly stated that there was uncertainty regarding the commercial viability of in-situ technologies. Based on our discussions with companies and review of available studies at the time we conducted our review, Shell was the only active oil shale company to have successfully produced shale oil from a true in-situ process. On the other hand, we noted that mining oil shale and retorting it at the surface was a relatively mature process. Nonetheless, competition from conventional crude oil has inhibited commercial oil shale development in the United States for almost 100 years. As noted in the report, we did not dismiss any companies' efforts to overcome long-standing challenges in this industry nor did we tout their progress. As a result of DOE comments, we added language to better explain the scope of our work and our characterization of the state of oil shale technology development.

3. **The House Appropriations Committee provides $25 million to the Department of Energy's Office of Fossil Energy for unconventional fossil energy research to support research to improve the economics of oil production from oil shale, as well as to reduce the health, safety, and environmental risks associated with oil shale extraction. If Congress appropriates this funding, what targeted research areas at DOE would be the most impactful for the development of the United States' unconventional energy resources?**

   a. **What specific recommendations do you have for how DOE can best fund research and development and otherwise leverage resources for unconventional energy production?**

Our October 2010 report examined federal research efforts to address impacts on water resources from commercial oil shale development. Therefore, the report did not provide specific recommendations for targeted research, nor did it offer recommendations on how DOE can best fund research and development for unconventional energy production. The report did, however, note that Interior and DOE officials generally have not shared information on water related oil shale research and that there is a need for federal agencies to improve their efforts to collaborate and develop more comprehensive baseline information on the current condition of groundwater and surface water in these western areas. Such information will be important for understanding the potential impacts of oil shale development on water resources in the region. As a result, we made three recommendations to the Secretary of the Interior to address these concerns.

4. **Ms. Mittal, your testimony notes "the eventual size of the industry may be limited by the availability of water and demands for water to meet other needs of the region." Is there a balance determined by water availability, as**

managed by state authorities that could enable the significant production of unconventional energy?

As you are aware, states play a large role in managing water resources, including in the West where the greatest potential for oil shale development is located. State officials will, therefore, need to consider the trade-offs between oil shale production and water quantity and quality while weighing competing demands for water resources, such as agricultural, municipal, and commercial use, particularly in light of the already constrained water supplies in the region. As noted in our report, water is likely to be available for the initial development of an oil shale industry. In this regard, we provided several illustrative examples depicting an oil shale industry of various sizes and the estimated water needs—for both surface and in-situ technologies—based on the studies we examined.

Office of the Governor

CODY B. STEWART
Energy Advisor

SAMANTHA MARY JULIAN
Director, Office of Energy Development

GARY R. HERBERT
Governor

GREG BELL
Lieutenant Governor

June 13, 2012

The Honorable Andy Harris M.D.
Chairman
Subcommittee on Energy & Environment
United States House of Representatives

Dear Chairman Harris,

Thank you for the opportunity to represent Utah and participate in the May 10, 2012 hearing entitled: *Supporting American Jobs and the Economy Through Expanded Energy Production: Challenges and Opportunities of Unconventional Resources Technology.* Energy is one of Governor Gary R. Herbert's four cornerstones and as such, it was an honor to speak to your Subcommittee on the importance of Unconventional Energy to Utah.

I write today to address the questions submitted for the record by Members of the Committee. Below please find my responses.

1. **The Government Accountability Office testimony mentioned the lack of knowledge of hydrologic conditions as a potential impediment or area that needs further research prior to commercial oil shale development. Does the State of Utah consider its specific knowledge of the hydrologic conditions and formations as uncertain or lacking?**
    a. **Please briefly describe how the State of Utah assesses ground and surface water resources and determine water rights and appropriations.**

    The State of Utah does not consider its knowledge of hydrologic conditions as uncertain or lacking. Hydrologic conditions are a vital part of the permitting process and are thoroughly examined by the Utah Division of Oil, Gas and Mining and the Department of Water Quality before permits are issued.

    Water is owned by the State in trust for its citizens and is subject to the State water appropriation system managed by the Utah State Water Engineer. Water rights appropriations are for specific diversion or use proposals. The State believes and asserts that water is available for oil shale and oil sands development through existing water rights and through the general market system. The State's allocation system examines issues related to availability, prioritization, interference with other rights, and related factors. The State makes decisions regarding the availability of water for

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energy development or any other use in all cases. The State will, consistent with the authority for the State Water Engineer, process applications to approve, transfer or reject water rights for oil shale, oil sands or any other use.

2. **Your testimony notes Utah's creation of an "Alternative Energy Development Incentive" to "encourage responsible energy development as Utah's education system relies on it for funding classrooms and textbooks." Please describe what increased energy production means for the State's budget, particularly how this initiative impacts the State's education programs.**

   A Headwaters Economy Study, *Energy Revenue in the Intermountain West*, identified that over $368 Million dollars flow to Utah's State budget from Energy Development through production value, production taxes, property taxes and royalties. A significant portion of this is through the State of Utah School and Institutional Trust Lands Administration, which for the fiscal year of 2011 received over $121Million in revenues that were almost entirely derived from energy development.

   As this is a critical part of the State's educational funding, increasing energy production would mean increasing the State's ability to educate its pupils through infrastructure investment, hiring additional teachers and upgrading our schools.

   This simple fact is why the Alternative Energy Development Incentive (AEDI) was created, because incentivizing energy development through the AEDI will lead to increased activity and larger overall State Revenues for education. Temporarily trading a portion of State Tax liability for long-term investment in alternative energy development will augment Utah's current position as a leader in traditional fossil fuel production by cementing Alternative Energy companies in Utah. This will assure long-term tax base and increased long-term educational funding.

3. **How is the State of Utah assisting localities and counties to plan for the possible development of the State's unconventional resources? Is the State developing long-term plans to address infrastructure and service challenges?**

   First: the State of Utah works closely with local Government in every instance possible. The Counties have been very active, vocal, and invaluable partners throughout the process of developing the State's unconventional resources. Most notably, in 2012 the State Legislature passed a bill to create an "Energy Zone" roughly aligning with the Uintah Basin. This was a coordinated effort of both the Legislature and Counties and cements State and local priorities as they relate to unconventional (and other) energy development efforts. The bill can be found at:

   http://le.utah.gov/~2012/bills/static/SB0083.html

   In addition to the State working closely with the Counties to develop legislation, the State coordinates development efforts and stays in close-and-constant communication with other County and other local leaders to harmonize efforts and assure that State efforts and policy align with local policies and efforts to every extent possible. The Office of Energy Development has made particular inroads to work with every

applicable State Agency and coordinate their communication and efforts to related field and State level offices. This model, and the overall synchronization of efforts, is what the State of Utah would like to achieve with Federal agencies.

Secondly, The State is certainly developing long-term plans to address infrastructure and service challenges. Most notably, Governor Gary R. Herbert's 10 year Strategic Energy Plans lays out several goals and recommendations to accomplish just that. The Plan can be found here:

http://www.utah.gov/governor/docs/10year-stragegic-energy.pdf

Within the plan, Governor Herbert's 5th overarching goal is to "Modernize the regulatory environment to support sustainable power generation, energy transmission and energy conservation".

Additionally, recommendation 7 clearly targets this effort by recommending:

"Utah should...Analyze current and future pipeline capacity for oil and gas"

This is expanded on page 34, suggesting that the State will consider alternatives to current regulation and funding sources to encourage transmission line and pipeline construction in areas that promote economic development.

To that end, in the 2012 Legislative Session the Office of Energy Development pushed a bill that included the creation of a Utah Energy Infrastructure Authority, the role of which is to promote the development of any "energy delivery project" that helps to facilitate responsible energy development in the State of Utah. The Authority has tax free bonding authority through which it can provide below-market financing for qualifying projects, and it may also partner with developers to advance projects of special importance to the state. While such authorities do exist in a handful of other states, Utah is increasingly seen as an energy crossroads for the West, as well as a great power producer, and the Authority is expected to play a key role in future years.

Aside from working to incent and promote energy infrastructure, there is also significant work to be undertaken to help streamline the siting and permitting of linear projects, and to that end increased coordination among State agencies, and between those agencies and the Federal government, will be essential. The current national dialogue on these issues, which can largely be credited to the advent of the Rapid Response Team for Transmission, is heartening, and Utah has been party to that dialogue from its outset.

The Utah Office of Energy Development's aim is to coordinate all such activities in the state, as well as to coordinate regionally and nationally. Analysis, streamlining and potential future investment in Utah's energy infrastructure is ongoing and will be coordinated with other Western States through the Western Governor's Association which Governor Gary R. Herbert currently chairs.

4. **How has the State of Utah worked with US Oil Sands to advance the oil sands project? Do you think such a model would be beneficial to replicate at the Federal level?**

   As with any other energy development company, the State of Utah has worked with US Oil Sands on several fronts. Most recently and notably, this has been through the Office of Energy Development. These efforts have included the identification and dissemination of fact-based information, arranging site-visits, participation in energy events and general coordination and communication.

   The State certainly believes that the Federal Government would benefit from increased communication and coordinating efforts with industry, something that has recently been a significant difficulty as outlined in the State of Utah's written comments on The Department of Interior's 2012 Oil Shale and Tar Sands PEIS (and previously submitted for the record) where the Federal Government showed little effort at working or communicating with industry at any level.

5. **As a part of Utah's commitment to develop its unconventional energy, it has created what you can an "Oil Sands Technology Zone." Please describe this effort and how it might be used as a model for responsible development and in improving safe, economical technologies.**

   This is a recent effort led by the Office of Energy Development to create a rent-free, pre-permitted site for oil sands technology companies to be able to showcase their innovations. The current site is a brownfield on State land immediately adjacent to an operating mine which has agreed to provide ore to allow tenants to mimic actual commercial operations.

   This effort was begun because companies and individuals with proprietary technology have been unable to gain access to land/leases for oil sands resources; largely because the Federal Government has closed off their leasing. As a result, the State wishes to enable these technologies to progress to the next level at a small, demonstration scale in order to identify the most environmentally responsible and economic technology. It is hoped that this effort will provide a bridge to commerciality and facilitate the funding of companies nurtured in this zone.

   The State applauds the consideration that this be used as a model for responsible development at the Federal level. We believe that an opportunity exists not only for oil sands but oil shale as well. While several companies are in the commercial development phase already (RedLeaf Resources, Enefit American Oil, American Shale Oil, etc) several innovations have been left by the wayside due to lack of a proper opportunity to truly demonstrate their technology. It would be a travesty if the responsible development of domestic energy resources were hindered due to the inability of innovators to innovate.

   It is worth noting that the recent RD&D efforts led by BLM to provide leases to these companies are an example of "what not-to-do". This program involved a significant multi-year application process which was extremely burdensome and anecdotally cost

companies over $1,000,000 to obtain. The State would suggest that the Federal Government identify a pre-permitted, rent-free site for small scale demonstration of oil sands and oil shale processing, including in-situ and surface technologies. Siting this zone on a previously disturbed area would minimize the environmental impact. The State of Utah would strongly appreciate the opportunity to work with the Federal Government to identify such a site and share in efforts leading to its creation.

In addition to exploring the creation of a Federal-level innovation zone concept, the State of Utah would like to highlight additional efforts which might benefit unconventional energy development. The first is to reverse the recent trend at the Department of Energy as discussed by Mr. McConnell during his testimony on May 10th where he highlighted that $0 have been devoted to oil sands and oil shale in recent budgets. Historically the Federal Government has supported these domestic sources of energy, most recently/notably through the Unconventional Fuels Task Force which published valuable studies examining these industries and their likely development. The State of Utah believes that Mr. McConnell's testimony stating that the Task Force has recently been active is factually incorrect. The State of Utah is unaware of any material efforts made by the DOE and/or Unconventional Fuels Task Force since 2009. Its re-establishment and re-funding would be a beneficial effort warranting discussion at future hearings.

Thank you, I look forward to the opportunity to address any additional questions and represent Utah at future hearings if you feel it is appropriate.

Best Regards,

Samantha Mary Julian
Director, Utah Office of Energy Development

June 8, 2012

Congressman Andy Harris M.D.
Chairman Subcommittee on Energy & Environment
2321 Rayburn House Office Building
Washington, D.C. 20616-6301

Honorable Congressman Harris,

It was an honor to participate in the May 10, 2012 hearing entitled *Supporting American Jobs and the Economy Through Expanded Energy Production: Challenges and Opportunities of Unconventional Resources Technology.* I thank you very much for the opportunity to testify before your sub-committee and am very pleased to answer the question below submitted for the record by Members of the Committee.

1. As you are aware, there is currently an intense debate regarding allegations from the Environmental Protection Agency and environmentalists that hydraulic fracturing may contaminate ground water. How might US Seismic's technology eventually assist in confirming or denying allegations of water contamination?

Our technology uses ultrasensitive fiber optic sensors to detect the microseismic fractures occurring in the gas-bearing rock (shale) during the hydraulic fracturing process. This monitoring of the microseismic activity allows operators to map the locations of the fractures as they are occurring, which provides them with the ability to terminate the fracturing process should they discover fractures occurring outside the desired zone (which can lead to water contamination). Unfortunately, only a very small percentage of the tens of thousands of hydraulic fracturing jobs being performed annually in the US are being monitored. We believe this is due to the very high cost of current, commercially available monitoring equipment and the marginal performance of this 50 year old legacy electronic monitoring technology. We believe that our new fiber optic technology, which field testing indicates will provide substantially better performance at a fraction of the cost of the legacy monitoring systems, will encourage operators to monitor 100% of their frac jobs, leading to significant reductions in environmental impact. Specifically, by continuously monitoring microseismic activity during the hydraulic fracturing process, time sequence data could enable a company to confirm or deny allegations of ground water contamination.

9601 Variel Ave., Chatsworth, CA 91311 Phone (818) 428-1457 Fax: (888) 892-7507
www.us-si.com

We hope this response fully and completely answers your question and look forward to being part of the solutions provided by innovative companies to ensure responsible fracturing in America.

Thank you again for the opportunity to appear before your Subcommittee.

Sincerely,

Jim Andersen
CEO & President
US Seismic Systems, Inc.
9601 Variel Avenue
Chatsworth, CA 91311

Hearing Questions for the Record
The Honorable Andy Harris

Supporting American Jobs and the Economy Through Expanded Energy Production: Challenges and Opportunities of Unconventional Resources Technology

Mr. Cameron Todd

1. How did your experience in Canada inform US Oil Sands' project in the United States? What lessons can be learned from Canada's successful development of oil sands?
    a. What are the largest technological challenges to producing oil sands in the United States compared to Canada, and how can the Federal government best assist in overcoming them?

The principal leaders of US Oil Sands have a long history of involvement in the development of oil and gas resources in both Canada and the United States, as well as in Canada's oil sands. We have come to understand the key technical challenges faced by the oil sands industry, as well as the long evolution of the technologies that have been key to Canada's success. We have also benefited from the ability to evaluate the current state of the industry and identify challenges that were not originally recognized. An example is the problem of tailings ponds. Originally tailings ponds were seen as the normal way for any mining and extraction project to handle its "un-finished" oil sand separation challenge. It is only relatively recently that the amalgamation of many large projects along with public concern has shown the need to reduce or eliminate tailings ponds. Understanding this problem in advance of initiating our first development in the Utah, US Oil Sands has re-engineered the extraction process and come up with a breakthrough approach that now eliminates the need for tailings ponds by starting with a much more efficient extraction process.

Canada has a long history of development of its oil sands resources, and there are many lessons to learn. Key among these is the recognition that it does not happen all at once. Commercial development of Canada's oil sands first started more than 45 years ago and at a time that oil prices did not support the economics. It did not become large scale for decades, and there has been plenty of opportunity for government, the public and industry to influence the outcomes along the way. Canada's oil sand resources are 50 times larger than those of the United states and it is highly unlikely that the US will ever reach the mega-production levels anywhere near the scale as Canada has. The oil sand resources of the US are large enough to be of great value and economic impact to the nation, (indeed the in-place estimates of oil sand resources are more than double the level of the nation's entire current conventional oil reserves) but not so large as to necessarily cause broader regional social dislocations or environmental impacts. Large scale development (if it is to happen in the US) will evolve over a long

period, and no one approach, technology or answer will solve all of the challenges and obstacles that arise. Partly because oil sands deposits differ and therefore different approaches will be necessary, and partly because technical innovation will evolve. Furthermore it is impossible to anticipate all of the technical, environmental or social issues or problems that may arise associated with oil sand development, let alone solve them before getting started. If this had been a requirement in Canada, there would be no oil sand production today. And it this tendency to need all the answers before starting is one of the main reasons the US is so late at getting started on developing its own extensive resources.

Policies, support and regulatory frameworks should recognize the various stages of development of a new and broad resource. In the early stages development is extremely fragile. Technologies are new and untested. With no cash flow to support on-going research and development, access to start-up capital is critical. Government supported seed capital for technology development can be helpful, but perhaps of even higher value would be government's demonstration of commitment. Private capital is widely available, but it is highly suspect of government's commitment to successful implementation of commercial technologies. Early efforts will need to focus on the immediate technical challenges of recovery of the resources. As successful technologies emerge, the broader challenges of infrastructure, regional impacts, social issues will be appropriately dealt with along the way, particularly given that policy makers and industry leaders now recognize the importance of these issues. As well, the more modest size of the resource will make for more modest growth allowing for any such impacts and issues to keep up with any growth in needs. Therefore while keeping the regional issues in mind, it is not necessary to figure out all of the potential answers in advance.

The federal government can best assist by providing a clear, consistent and coordinated message (from all federal departments) that it supports sustainable development of oil sands and oil shale. It should not be supporting research on technology from the DOE on the one hand, and then creating obstacle after obstacle by denying access to land from the Department of Interior or raising insurmountable barriers from the EPA on the other. As far as research goes, support of new technologies in oil recovery and in particular in water treatment and recycling would be of greatest assistance.

2. In your testimony, you stated, "it is no accident that 100% of US Oil Sands leases are on State lands" due to a "de facto moratorium" on leasing oil sands or oil shale and approval of commercial projects by the BLM. Can you describe in a bit more detail the Federal position and approach to oil sands leasing?
    a. What specifically could be done to improve public-private cooperation in this area? Would you characterize this Administration's approach to oil sands as "all-of-the-above"?

In the Energy Policy Act of 2005, Congress specified that the BLM was to make oil shale and tar sand leases available to be developed. In keeping with this directive, on November 17, 2008, the U.S. Bureau of Land Management issued an Approved Resource Management Plan Amendments / Record of Decision for Oil Shale and Tar Sands Resources to Address Land Use Allocations in Colorado, Utah, and Wyoming and Final Programmatic Environmental Impact Statement ("2008 OSTS ROD").

However, this decision was challenged by a number of environmental groups, and on February 15, 2011 the BLM reached a settlement agreement with these parties which included a provision that the BLM would not offer lands for competitive tar sands leasing, or accept expressions of interest in tracts for competitive tar sands leasing until publication of a new decision or decisions regarding amendments for each of the planning decisions made by the 2008 OSTS ROD, or January 15, 2013, whichever occurs first. (A copy of that settlement agreement is appended to this document.)

This settlement agreement was unprecedented and completely at odds with the directive from Congress. No effort was made to promote or allow any leasing or opening of federal lands. In essence the settlement agreement thwarted the intentions of Congress and at minimum ensured a lengthy delay (in essence a "moratorium" on leasing and development). The BLM then set about to undertake an extremely lengthy and expensive public consultation process, which merely served to further delay the action intended by Congress. Finally in January 2012 the BLM issued a draft Programmatic Environmental Impact Statement ("PEIS") which seeks to exclude approximately 75% of the original 2.3 million acres of Federal Lands under consideration for commercial leasing of oil sand and oil shale rights.

The Secretary of the Interior made clear his intentions in this regard when he addressed a meeting of energy producers at the Uintah County Energy Forum held in Vernal, Utah in September 2011, as he stated that a better use of these lands would be conserving them for hunters and sportsmen. Clearly the BLM is not pursuing a balanced approach in regard to an "all-of-the-above" energy strategy, but rather acceding to various environmental radical groups' desire for a "no-development-here" approach.

In order to be consistent with an "all-of-the-above" approach to energy development in the United States of America, our position is that each potential commercial lease should be evaluated on its own specific merits. To categorically exclude lands based on a programmatic document does not further the goal of development of unconventional resources. Further, other commercial activities such as livestock grazing, logging, and conventional oil and gas production take place on these lands and to exclude oil sands and oil shale development from these areas is not equitable, nor conservationist.

A major unintended consequence of the chaotic and disjointed federal approach to the leasing of federal lands has been to cause a flight of access to investment capital for R&D and technology development. While seed money from the DOE might be helpful, entrepreneurs and investors know that without access to the land and resources, there is no point in developing technologies which cannot be used. Thus the only way to secure funding for any project or company working the oil shale or oil sands regions has been to target state and private lands, even though most of the resources reside on federal lands.

3. How has the State of Utah worked with US Oil Sands to advance the oil sands project? Do you think such a model would be beneficial to replicate at the Federal level?

The State of Utah has worked very hard to advance oil sands development in general. One of the key elements in this assistance has been Utah's approach to coordinating the roles of various state agencies that are involved in approving a project. In this way all the departments get involved together and it tends to streamline the approach for a project. You don't have to answer the same questions twice. In addition the State sees the benefit of getting a project moving and therefore does not just act as a "gatekeeper" turning back deficient projects, but more like a guide helping companies navigate the bureaucracy and showing what needs to be done to meet the requirements. In this way the public is protected, by ensuring projects meet the requirements, but at the same time the approval is streamlined by showing companies how to meet the requirements. It's a win-win approach.

For the federal government, it could also work, but it would require the resolve to try and encourage projects and to coordinate between large departments. While this is not the norm at the federal level, it could be accomplished. Perhaps there could be a project coordinator assigned to each project to work across department lines.

4. How does the environmental footprint of U.S. Oil Sands' technology compare to that being used in Canada?

US Oil Sands' technology is a major advancement over existing processes currently in use for oil sands extraction in Canada. Through the use of US Oil Sands' proprietary technology, we have been able to greatly increase bitumen recovery, while reducing residual waste streams. This has allowed us to generate clean sand tailings, which in turn allows us to develop a project without the need for a waste tailings pond. Instead we can now place damp dry tailings back into empty mine pit and reclaim the mined area as we go. Effectively this reduces the time the mine is open by more than 20 years over current technologies in use, and greatly reduces the surface area required.

Furthermore, because our water is separated in the process immediately (and not put into tailings) we are able to recycle much higher levels of water. Our water recycle rates are 95%, higher than the other extraction projects, and our water use is lower. As well our energy use is much lower, as we recycle hot water and don't lose thermal energy to the air in the tailings pond. Process temperatures are also lower. With lower energy use and much lower fugitive emissions our greenhouse gas footprint is also lower, and our air quality much improved. Utah bitumen is sweet, meaning it contains 90% less sulfur than Canadian heavy crudes. This reduces sulfur emissions both at the project and at the refineries that process the crude. This also reduces the energy use and greenhouse gas output at the refinery.

Our process uses non-toxic bio-solvent and therefore does not release harmful chemicals to either air or water. Our process is modular, thereby allowing much smaller projects to be developed sequentially. This allows a much smaller surface footprint and lowers impacts on both the natural environment and on local social and public infrastructure.

Incidentally, the existing processes used in Canada are not effective at economically extracting Utah bitumen, primarily due to differences in the oil/sand chemistry. However US Oil Sands' process works on both Canadian and Utah oil sands, and on other deposits found around the world. Thus we expect that once our process has been pioneered in Utah, it will not only expand to more development in the US, but can also be exported to Canada and other bitumen deposits around the world, thereby greatly improving the environmental benefits to many other areas.

5. The House Appropriations Committee provides $25 million to the Department of Energy's Office of Fossil Energy for unconventional fossil energy research to support research to improve the economics of oil production from oil shale, as well as to reduce the health, safety, and environmental risks associated with oil shale extraction. If Congress appropriates this funding, what targeted research areas at DOE would be the most impactful for the development of the United States' unconventional energy resources?
    a. What specific recommendations do you have for how DOE can best fund research and development and otherwise leverage resources for unconventional energy production?

Some of the best approaches are joint efforts between various industry groups as well as educational and state agencies. It may be possible to leverage funds further by obtaining joint federal, state and industry funding. In addition funding should not be targeted only to national research bodies as it may be better placed closer to the resource and the projects. A joint advisory board could steer projects through the process, and the use of coordinators to help navigate the federal bureaucracy would be useful.

Some of the key obstacles which may require improved technology to overcome will deal with environmental mitigation and improvements. These technologies may involve joint study into water treating and recycle. Much additional work will also be required into oil sand extraction techniques. Research into the use of non-toxic and biodegradable chemicals used in extraction would be valuable. Concentration on approaches for oil-wet reservoirs would be valuable as well.

Lastly we would suggest that the US consider partnering with Canadian and Albertan research programs. Many of the technological challenges to be overcome are already being worked on in Canada and there would be much synergy in applying joint approaches.

U.S House of Representatives
Committee on Science, Space, and Technology
Subcommittee on Energy & Environment

Dammer Answers to the Hearing Questions

1. The GAO Report "Energy-Water Nexus" is essentially a fine report and accurate in many respects. It is unnecessarily confusing and often contradictory, however, when it discusses ranges of potential water use in the development of oil shale. Most prominently is the contention that 12 barrels of water per barrel of oil is conceivable by some "hypothetical" oil shale extraction process that uses a water-cooled, coal fired power plant to generate power. No one would or could do that. If you are an opponent to oil shale development....what number do you cherry-pick to support your opposition? Plucking a number out of a quick-study RAND report isn't bad in and of itself, but it represents a development scenario that has never been considered nor suggested by the industry. There are no commercial oil shale projects in the United States but a great deal of analytical work and pilot plant experience has been accomplished over the years. The literature is quite prolific and the companies involved in oil shale development have been forthcoming regarding the ranges of water use their technologies will require. That is a range between one barrel of water per barrel of oil and three barrels of water per barrel of oil. It should be added that it is to the absolute economic advantage of every oil shale technology to reduce process water consumption and many companies are examining the recycling of produced water from both their processes and neighboring natural gas development.

One point that the GAO Report made that is extremely important is to "coordinate on water related research". There are a bunch of analyses out there that are at times contradictory, often unrepresentative of the realities of the past and developing industries, and totally uncoordinated. The problem is that there are multiple competing federal offices working on the same issue but with slightly different objectives and inconsistent data. I think the GAO Report is subtly suggesting that someone should be in charge.

2. Funding legitimizes government programs. The mandates of EPACT 05, Sections 369 (h) and (i) were never fully implemented because a specific appropriation was not directed to that purpose. Ironically, there were existing funds to accomplish work in this area, but the lack of appropriated funding provided the excuse to suspend work on an area that was not a goal of the administration. The Task Force on Strategic Unconventional Fuels report America's Strategic Unconventional Fuels made many recommendations regarding everything from regulatory and permitting streamlining; to infrastructure planning; to fiscal and tax reform; to market analysis; to water resource stewardship. All of this would require a program plan and a specific office to coordinate and eventually implement the plan. Further, the issues associated with development of oil shale in the Green River formation encompasses several States and a variety of other oil, gas, and mining industries. Multiple State and local interests must be accommodated, all in an area where 80% of the land is owned by the Federal Government. And that 80% is why it is essential that the Federal Government take a proactive role in planning for the sustainable development of this region.

During the time the Task Force was functioning, the Office of Petroleum Reserves, Office of the Naval Petroleum and Oil Shale Reserves, who had the responsibility to manage the Task Force [Section 369 (h)] and develop an unconventional fuels program [Section 369 (i)], formed an Ad Hoc Unconventional Fuels Working Group and through multiple planning meeting published; Strategic Plan: Unconventional Fuels Development Within the Western Energy Corridor (attached). The working group included

representative from every major oil shale development company, regional universities, National Labs, DOE, DOI, DOD, and representatives of Alberta (Oil Sands).

My specific recommendation would be to establish an Unconventional Fuels Center to implement the aforementioned "Strategic Plan", reestablish the Ad Hoc Working Group to assure continued input into the process and provide a one year timeframe to recommend a plan for the development of the "Western Energy Corridor Initiative". I would allocate $2 million to that purpose. I would make the remaining $23 million contingent on establishing effective work plans and implementation strategies. The problem is to assure that there is proper motivation to get the job done. In EPACT 05, that responsibility resides with the Office of Petroleum Reserves, but little to nothing has been accomplished in the last several years.

3. The Department of Energy has not fulfilled the statutory requirement of EPACT 05, Sections 369 (h) and (i). They have done little to advance unconventional energy resources since 2008. By all indications, they are not interested in the problem. There is no indication that DOE or Fossil Energy, within DOE, has the interest or resident expertise to accomplish this work.

From the beginning of the 369 program, Idaho National Laboratory (INL) provided the greatest interest and the most consistent and valuable service to the unconventional fuels program. They continue to actively support and promote the Western Energy Corridor concept. If possible, I would recommend the establishment of an Unconventional Fuels Center to manage the work described above and place it under an interagency group managed at INL and supported by that lab. They would be directly responsible for reinitiating the Ad Hoc Unconventional Fuels Working Group and completing the Western Energy Corridor Initiative Plan.

Appendix 2

Additional Material for the Record

LETTER FROM MEMBERS OF WYOMING HOUSE OF REPRESENTATIVES TO BUREAU OF LAND MANAGEMENT

May 4, 2012

Draft OSTS PEIS
Argonne National Laboratory
9700 S. Cass Ave.
EVS/240
Argonne, IL 60439

Re: Oil Shale and Tar Sands Resources Programmatic EIS

Dear Bureau of Land Management,

We are writing to express our support for the approach that is being taken in the Bureau of Land Management's recently released Draft Programmatic EIS (PEIS) for oil shale and tar sands, which defines the terms of potential future leasing of oil shale and tar sands deposits on federal lands in Colorado, Utah and Wyoming. As elected officials in these states, we believe it is essential that the final plan ensures that key questions are answered before opening public land to commercial development. Given that a commercial industry does not yet exist, it is smart to require that research and development of oil shale and tar sands technologies be completed and the impacts analyzed before moving forward with a commercial leasing program. The final plan should reflect a common sense approach that puts the prosperity of our region first.

Our public lands are enormous economic drivers in the Intermountain West. Tourism, recreation, hunting and fishing, ranching, and other industries provide billions of dollars of revenue and hundreds of thousands jobs throughout the three-state region. Our public lands also contain the headwaters to critical western water supplies, the economic backbone of our economies. The BLM has acknowledged in the Draft PEIS that the potential impacts of development on communities, water and air are largely unknown but potentially significant. We do not know, for instance, if either industry would produce significant revenues, but we do know that development would divert critical water resources from existing and future uses and require trade-offs that may be substantial, but which we cannot yet assess. We thus strongly urge the BLM to prioritize research and development in the final PEIS, to ensure that impacts are analyzed and we can make smart decisions about commercial leasing.

These lands are our heritage, and for many, our livelihoods. As representatives of communities across the three-state region, we have a responsibility to work to protect those values. It is critical that we know more about the impacts of oil shale and tar sands development before putting communities, water and air at risk.

Sincerely,

Ken Esquibel
Wyoming House of Representatives
District 41
Cheyenne, Wyoming

Representative Stan Blake
Wyoming House of Representatives
House District 39
Green River, WY

Bernadine Craft
Wyoming House of Representatives
District 17
Rock Springs, Wyoming

Floyd Esquibel
Wyoming Senate
District 8
Cheyenne, Wyoming

Joyce Corcoran
Rock Springs City Council
Rock Springs, WY

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Laramie City Council
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Bruce Christensen
Former Mayor
Glenwood Springs, CO

Frosty Merriott
Carbondale Town Council
Carbondale, CO

John Hoffmann
Carbondale Town Council
Carbondale, CO

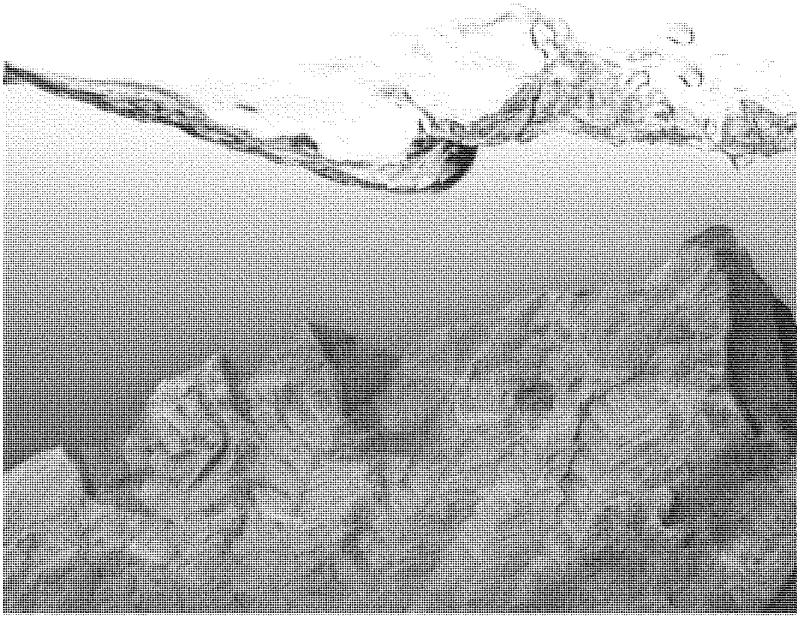
Allyn Harvey
Carbondale Town Council
Carbondale, CO

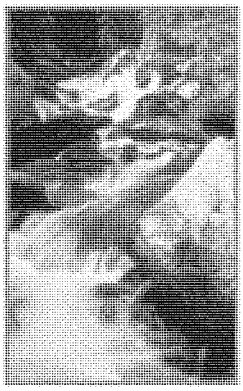
Gerry Horak
Fort Collins City Council
Fort Collins, CO

WATER ON THE ROCKS

Oil Shale Water Rights in Colorado

WESTERN RESOURCE ADVOCATES





This report was written by Lawrence J. MacDonnell with invaluable assistance from David M. Abelson. The introduction was written by Karin P. Sheldon. The project was funded by grants from the William and Flora Hewlett Foundation and the Aspen Skiing Company Environment Foundation.

Dan Luecke contributed the sections on the Upper Colorado River Endangered Fishes Recovery Program and the Colorado River Compact. Robert Harris researched the decrees for the conditional water rights. Steve Styler generated the many tables. Geneva Mixon developed the maps. The report also benefited from the expert review of Chase Huntley, Amy Mall, Bart Miller, Peter Roessmann, Anita Schwartz, and Barney White.

About Western Resource Advocates
Western Resource Advocates is a nonprofit environmental law and policy organization dedicated to protecting the West's land, air, and water.

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WATER ON THE ROCKS: *Oil Shale Water Rights in Colorado*

Foreword: Why This Water and Oil Shale Analysis Matter iii
Executive Summary xiii
Introduction 1
Water for Oil Shale Development 5
Water Rights for Oil Shale 7
A. Conditional Water Rights 7
B. Agricultural Water Rights 8
A Closer Look at Water Rights for Oil Shale 16
A. Colorado River Basin 16
1. Chevron Texaco 16
2. Colorado River Water Conservation District 19
3. Exxon Mobil Corporation 19
4. The Oil Shale Corporation 21
5. OXY USA 21
6. Shell Texaco 22
7. Union Oil Company of California 23
B. White River Basin 26
1. Colorado River Water Conservation District 26
2. Exxon Mobil Corporation 27
3. Shell Frontier 30
4. The Oil Shale Corporation 30
5. Yellow Jacket Water Conservancy District 32
Key Implications of and Limitations on Water Development for Oil Shale 33
A. Oil Shale and Existing Water Uses 33
B. Oil Shale and the Colorado River Compact 35
C. Oil Shale and the Upper Colorado River Recovery Program 36
1. Colorado River 37
2. White River 38
Conclusion 39
Appendix A: Chronological Development of Conditional Water Rights for Oil Shale Development 40
A. Development in the Colorado River Basin 40
B. Development in the White River Basin 43
Appendix B: Conditional Water Rights for Oil Shale Development 46
Appendix C: Irrigation Ditches Purchased by Energy Companies 55
Appendix D: Colorado River -- Absolute Wells and Springs 62
Appendix E: Comparing Selected Oil Shale and Non-Oil Shale Conditional Rights in the Colorado Basin 65
Glossary of Water Terms 71
End Notes 75

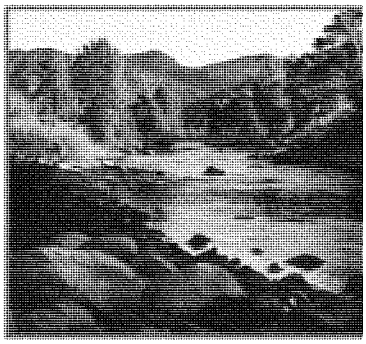
FOREWORD

WHY THIS WATER AND OIL SHALE ANALYSIS MATTERS

KARIN P. SHELDON
Executive Director
Western Resource Advocates

Since the early 1900s, the dream of tapping vast oil shale reserves has drawn energy companies to western Colorado. That dream has proven elusive, for while small quantities of oil have been released after heating shale, commercial production technology remains undeveloped. Past development attempts have failed because of a number of technical, economic, and environmental challenges that have yet to be overcome, despite the billions of dollars invested by both government and industry.

Some members of Congress and a few oil companies suggest the oil shale puzzle may soon be solved. Should this prove to be the case, western Colorado will witness, as Colorado Governor Bill Ritter cautions, "the largest industrial development in the State's history — with enormous implications for all of Northwest Colorado and for the State itself."[1] Oil shale development would bring significant change in western economies, communities, and ways of life. One of the most significant aspects of such change would be in the use of water.



Oil shale development would have tremendous impacts on current and future uses of water — Colorado's most precious natural resource. Water is the lifeblood of the West. It's the foundation of western economies and communities, the basis of political divisions, and often the cause of conflict. Battles over water often pit Front Range cities, such as Denver and Colorado Springs, against West Slope communities, such as Rifle and Grand Junction. Renewed efforts to develop a commercial oil shale industry could once again fan the flames that fuel such battles.

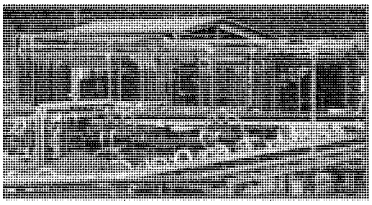
Initial analyses by the RAND Corporation and the U.S. Departments of Energy and the Interior conclude that significant amounts of water will be required to both extract oil from shale and power the extraction processes. Large quantities of water will also be needed to support major infrastructure development and the influx of new workers. It would be folly to discount the crucial link between oil shale development and water resources, ignoring the fact that the arid Rocky Mountain Region is defined by the scarcity of water. Westerners understand this link — and our leaders understand the vital importance of examining potential oil shale development within the context of increasing competition for dwindling water supplies.

It is undisputed that oil shale development will stress limited water resources. The question for elected officials and other community leaders are how, when, where, and to what extent. In a May 2008 letter to Congress, Hamlet J. "Chips" Barry III, manager of the Denver Water Board, stated that "development of oil shale in Colorado could significantly affect the [Front Range Water Users] Council's ability to serve existing customers and the future growth projected for the Front Range of Colorado."[2] That conclusion is significant. What is unclear, however, are the specific impacts on Colorado water and the timing of such impacts.

In order to more fully understand the conflict Barry identifies, Western Resources Advocates (WRA) engaged Larry MacDonnell to investigate the extent of water rights in Colorado held by oil companies, individuals, and water providers that could be used for oil shale development. Entitled "Water on the Rocks: Oil Shale Water Rights in Colorado," this report frames critically important issues vital to the future of Colorado and the West.

BACKGROUND AND KEY FINDINGS

In a 2008 environmental analysis covering oil shale development, the Department of the Interior's Bureau of Land Management (BLM) concluded that oil shale development would likely transform communities in western Colorado from agricultural-based to industrial economies. While noting the likelihood of this fundamental shift, the BLM largely ignored the potentially staggering ramifications.



For northwest Colorado, the fundamental change the BLM forecasts is troubling. Several analyses have already kicked off the public debate. Recently, the Associated Governments of Northwest Colorado teamed with the Colorado Department of Local Affairs to evaluate the socioeconomic impacts of energy development in a four-county region. Their report, which was issued in February 2008, projects a $1.3 billion shortfall in the monies local governments will need to support critical infrastructure upgrades required by oil and natural gas development and oil shale development.

Another study, commissioned by water providers in northwestern Colorado, estimates the growth in water demand needed to support increased extraction and production of energy in four sectors in northwest Colorado, including natural gas, coal, uranium, and oil shale.[3] That report concludes water demands for oil shale could be as much as 378,000 acre-feet per year, an amount that is approximately 25% more than the city of Denver uses annually.[4]

This report fills in another critical piece of the puzzle. It identifies water rights held by energy companies and water providers that could support oil shale development. The report:

- Projects water requirements associated with oil shale development.
- Identifies all major water rights currently owned by energy companies that could be used for oil shale development in Colorado, as well as conditional rights that could be exercised in the future.
- Analyzes legal and hydrological issues of the Colorado River Basin affecting future development of Colorado's allocation under the 1922 Colorado River Compact and subsequent 1948 Upper Basin Compact.
- Explains how the Upper Colorado River Endangered Fish Recovery Program affects and limits additional consumptive uses of water in the mainstem Colorado River.

To illustrate the scope and potential impacts of building new water reservoirs and pipelines, plus shifting existing agricultural rights to oil shale, Geneva Mixon, a Colorado-based cartographer, mapped these rights.

The report's key findings include the following:

1. Energy companies and water supply districts have established conditional water rights associated with more than 200 separate structures (e.g., reservoirs and pipelines) in the Colorado River and White River Basins that potentially could be developed to support oil shale production. Most of these conditional rights were established in the 1950s and 1960s.
2. Collectively, with these rights, energy companies have the right to divert annually more than 10,000 cubic feet per second (cfs) — or 7.24 million acre-feet (af) — of water and store more than 1.7 million af, enough storage to meet the annual needs of 8-10 million Colorado residents.
3. Energy companies have acquired rights in more than 100 existing irrigation ditches in the Colorado River and White River Basins. The flow associated with these rights total 650 cfs. Diverting scarce water for oil shale and other energy development would likely eliminate much of the existing irrigated agriculture in northwest Colorado.
4. The Upper Colorado River Endangered Fish Recovery Program and 1922 Colorado River Compact limit the amount of water Colorado has available for development. As the state edges closer to these limitations, large-scale oil shale and other development projects become mutually exclusive.
5. Large-scale oil shale development would affect existing uses established under more junior water rights, either by curtailment and/or through decreased water availability. Because of potential limits imposed by the 1922 Colorado River Compact, rights junior to 1922 but senior to the oil shale rights could become subject to a call if oil shale resulted in an over-development of Colorado's compact entitlement. A call would potentially limit other planned water development projects, which propose to rely on water from Colorado's West Slope. Those development projects include plans to transfer additional water to Colorado's Front Range cities.

WRA'S CONCLUSIONS FROM THIS REPORT AND OTHER ANALYSES

This report frames a vitally important issue — the nature and extent of water rights that could support oil shale development. By design, however, the report generally does not examine broader issues of the nexus of oil shale and water, and the potential impacts on local economies, the environment, and other water users. Nor does it address the critical issue of climate change and the potential impacts on water availability.

The report's findings are all the more significant when viewed in the larger socioeconomic context of oil shale development. By synthesizing this report and other analyses of potential energy development in Colorado, Utah, and Wyoming, WRA has reached the five conclusions described below on important questions facing the region.

Conclusion #1: ***Commercial oil shale development would transform western Colorado communities.***

> "Water is likely to be transferred from traditional agricultural uses to industrial uses, resulting in the loss of traditional irrigated agriculture. Changes may also result in an increase in dryland agriculture and livestock grazing on lands. It may also result in a transition from traditional agriculture based economy to a more urban and industrial."
>
> — Bureau of Land Management, 2008

> "If oil shale development proceeds, the oil shale industry has the potential to expand very rapidly — very likely overwhelming the capacity of local governments to deal with growth requirements."
>
> — Associated Governments of Northwest Colorado, 2008

First, as this "Water on the Rocks" report makes clear, water for oil shale will partially come at the expense of agricultural use. The vast majority of the agricultural water rights held by oil companies are in Rio Blanco County, an area of the state where the local economy depends heavily on existing agriculture. Many of these water rights, which date back to the late 1800s and early 1900s, are owned by oil companies and are now being leased back to ranches. So, for now, most of the water still remains in irrigation.

However, as this report cautions — and as the BLM notes through its environmental analyses — should commercial oil shale development take off, oil companies would transfer water currently used for agriculture to oil shale production. Thousands of acres historically irrigated would be taken out of agriculture, resulting in a dramatic transformation of land use and associated water uses in the region from an agricultural to an industrial landscape. As witnessed in the Arkansas Basin in Colorado, once a critical mass of farmers (or, in the case of the Piceance Basin, ranchers) sell their lands and associated water rights, it is hard for the agriculture community to sustain itself. The infrastructure that supported the local economy — suppliers, producers, and landowners — shifts to a new economy, and with it the impetus and ability to sustain an agriculture economy. Such changes signal a marked difference in the socioeconomic fabric of agricultural-based communities — the transformation the BLM forecasts.

Anticipated changes in populations necessary to support large-scale industrial development add to the changing uses of water. With rapid industrialization comes the ripple effect of increased populations and related infrastructure needs. The amount of water associated with changing demographics is significant. According to a recent report prepared for the Colorado, Yampa, and White River Basin Roundtables Energy Subcommittee, full-scale oil shale production (which the BLM estimates could occur from 2036-2050) will require an additional 21,100 af of water to accommodate municipal use resulting from the additional 100,000 workers and their families who will move to the area.[7]

Estimated Oil Shale Water Demands

Source of Water Demand	Annual Quantity (af)
Direct demand (1.55 million barrels per day)	112,675
Electric power	244,535
Increased population	21,100
Total	**378,310**

A second impact resulting from oil shale development that requires careful examination is the development of senior conditional water rights. While these rights have not yet been exercised, they have priority dates that are senior to many developed water rights on which Colorado's economy depends today. As MacDonnell discovered through his extensive research of the hundreds of conditional water rights held by energy companies, many of these rights date back to the 1950s. Once oil companies begin using these rights for oil shale development, other users whose rights are junior to oil shale rights could see use of their rights curtailed. This report provides some key examples of development scenarios that show the extent of such displacements.

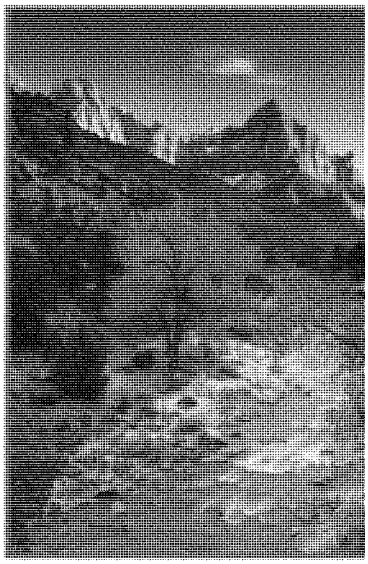
One example is ski towns in western Colorado. Many of Colorado's premier destination resorts were developed in the 1950s and 1960s, the same period that oil companies were establishing initial water rights for oil shale. Once sleepy towns in the Colorado River Basin, these commu-

nities now sustain substantial year-round populations, recreation, and numerous second homes. As this report notes, much of the water used to serve these communities depends on rights that are junior to oil shale rights. These towns are a core component of a diversified economy that could, along with agriculture, be undermined by oil shale development. Impacts would not be limited to existing uses, as oil shale development would likewise threaten future municipal, recreational, and other development projects on Colorado's West Slope.

Conclusion #2: ***Oil shale development in western Colorado would affect Colorado's Front Range communities and must be thoroughly evaluated and understood.***

> "The prospects of oil shale proceeding to full-scale development and the prospects of developing water for Front Range growth are mutually exclusive so there has to be a balancing act."
>
> — Colorado River Water Conservation District, 2008

Front Range water providers, such as the Denver Water Board and the Northern Colorado Water Conservancy District, agree with the Colorado River Water Conservation District on one key conclusion — oil shale development will stress and/or compromise future water projects as well as existing projects that are subject to calls from senior in-basin rights and compact curtailment throughout Colorado.



Denver Water and other Front Range water providers divert several hundred thousand acre-feet of water annually out of the Colorado River Basin. Much of this water is senior to conditional water rights established for oil shale development and thus is less likely affected by such development. However, oil shale could trigger a compact call that could lead to curtailment of any post-1922 water uses. Because of increasing needs on Colorado's Front Range, plans are in place to boost water deliveries to Denver and other cities by enlarging existing transbasin diversions and developing new projects. For some of these new projects, water utilities would rely on a combination of both older, pre-oil shale rights and newer junior rights.

For instance, Denver Water's Williams Fork project holds a conditional water right for the Darling Creek Enlargement that is junior to a collection of conditional rights for oil shale. Similarly, the refill right for Williams Fork Reservoir is junior to oil shale conditional rights held by oil companies, as is the proposed Straight Creek Collection System for Roberts Tunnel. Under Colorado water law, senior rights must be fulfilled prior to junior rights. During dry years, junior rights may only be partially met, if at all.

Similarly, the Northern Colorado Water Conservancy District's Windy Gap Reservoir has a 1967 priority date. While this project currently only diverts small amounts of water from the Colorado River Basin, water providers have encountered difficulties in diverting water because their rights are relatively junior. Efforts are underway to "firm" the yield from this project by improving the delivery and reliability of the existing supply with an additional Front Range reservoir. However, substantial development of senior rights for oil shale development would make this task much harder to achieve.

To some outside of the West, these conflicts may appear minor in relation to the need to increase domestic oil production. To those of us in this arid region, how such conflicts are resolved bears directly on Colorado's economic prosperity, future growth, and environmental protection.

Conclusion #3: ***Oil shale will accelerate climate change and will further stress water availability.***

> "Production of unconventional fuels (oil shale, coal to liquids, heavy oil) produces more CO_2 than is produced when using conventional petroleum."
>
> — U.S. Department of Energy, 2007

Photo courtesy of Pershing County

Climate change exacerbates and potentially eclipses all other foreseeable stresses on the environment in the region. In February 2007, the Intergovernmental Panel on Climate Change (IPCC) declared: "Warming of the climate system is unequivocal…" and "Most of the observed increase in global average temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic GHG [greenhouse gas] concentrations."[10]

Oil shale development poses serious climate threats. Producing oil from shale will likely result in the generation of huge quantities of greenhouse gas emissions. Transportation fuels derived from oil shale will be highly energy-intensive and have a carbon footprint greater than both conventional fuels and cleaner fuel alternatives.

Throughout the western United States, climate change is projected to further reduce water availability. In general, these transformations will result from changes in temperature, precipitation, and evapotranspiration. The challenge facing allocation and use of western water is determining the impacts in future years on water availability as temperatures rise and supplies decrease. While the specific impacts are hard to predict, scientists of all disciplines are sounding the alarm. Here is what we do know:

1. The West is getting hotter.
   In a recent, comprehensive assessment, researchers found that 46 out of 49 global circulation model simulations project a more arid southwestern U.S. in future years, with droughts becoming the norm.[11] Climate models project Colorado's average temperature will warm 1.5 to 3.5°F by 2025, relative to the 1950-1999 baseline, and 2.5 to 5.5°F by 2050.[12]

2. The West is getting drier.
   In the arid and semi-arid West, global warming is already having serious consequences for the region's scarce water supplies. As with much of the West, Colorado has a snowfall-dependent water system, deriving 70% of its water supply from snowmelt. Recent hydrologic studies of the Upper Colorado River Basin project multi-model average decreases in runoff ranging from 6% to 20% by 2050 compared to the 20th century average.[13] Relative to the 1950-2000 baseline, evaporation is projected to exceed precipitation by 1.24 inches in the period 2021-2040.[14] This difference compares to that of the Dust Bowl years.[15]

3. Droughts will increase.
   As global warming continues, the IPCC predicts more intense and longer droughts, as characterized by the severe drought that began in the western United States in 1999 and continues today. Moreover, whereas past droughts have been caused by natural variability in ocean and atmospheric circulation (e.g., La Niña events), climatologists predict future drying will be caused by an overall warming. Normal climatic variability will further stimulate additional, increasingly severe, droughts.

4. Streamflows will change.
   Throughout the 20th century, much of the United States has experienced higher streamflow and precipitation, with a corresponding decrease in the duration and severity of drought. The notable exception is the West and Southwest. With drought comes a trend toward reduced mountain snowpack and earlier spring snowmelt runoff, both of which affect water availability and quantity.[16]

5. Ecosystems will be disrupted and wildlife will be affected.
   The IPCC also concluded that recent warming is already strongly affecting ecosystems and wildlife. Glaciers are melting and forests across the West have suffered as warming has extended the range of some damaging insects, such as the mountain pine beetle. Warming is also disrupting the natural timing of seasons and leading to loss of wildlife, including diminished fishing and hunting opportunities in the West.[17]

Importantly, federal officials project oil shale production would not reach full capacity before 2050, the same time that climatologists believe runoff in the Colorado River Basin will have dropped by 6-20% over 20th century levels. The convergence of events would further stress water availability, compounding the challenges and conflicts MacDonnell identifies, including constraints associated with the Upper Colorado River Endangered Fish Recovery Program and allocations under the 1922 Colorado River Compact.

Conclusion #4: ***Water needs must be quantified and supply sources identified before committing to commercial oil shale leasing.***

> "We need to be thoughtful about our approach, especially in light of the long
> [illegible] of such development. In fact, if the Department of the Interior were to
> authorize a commercial oil shale industry in Colorado, the development would
> [illegible] the largest industrial development in the State's history — with enor-
> mous implications for all of Northwest Colorado and for the State itself."
>
> — Colorado Governor Bill Ritter, Jr., 2008

Future municipal development, power production, instream flows for federally endangered fish, and other types of energy development are expected to rely on water from the Colorado River. However, as a result of anticipated changes in climate, population, and changing land uses both within and outside the Colorado River Basin, the margin of uncertainty regarding water availability is troubling.

Estimates of water needed to directly support oil shale development also vary by 400%. According to the RAND Corporation, 1 to 3 barrels of water would be needed for construction, operation, and production for every barrel of oil produced via in-situ methods;[19] 2.6 to 4 barrels of water would be needed for every barrel of oil produced via retort.[20] When electricity demand is added, these estimates jump to 5 barrels of water for every barrel of oil produced. Water used for refining (called "upgrading") further increases the water demands. These margins are significant, especially when the BLM estimates peg potential oil shale development at 2 million barrels per day.

Bruce Lytle, a hydrologist who has evaluated water needs associated with oil shale development, underscores the significance of this margin of uncertainty. He points out that the BLM's analysis of water needed is deficient, noting the BLM's analysis:

- Does not adequately evaluate site-specific water supplies in river basins where oil development may occur.
- Fails to assess impacts from oil shale development in forcing the retirement of agricultural water rights and the dry-up of agricultural lands.
- Does not sufficiently address water rights issues related to hydraulic interconnection of aquifers, permanent changes to surface and groundwater systems, water quality, and mitigation of impacts related to either surface or groundwater supply development.

These conclusions present important warnings to policy makers, especially when coupled with the "Water on the Rocks" report's findings regarding (a) likely elimination of most of the existing irrigated agriculture in northwestern Colorado, (b) constraints associated with the Upper Colorado River Endangered Fish Recovery Program and obligations under the 1922 Colorado River Compact, and (c) impacts on junior water rights throughout Colorado.

These facts are the reason, we believe, why Denver Water and other water providers warned Congress that oil shale development could significantly affect their "ability to serve existing customers and the future growth projected for the Front Range of Colorado."[21]

As long as there is ample water to appropriate, there is little need or incentive for parties to collaborate. That was the case during the failed oil shale development program of the early 1980s, when water was a secondary concern. Since that time, Colorado has experienced a population explosion, which has increased competition for water and decreased water availability.

As Colorado begins to push up against Colorado River Compact allocations and endangered fish recovery goals and agreements, it is vital that stakeholders collaborate to address competing needs. Planning must be integrated to ensure development is consistent with other projects. As a first step in this process, companies seeking to develop oil shale must quantify their water needs and identify supply sources. Without such information, regional planning cannot be accomplished — and regional planning is increasingly necessary as supplies become further stressed.

Conclusion #5: ***Energy demands must be quantified and sources identified before committing to commercial oil shale leasing.***

> "In addition to the emissions associated with the operations themselves, extraction of oil from shale could require massive quantities of electricity. This would necessitate the building of new power plants, which could further contribute air emissions."[22]
>
> — Bureau of Land Management, 2008

> "We do not know the amount of energy that will be needed to produce shale oil, the sources or locations of necessary power plants, the impacts such energy production would have on regional air quality and visibility, or the greenhouse gas implications."[23]
>
> — Colorado Governor Bill Ritter, Jr., 2008

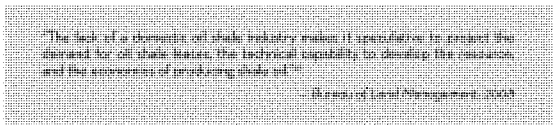
The BLM estimates that a 100,000-barrel-per-day (bpd) oil shale operation using in-situ conversion technology would likely require 1,200 megawatts (MW) of electricity. That amount of energy roughly equates to the amount needed to serve a city of 500,000. To produce one million barrels of shale oil per day would require 10 new power plants and 5 new coal mines.

In addition to the water required to extract the resource, water would also be needed to power the extraction process. Because oil shale technologies remain in their infancy, it is difficult to ascertain how much energy development would be required or the source of such energy.[34] Nevertheless, the Colorado River Water Conservation District estimates that the BLM's goal of full-scale oil shale development (2 million barrels per day) could require as much as 244,532,000 af of water to power oil shale development.[35] One of the critical policy issues Congress and federal officials must ask is whether the huge volumes of energy required to produce shale is an appropriate use of such power. A closely linked question is whether the associated water needs are an appropriate use of increasingly limited water supplies.

Water need projections for power generation are based on the BLM's assumptions that oil companies will use coal-fired power plants to power oil shale operations. In addition to the vast water requirements, these plants will be a major source of air pollution, which damages human health and the environment. They likewise will use dwindling water supplies and impact (and, in some cases, curtail) junior water users throughout the state.

Before diverting limited water supplies to support 20th century technologies, federal, state, and local leaders must engage in a robust public dialogue on broader energy policy — and must determine whether to promote old technologies or pursue new ones. WRA supports the latter and thus questions using limited water supplies to generate huge amounts of power for oil shale development.

WRA's final conclusion: Develop the information necessary to make informed decisions.



Oil shale development is fraught with uncertainty. While this report sheds light on the nexus between oil shale development and water, the unknowns are still paramount. The BLM acknowledges a 400% range of uncertainty for the amount of water needed to support oil shale development. Uncertainties regarding water availability and water requirements also include:

- Sequencing of development projects
- Rate of consumption
- Power generation needs
- Competition for shared resources
- Impacts of perfecting conditional water rights on junior users
- Impacts of climate change

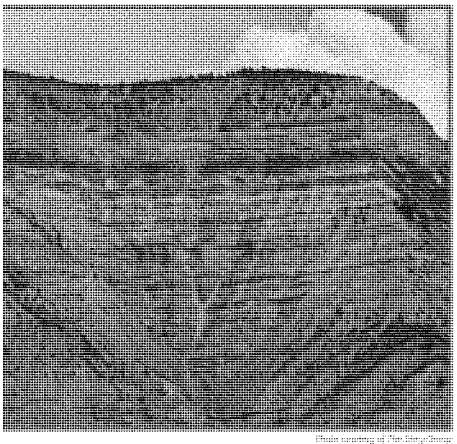


Photo courtesy of The Sierra Club

This report makes clear that the link between oil shale and water is complex. Whether changes faced by communities will be incremental or seismic is difficult to predict. Nevertheless, while the specific impacts are difficult to quantify, the BLM's prediction that western Colorado will transition from an agricultural society to an industrial society is well-grounded.

Before we rush headlong into a commercial leasing program, it is wise to remember Spanish philosopher George Santayana's counsel: "Those who cannot remember the past are condemned to repeat it." In May 1982, as world oil prices plummeted, Exxon Oil pulled out of its oil shale Colony Project in Parachute, Colorado, leaving 2,000 people without work. The promise of energy independence turned bust overnight. Government subsidies were not enough to save this faltering industry as the technological obstacles and many costs proved too powerful a force.

Governmental officials at the local, state, and federal level continue to warn policy makers in Washington, D.C. that the knowledge base is simply not there to make informed decisions. Colorado cannot afford to again compromise its strong and diversified economy, but that's what certain lawmakers are asking us to do. By gambling on oil shale and failing, the state could once again be driven into an economic and social recession.

WRA opposes development of oil shale resources in the West unless and until industry and government demonstrate that proven technologies can develop oil shale without unacceptable environmental, climate, economic, or social costs. The industry has barely begun to address that challenge.

One of the significant differences in Colorado today, when compared to 1982, is water availability. In 1982, water was a secondary concern. Now, because of a number of factors — including significant increases in population, an energy boom, and development of the state's recreational economy — water resources and related environmental values are increasingly stressed. Water is central to oil shale development — but it is also critical to Colorado's economic, social, and environmental foundation.

As the Obama Administration takes its seat in Washington, D.C., it is time for elected officials and administration officials at the federal, state, and local level to comprehensively review the federal government's oil shale policy. Front and center must be a hard look at the water requirements and the opportunities and constraints posed by large-scale commercial leasing.

This is a time of great challenge and opportunity in the West. The Colorado Plateau and neighboring Rocky Mountain states are changing dramatically. The Interior West is still a place of spectacular landscapes that support vital ecosystems, important wildlife habitat, and large areas of undeveloped land. But it is also a region characterized by accelerating growth. While the environmental challenges facing the region are huge, the opportunities to address and resolve them are huge as well. The public is increasingly aware of the need for new energy policies and practices, for careful management and conservation of water, and for stewardship of irreplaceable public land resources. Oil shale development runs counter to these needs.

EXECUTIVE SUMMARY

Colorado's oil shale deposits are once again the focus of potential development, intensifying the need to quantify the potential impacts to already limited water supplies. Development would require the use of large quantities of water – perhaps as much as 3-4 barrels of water for each barrel of shale oil for direct use, plus additional water for indirect demands, such as electricity generation and an increased population. Given the magnitude of development the U.S. Department of the Interior's Bureau of Land Management (BLM) projects is one-day feasible, as much as 378,000 acre-feet of water could be required annually to support oil shale development, more than the Denver Metro area uses each year.

The possible development and use of substantial water for oil shale production raise important considerations for Colorado because of their potential to adversely affect some existing water uses and many expected future water uses. Companies with an interest in oil shale development own enormous portfolios of water rights. While there is great uncertainty with respect to the manner in which these rights will be developed and used, the consequences of such development are unquestionable.

Among the many likely changes in the use of Colorado water resulting from oil shale development are changes in existing irrigated agriculture, limitations on existing and planned water development for the Front Range and the West Slope, and likely limitations on other water development for new uses on the West Slope. While these general impacts are relatively easy to project, it is harder to identify the exact development scenarios and the resulting impacts on a given water right or a specific project.

This report helps frame these and other issues central to the many technical and policy questions posed by oil shale development. The report:

- Projects water requirements associated with oil shale development.
- Identifies all major water rights currently owned by energy companies that could be used for oil shale development in Colorado, as well as conditional rights that could be exercised in the future. Rights are grouped by basin, source, point of diversion, and diversion amount.
- Analyzes legal and hydrological issues of the Colorado River Basin that affect future development of Colorado's allocation under the 1922 Colorado River Compact and subsequent 1948 Upper Basin Compact.
- Explains how the Upper Colorado River Endangered Fish Recovery Program affects and limits additional consumptive uses of water in the mainstem Colorado River.

In order to meet the significant water demands associated with oil shale development, oil companies as well as water supply districts have secured hundreds o f water rights through western Colorado. They have established conditional water associated with more than 200 separate proposed structures, such as reservoirs and pipelines in the Colorado and White River Basins, which could potentially be developed in support of oil shale production. Many of these rights

were established in the 1950s and 1960s, and collectively would enable the direct diversion of more than 10,000 cubic feet per second (cfs) of water and the storage of more than 1.7 million acre-feet (af). In addition, energy companies have acquired full or partial ownership of more than 100 existing irrigation ditches with decreed rights to divert more than 650 cfs in the two basins in proximity to the shale deposits.

ExxonMobil owns the most rights: 49 conditional claims and ownership in 48 irrigation ditches. Most of its rights are located in the White River Basin. Shell holds 31 conditional rights in the two basins and has purchased ownership in 5 irrigation ditches. It is now in the process of securing rights on the Yampa River. Chevron holds 28 conditional rights and ownership in 24 irrigation ditches, all located in the Colorado River Basin. Its Unocal subsidiary owns absolute rights to another 48 wells and springs, as well as ownership in 13 ditches in this basin. OXY USA holds conditional rights for 22 proposed structures in the Colorado River Basin. Tosco holds 17 conditional rights and ownership in 14 ditches in the White River Basin. The Colorado River Water Conservation District holds conditional claims to store over 900,000 af of water at locations in the two basins that could serve oil shale development.

In addition to quantifying water rights, the report raises a number of important issues that could disrupt traditional uses of water in Colorado:

1. **Impacts on agriculture:** Energy companies own large portions of the water rights historically used to irrigate lands in the region. Many of these rights date back to the late 1800s and early 1900s. As pre-Colorado River Compact rights, these diversions would not be affected by a call placed against the Upper Basin states. Additionally, most of the associated water still remains in irrigation use as energy companies lease back the water to ranchers. Should oil shale development move beyond the research phase, many, if not all, of these rights would be changed in use, and the lands historically irrigated would be taken out of agriculture. The result would be a dramatic transformation of land and water uses in these areas.

2. **Impacts on junior users:** A second and less obvious outcome of oil shale development would be the displacement of some existing uses by new oil-shale-related uses with senior priorities. Conditional water rights for oil shale development date back to the 1950s. Should these rights be placed into use, they would be senior to all existing uses from the same source of water with subsequent priority dates, thereby affecting rights used both in western Colorado and in Colorado's Front Range. Development would also affect some existing uses established under more junior water rights and would potentially limit much other planned water development from sources on Colorado's West Slope — including plans to take additional water to the Front Range.

3. **Restrictions under the 1922 Colorado River Compact:** An important uncertainty facing future water development in western Colorado is the legal availability of water for development under the 1922 Colorado River Compact and associated laws and requirements. Water development could be constrained by obligations under the compact, as increased consumption would also increase the risk of "call" by the Lower Colorado Basin states against the Upper Basin.

4. **Impacts on endangered fish:** The ultimate extent of new water development is also subject to constraints associated with the Upper Colorado River Endangered Fish Recovery Program. At issue is the continued survival of four species of fish found only in this basin. The U.S. Fish and Wildlife Service has determined that additional depletions of the Colorado River Basin's water would jeopardize the continued existence of these species and any new water development —whether for oil shale or otherwise — must satisfy substantial program requirements intended to protect and recover them.

LETTER FROM DENVER BOARD OF WATER COMMISSIONERS TO SUBCOMMITTEE ON INTERIOR, ENVIRONMENT, AND RELATED AGENCIES, COMMITTEE ON APPROPRIATIONS

Denver Board of Water Commissioners

Thomas A. Gougeon, President
Penfield W. Tate, III, 1st Vice President
George B. Beardsley
John R. Lucero
Susan D. Daggett

Hamlet J. Barry, III, Manager

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chips.barry@denverwater.org
www.denverwater.org

May 14, 2008

Honorable Norman D. Dicks, Chairman
Honorable Todd Tiahrt, Ranking Member
Subcommittee on Interior, Environment, and Related Agencies
Committee on Appropriations
B 308 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Dicks and Ranking Member Tiahrt:

The Front Range Water Users Council (Council) – consisting of Denver Water, Northern Colorado Water Conservancy District, Colorado Springs Utilities, Aurora Water, Board of Water Works of Pueblo, Southeastern Colorado Water Conservancy District, and Twin Lakes Reservoir and Canal Company – formally requests Congress extend Section 433 of the Consolidated Appropriations Act of 2008 which prohibits the Department of the Interior from issuing oil shale and tar sands leasing regulations. This moratorium is slated to expire at the end of the current fiscal year.

The Council members are the largest water suppliers of municipal, commercial, industrial and agricultural water needs in the state of Colorado. Approximately one half of the population receives water from Council members.

As stated in our March 20, 2008, comments on the Bureau of Land Management's (BLM) programmatic environmental impact statement for oil shale and tar sands development, the Council believes the BLM's analysis raises significant questions that must be fully addressed before anyone can assess the full range of impacts of oil shale development. While oil shale would be developed in western Colorado, because of the enormous amount of water needed to process shale and the associated energy needs, the impacts would be felt statewide. We are concerned, as we expressed in our comments to the BLM, that the "development of oil shale in Colorado could significantly affect the Council's ability to serve existing customers and the future growth projected for the Front Range of Colorado."

The research leases Congress authorized in the Energy Policy Act of 2005 are designed to provide meaningful data necessary to make informed decisions. Those leases are ongoing, but as the BLM and industry acknowledge, it will be years before new technologies are developed and we will know whether commercial development is possible. Before adopting leasing regulations, federal and state officials must first understand critical issues such as process performance, infrastructure demands

(especially, water, power, processing facilities, and pipelines), and options for protecting and water quality. Without this data informed decisions cannot be made.

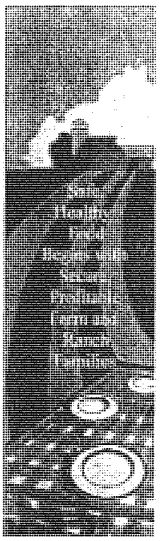
Accordingly, committing to leasing regulations prior to a full and complete evaluation of the results from these research leases puts the cart before the horse. We ask that order be restored to the process and that the moratorium be maintained until such time that all involved can assess the impacts of oil shale development.

Sincerely,

H.J. Barry
Manager - on behalf of the Denver Board of Water Commissioners

cc: Governor Bill Ritter
Senator Wayne Allard
Senator Ken Salazar
Representative Diana DeGette
Representative Mark Udall
Representative John Salazar
Representative Marilyn Musgrave
Honorable Doug Lamborn
Honorable Tom Tancredo
Honorable Ed Perlmutter

LETTER FROM ROCKY MOUNTAIN FARMERS UNION TO SUBCOMMITTEE ON INTERIOR, ENVIRONMENT, AND RELATED AGENCIES, COMMITTEE ON APPROPRIATIONS



May 14, 2008

Honorable Diane Feinstein, Chairman
Honorable Wayne Allard, Ranking Member
Subcommittee on Interior, Environment, and Related Agencies
Committee on Appropriations
SD 131 Dirksen Senate Office Building
Washington, DC 20510

Dear Chairman Feinstein and Ranking Member Allard,

Rocky Mountain Farmers Union requests that Congress extend Section 433 of the Consolidated Appropriations Act of 2008 which prohibits the Department of the Interior from issuing oil shale and tar sands leasing regulations. This moratorium is slated to expire at the end of the current fiscal year, and we feel it is appropriate to extend this moratorium for the reasons listed below.

Water users on both sides of the Continental Divide use the water resources of the Western Slope, from agricultural producers to recreational and municipal users. Instead of playing a game of chance with Colorado's most precious natural resource, Congress should authorize oil shale leases only when comprehensive data from research leases are properly analyzed.

The issues before us are complex. We must fully understand the possible demands on statewide infrastructure from water needs to energy consumption to transportation demands before leasing regulations are adopted. Rocky Mountain Farmers Union is opposed to the leasing of commercial oil lease resources before the full effectiveness of and impacts from research and development are fully known. Please do not play games with Colorado's precious water resources.

Sincerely,

Kent Peppler
President

C: Governor Bill Ritter
Senator Ken Salazar
Representative Diana DeGette
Representative Mark Udall
Representative John Salazar
Representative Marilyn Musgrave
Honorable Doug Lamborn
Honorable Tom Tancredo
Honorable Ed Perlmutter

ROCKY MOUNTAIN FARMERS UNION

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THE WILDERNESS SOCIETY

Oil Shale Fact Sheet

Private Shale Resources Are Undeveloped

- **Though proponents of oil shale development claim the need for an expedited federal oil shale leasing program, the Department of Energy's Office of Naval Petroleum and Oil Shale Reserves has estimated that *more than three million acres* of oil shale lands in Colorado, Utah, and Wyoming are already in private hands and have been for decades.**[1]

- **Several large companies alone control over 200,000 acres of oil shale lands, but none to date has engaged in commercial-scale development.** For instance, the following companies already control extensive oil shale resources but have not yet established technologies to develop them:
  - **ExxonMobil** owns 50,000 acres of oil shale lands in Colorado's Rio Blanco and Garfield counties alone[2];
  - **Red Leaf Resources** controls oil shale leases of about 16,500 acres on Utah state lands[3];
  - **Great Western Energy, LLC** owns or controls oil shale leases on 16,500 acres of state lands in Uintah County, Utah[4];
  - **Millennium Synfuels, LLC** controls approximately 34,000 acres of oil shale leases in Utah[5];
  - **Shell** owns 36,000 acres of oil shale lands in Rio Blanco and Garfield counties Colorado[6];
  - The **Oil Shale Exploration Company** controls over 45,000 acres of oil shale lands in Colorado[7].

- **Several of these companies are also engaged in research and development on federal land controlled by the Bureau of Land Management.** BLM leased six 160-acre tracts of federal lands for the expressed purpose of facilitating technologies to overcome the significant obstacles to efficient and sustainable oil shale development. Shell holds 3 of these leases (480 acres total), all in Colorado. EGL Resources and Chevron each also hold a lease in Colorado. OSEC holds the only federal research lease in Utah.

---

[1] *National Strategic Unconventional Resource Model*, U.S. Department of Energy Office of Naval Petroleum and Oil Shale Reserves, April 2006, p. 6.
[2] *Secure Fuels from Domestic Resources: The Continuing Evolution of America's Oil Shale and Tar Sands Industries.* U.S. Department of Energy, 2007, p. 33
[3] Ibid., p. 61
[4] Ibid., p. 70
[5] Ibid., p. 47
[6] *Mahogany Research Project – Doing Oil Shale the Right Way*, Royal Dutch Shell, (company brochure), www.shell.com/us/mahogany/
[7] *OSEC's Privately Held Land*, The Oil Shale Exploration Company (company brochure), http://www.oilshaleexplorationcompany.com/default.asp

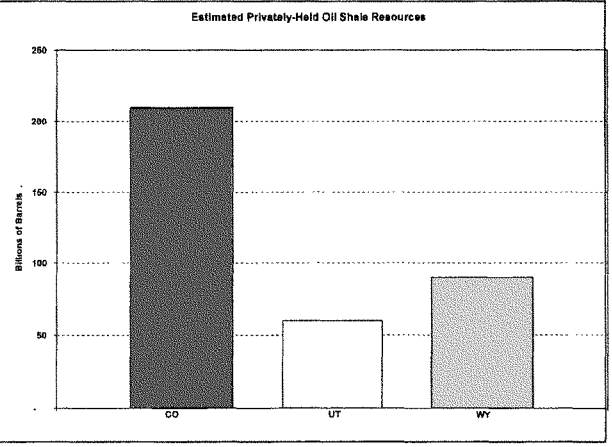
For more information: Dave Alberswerth, TWS, 202-429-2695 Chase Huntley, TWS, 202-429-7431

When coupled with the federal research and development leases currently held by private companies, industry has ample resources already at their disposal to begin developing a commercial-scale industry without the need for large scale commercial leasing of the public lands.

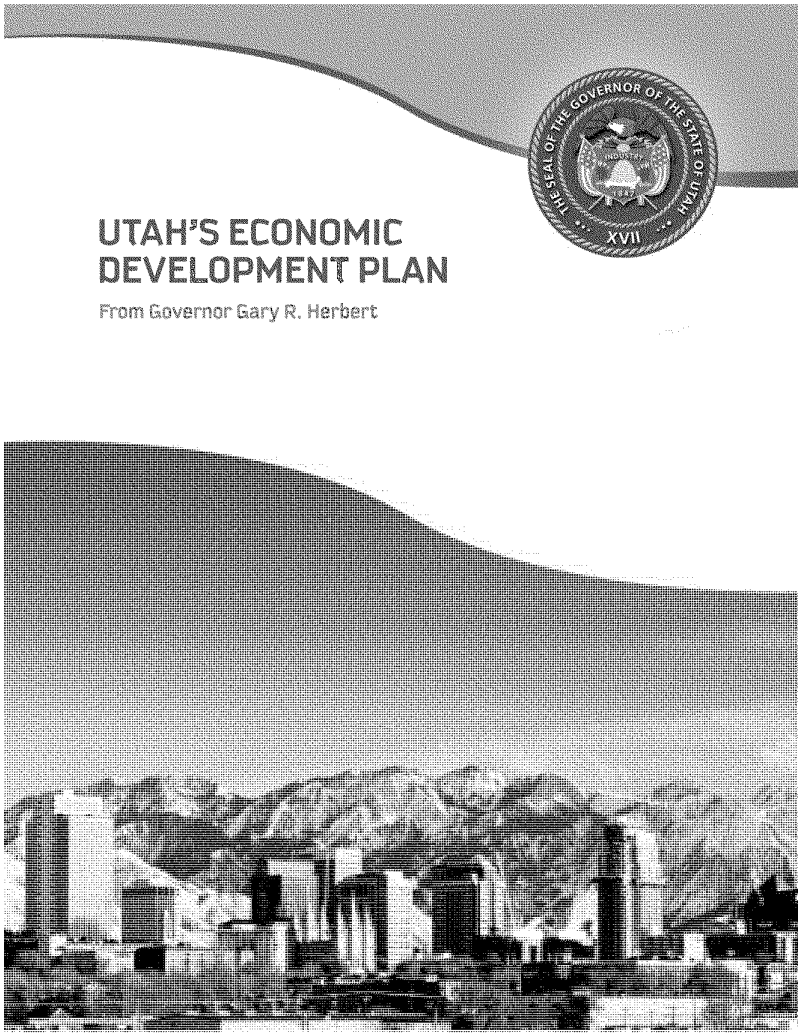
Department of Energy Overview of U.S. Oil Shale Resource (2006)

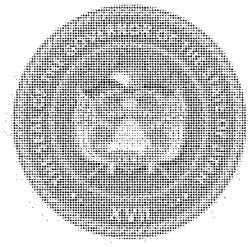
State	Ownership	Minimum thickness (feet)	Yield (gal/ton)	Average Yield	Acreage (thousands)	Resources (billion bbls)
CO	F	-	<10	5	570	-
	F	15	15-25	20	300	600
	F	10	>25	30	600	390
	NF	-	<10	5	165	-
	NF	15	15-25	20	80	130
	NF	10	>25	30	170	80
Subtotal					1,885	1,200
UT	F	-	<10	5	2,130	-
	F	15	15-25	20	1,070	150
	F	10	>25	30	600	70
	NF	-	<10	5	640	-
	NF	15	15-25	20	320	40
	NF	10	>25	30	170	20
Subtotal					4,930	280
WY	F	-	<10	5	1,500	-
	F	15	15-25	20	700	150
	F	10	>25	30	400	20
	NF	-	<10	5	890	-
	NF	15	15-25	20	440	80
	NF	10	>25	30	260	10
Subtotal					4,190	260
Totals	F				7,870	1,480
	NF				3,135	360
					11,005	1,840

Notes
F = federal NF = non-federal



Source: Adapted from data found in *National Strategic Unconventional Resource Model*, U.S. Department of Energy Office of Naval Petroleum and Oil Shale Reserves, April 2006, page 6.


THE SEAL OF THE GOVERNOR OF THE STATE OF UTAH
INDUSTRY
XVII
UTAH'S ECONOMIC
DEVELOPMENT PLAN
From Governor Gary R. Herbert



FALL 2010

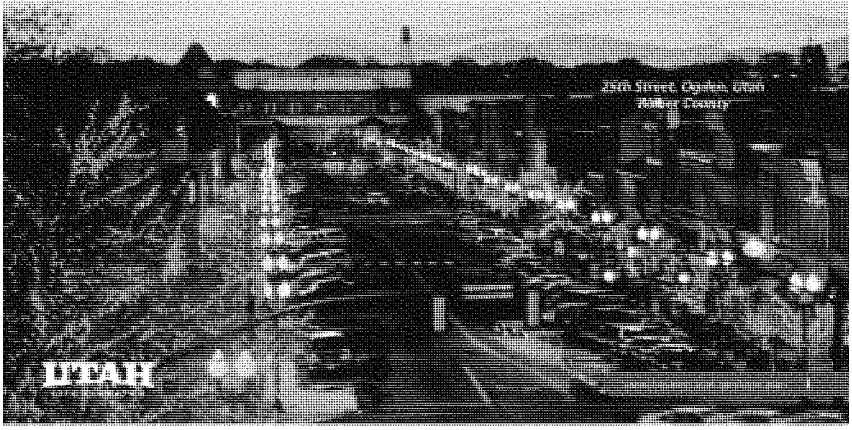
TABLE OF CONTENTS

Governor's Introduction 2
- Vision 3
- Mission 3
- What Others are Saying 4
- Results Are In 5
- Not by Chance or Coincidence 6
- Not Resting on Our Laurels 7

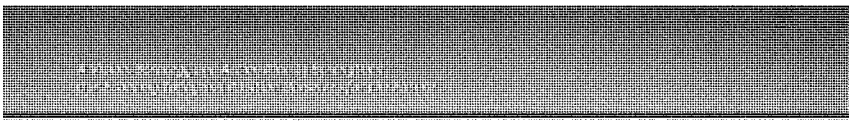
Objectives
- Strengthen and Grow Existing Utah Businesses, both Urban and Rural 11
- Increase Innovation, Entrepreneurship, and Investment 13
- Increase National and International Business 15
- Prioritize Education to Develop the Workforce of the Future 17
- The Bottom Line 18

Appendix A
- Governor Herbert's 4-Point Plan Successes 19

Appendix B
- Progress Report on the 2014 Economic Development Plan 20



25th Street, Ogden, Utah
Weber County



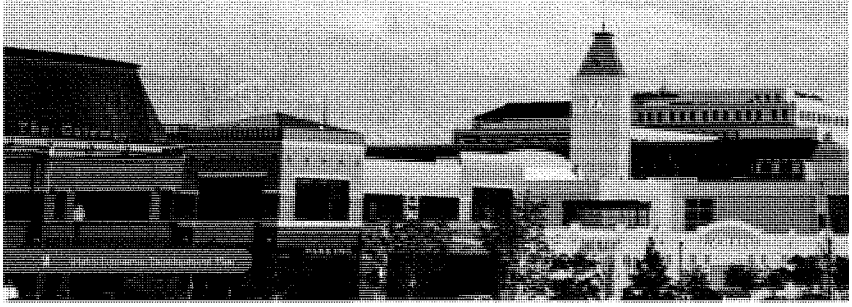
UTAH'S ECONOMIC DEVELOPMENT PLAN

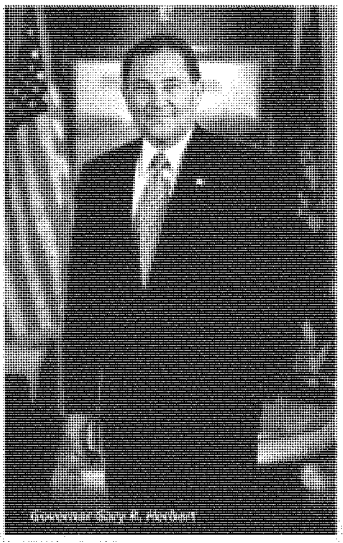
by Governor Gary R. Herbert

As a life-long Utahn, it is no surprise that I believe our State is the best place to live, work and raise a family. As a former executive for a small business and the husband of a small business owner, I recognize our unique opportunities and challenges. Throughout my business career, as a County Commissioner, Lieutenant Governor and now as Governor, I have traveled extensively around the State. During those travels, I have been repeatedly reminded of the many reasons each of us chooses to live in Utah, and I am also reminded of the reasons why Utah is praised by those outside of our State. This praise is because we work to our unique strengths, we are humble enough to recognize and overcome our challenges, we are innovative and we exude an optimistic attitude of success.

While we have received accolades for weathering the current economic storm, we must stay focused on continual improvement. This economic development plan outlines specific objectives and activities that will lead to accomplishing our goals. Some of the action items are a continuation and improvement of what we have done well and other action items are new and necessary adjustments designed to keep Utah a leader in job creation and economic prosperity.

Realizing this *vision* and accomplishing this *mission* will take the collective efforts of all Utahns or, as I like to say, "Team Utah." What I commit to you, as Governor of our great State, is to never forget that I work for you and I will do so tirelessly to strengthen Utah companies, bring more business to the State, support our unequaled quality of life and ensure the world knows that Utah is a great place to do business. What I ask of you is your commitment to continued hard work, entrepreneurial spirit, and innovation. Economic development is everyone's job – public and private, business and government, rural and urban, small business and large. I also need your input. This plan builds on what we have accomplished over the past five years and, more specifically, upon the framework that I introduced just over a year ago when I became Governor (Appendix A). Over the past five years I have had conversations with business people throughout the State and together, we have identified areas of importance that will help us continue to plant the seeds of the future. I look forward to discussing this plan with you as I continue to travel throughout the State.





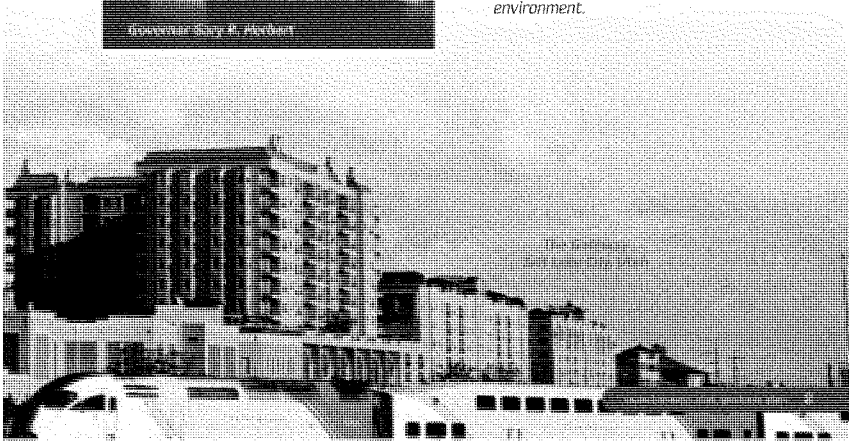
Governor Gary R. Herbert

MY VISION FOR OUR STATE:

Utah will lead the nation as the best performing economy and be recognized as a premier global business destination.

OUR MISSION STATEMENT FOR MAKING THIS VISION A REALITY:

Utah will excel in job creation, innovation, entrepreneurship, global business, and quality workforce and have a stable and sustainable business friendly environment.



WHAT OTHERS ARE SAYING ABOUT UTAH...

As Utahns we recognize all that our State has to offer and "singing our own praises" comes naturally. Of course, it's always great when someone else is doing the singing for you. Our State has received many accolades. Take a look at the list below and I think you'll find one that resonates for you.

Utah #1
"Most Dynamic Economy"
Kaufmann Foundation 2009

Utah #1
"Most Fiscally Fit State"
Forbes Magazine 2010

Utah #1
"Best States to Live"
Gallup Healthways 2010

Utah #1
"Expected Economic Recovery"
and "Economic Outlook"
American Legislative Exchange Council 2010

Utah #1
"Technology Concentration and Dynamism"
Milken Institute 2009

Utah #1
"Volunteerism"
Corporation of National and Community Service

University of Utah #1
for number of research produced business start-ups
The Association of University Technology Managers 2010

Brigham Young University #1
for the number of startups, licenses, and patent applications per research dollar spent
Association of University Technology Managers 2010.

Utah #2
"Top Pro-Business State"
Pollina Corporate 2010

Utah #2
"Best Education Climate"
Business Facilities Magazine 2010

Provo #2
"Fastest Growing Market in America"
midsize metro area
Portfolio.com 2010

Utah #3
"Best State for Business"
Forbes Magazine 2009

Utah #3
"Most Competitive States" for Business
Beacon Hill Institute 2010

SLC #5
"Best Cities for the Next Decade"
Kiplinger 2010

Utah #8
"Top States for Business"
CNBC 2010

Utah #8
"Best Transportation Infrastructure"
Business Facilities Magazine 2010

Utah #9
"States that will create the most jobs annually through 2015"
IHS Global Insight

Utah #10
"State Business Tax Climate"
The Tax Foundation 2010

Cache County #10, Utah County #11, & Davis County #18
"Best Areas for Finding a Job"
Money Magazine 2010

THE RESULTS ARE IN...

Through the good times and the tough times, Utah has been recognized year after year as having one of the strongest economies in the country. Despite the current economic challenges we are facing both globally and at home, the fundamentals of the Utah economy remain solid and provide the foundation for our recovery. Some of these fundamentals include:

- Utah's world exports have increased 45% year over year since June 2009 and Utah was the only state to increase exports in 2009.
- The Zions Bank Small Business Index, which measures conditions from a 100 point baseline for small businesses around the State, was 106.9 as of July 2010 up from 103.4 in May 2010.
- Utah is one of eight states with a AAA bond rating as of April 2010.
- Utah's unemployment rate is 7.4%, well below the national average of 9.6%.
- Utah companies competed for and won a record-setting $500 million in government/military contracts, equating to 10,000 jobs created or retained.
- Utah's employment forecast shows that by 2011, construction will be the fastest growing sector with a 4.2% growth rate, followed by professional and business services with a 2.67% gain, and a 2.38% increase in manufacturing.

NOT BY CHANCE OR COINCIDENCE...

I am thrilled, but not surprised, that Utah has been recognized by the world as a premier business destination. As Utahns, we have long understood what makes our home a wonderful place, and now the world is beginning to understand as well. We have not found ourselves on top of this mountain by accident – it took hard work and innovation. The path was charted in 2004, when Jon Huntsman and I joined forces to run for Governor and Lt. Governor of Utah. The Huntsman - Herbert campaign was based on a vision to make Utah's economy the best in the nation. With the help of key business leaders around the State, we detailed a 10-point plan (Appendix B) for economic revitalization in Utah.

The objective of the original 10 point plan was to implement policies and initiatives that would make Utah an attractive place to invest and do business. This plan has served as a roadmap for success, and with your help we have made progress on each of the 10 points. For example, we have recruited some of the most recognized businesses in the world. Companies like Adobe, Procter and Gamble, Sephora, eBay, Oracle, Disney, and Goldman Sachs have recently announced projects in Utah. Additionally, local Utah companies like Petersen Inc., Nelson Laboratories, and Macy continue to expand.

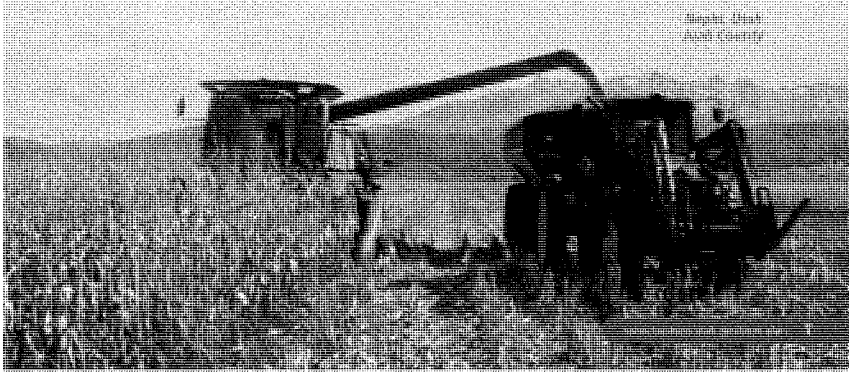
People and companies recognize Utah's economic strength and they want to know the secret of our success. Just recently I was selected by my fellow governors to serve as Chairman of the Economic Develop-

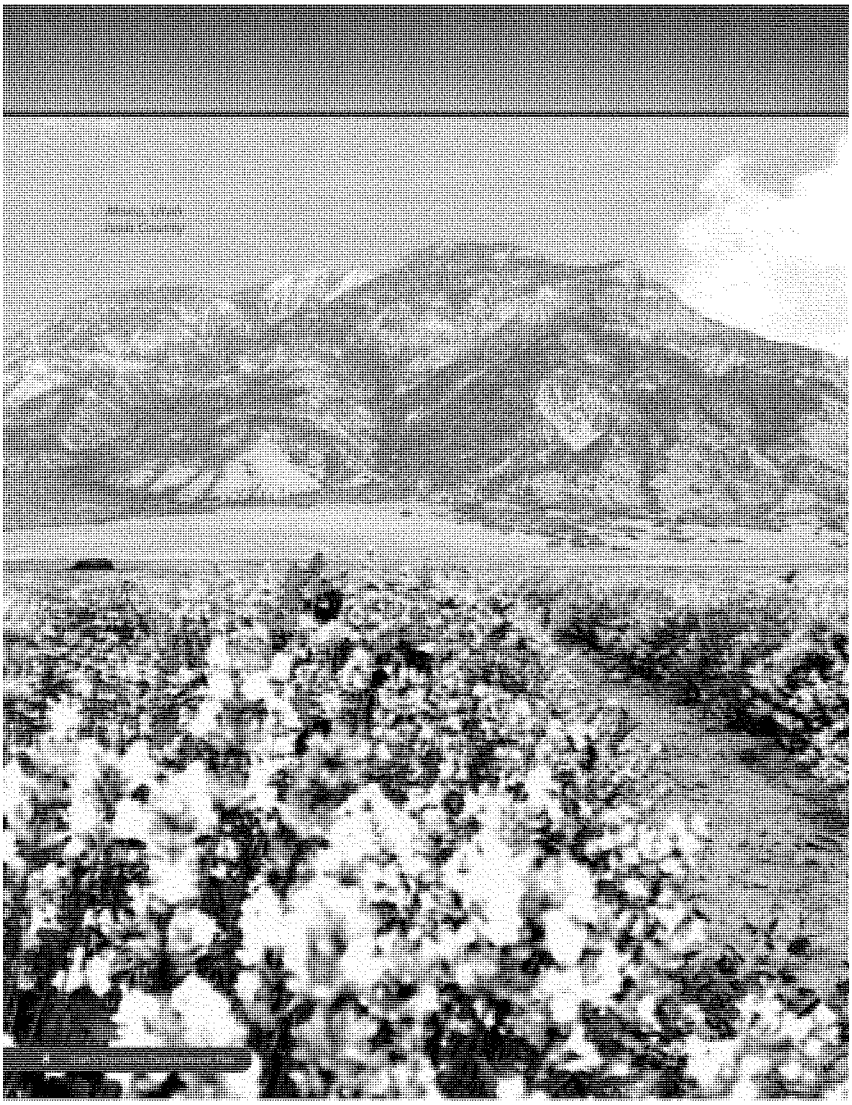
ment and Commerce Committee for the National Governors Association. I am humbled by this opportunity to share with the rest of the country Utah's best practices for economic success and survival.

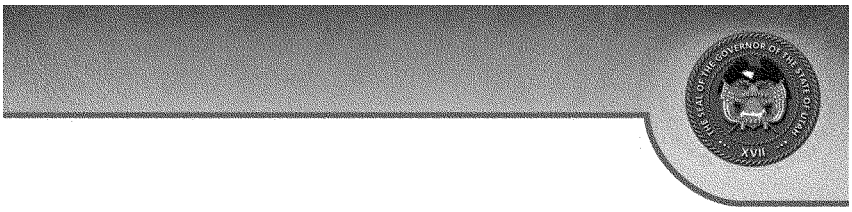
One of the most important "ingredients" of our success is collaboration and leveraging of public and private sector resources. This collaboration is evident in the "unprecedented partnerships" between state and local elected officials, community and business leaders, as well as organizations such as Chambers of Commerce, the Utah Science Technology and Research (USTAR), World Trade Center of Utah, Utah Technology Council, Economic Development Corporation of Utah, Utah Fund of Funds, Utah Sports Commission, Utah Alliance, and countless other entities that work together for the advancement of our State.

NOT RESTING ON OUR LAURELS...

The economic development plan that we developed is working. Our vision for Utah is coming into focus, but there is still more to be done. We must be willing to learn, we must adapt to a changing environment, and we must work harder than ever to accomplish our shared goals. The following objectives and action items will take us to the next level as we emerge from this historic economic downturn faster, stronger, and better-positioned to succeed. I will make sure that each member of my administration does their part to accomplish these objectives and action items. I have tasked the Governor's Office of Economic Development (GOED) to work with each member of my cabinet to fully implement this plan across all areas of State Government.

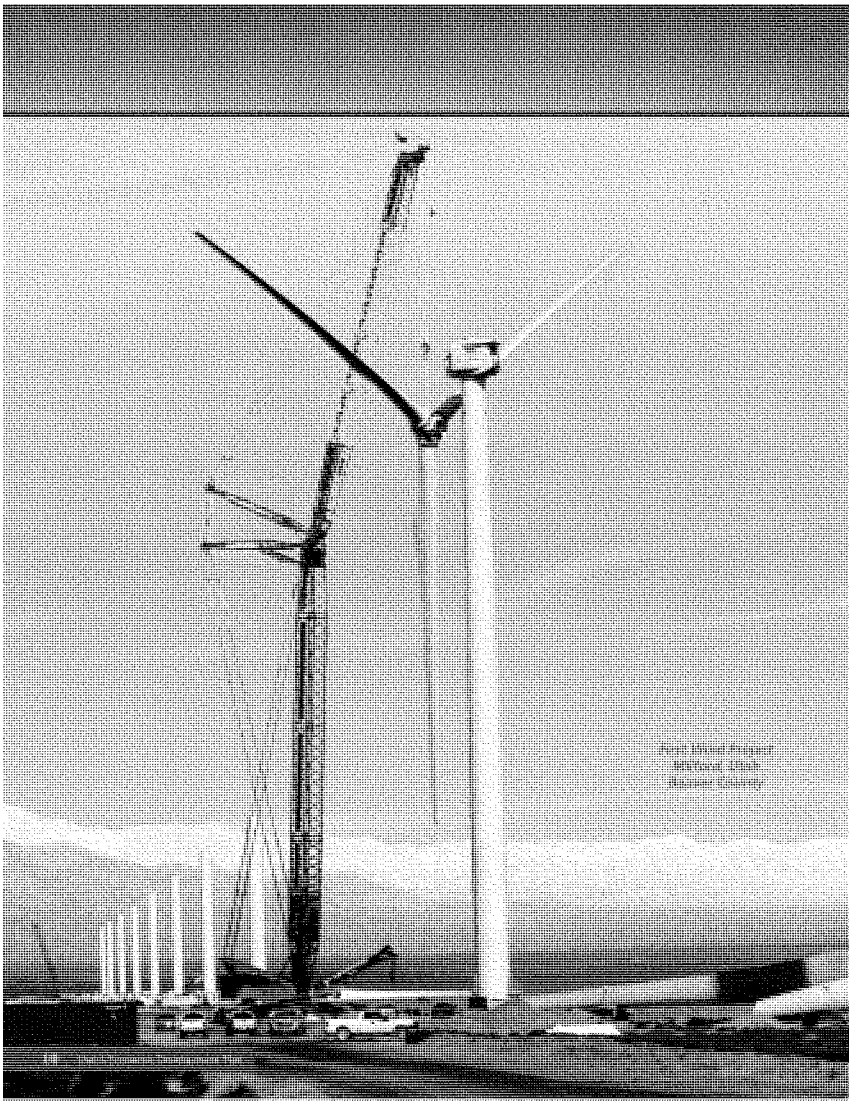






GOVERNOR GARY R. HERBERT'S FOUR OBJECTIVES

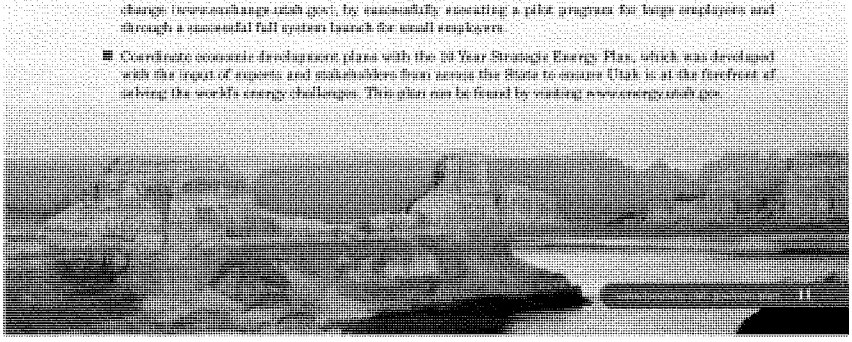
1. Strengthen and Grow Existing Utah Businesses, Both Urban and Rural
2. Increase Innovation, Entrepreneurship & Investment
3. Increase National and International Business
4. Prioritize Education to Develop the Workforce of the Future

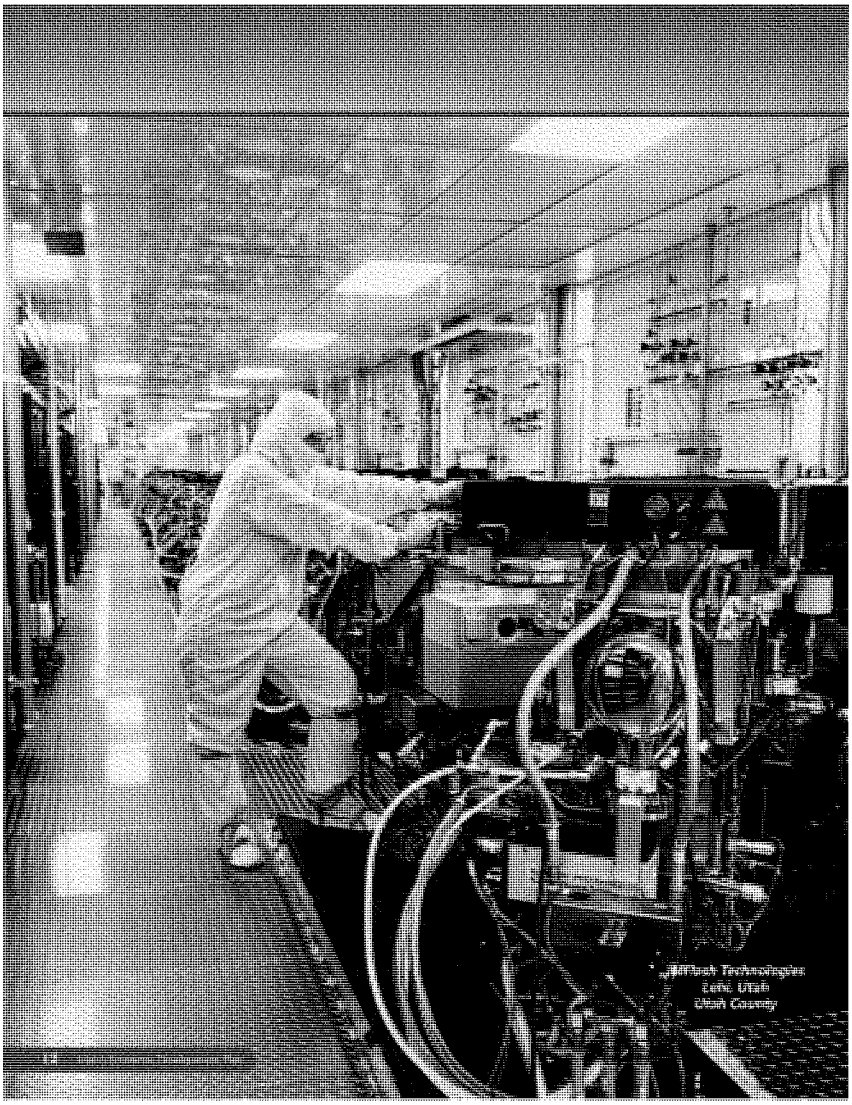


OBJECTIVE ONE

Strengthen and Grow Existing Utah Businesses, Both Urban and Rural

- Strengthen relationships and identify areas of opportunities for economic development with municipalities, industry associations, and other economic development, tourism, and film partners.
- Convene quarterly meetings to coordinate goals and activities with economic development stakeholders including representatives from GOED, World Trade Center Utah, Utah Science Technology and Research initiative (USTAR), Economic Development Corporation of Utah (EDCUtah), Chambers of Commerce, and other trade associations, etc.
- Sustain growth in economic clusters to provide high paying jobs in strategic industries that demonstrate the best opportunity for future expansion.
  - Visit 100 premier Utah companies to identify opportunities for expansion.
  - Conduct targeted industry summits and roundtables with stakeholders and partners to discuss industry sector needs and opportunities.
- Support small businesses through programs such as the Procurement and Technical Assistance Center (PTAC), Business Resource Centers (BRCs), Rural Fast Track, Small Business Development Centers (SBDCs), and Business Expansion and Retention (BEAR).
- Increase business opportunities in rural Utah by identifying unserved and underserved high-speed Internet service areas and by developing a plan to extend broadband service statewide.
- Maintain Utah's status as the "Crossroads of the West" by continuing to fund vital transportation infrastructure projects including highway construction, the extension of FrontRunner Commuter Rail, and expansion at the Salt Lake City International Airport.
- Maintain access to high-quality health insurance at competitive costs through the Utah Health Exchange (www.exchange.utah.gov), by successfully executing a pilot program for large employers and through a successful full system launch for small employers.
- Coordinate economic development plans with the 10 Year Strategic Energy Plan, which was developed with the input of experts and stakeholders from across the State to ensure Utah is at the forefront of solving the world's energy challenges. This plan can be found by visiting www.energy.utah.gov.

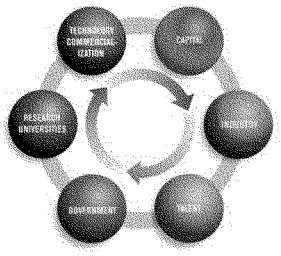



Provo, Utah
Utah County

OBJECTIVE TWO

Increase Innovation, Entrepreneurship & Investment

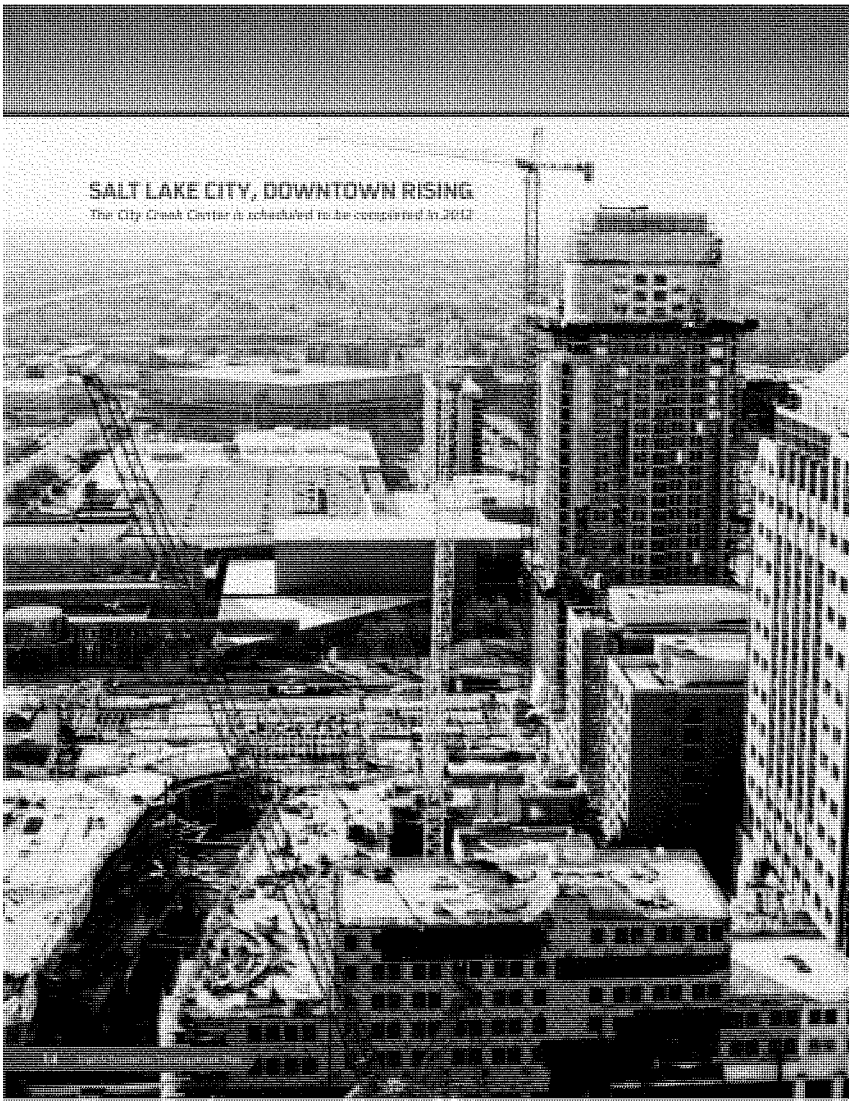
- Support early stage companies by working with the Utah State Legislature to ensure that the current tax and regulatory environment continues to encourage investment.
- Support and strengthen entrepreneurship and company growth through programs and partners such as Business Resource Centers, international export training, and rural outreach and mentoring.
- Expand Utah's capacity for technology-based economic development by opening a nationally recognized interdisciplinary bio-focused research development and commercialization center at Utah State University in 2010.
- Continue to foster high-powered research and commercialization collaborations by expanding the number of world-class innovators recruited to the University of Utah and Utah State University through Utah Science Technology and Research (USTAR) Initiative (www.innovationutah.com).
- Drive start-up business growth and foster more interaction between local companies, entrepreneurs, and regional higher education institutions by providing business services and project management through USTAR to Technology Commercialization Grant awardees.
- Train Utah's future entrepreneurs and innovators by connecting private industry with institutions of public and higher education through programs such as the Utah Cluster Acceleration Partnership (UCAP), Workforce Innovations in Regional Economic Development (WIRED), and the Utah College of Applied Technology (UCAT).
- Attract capital to the State and help introduce start-up companies to potential investors through the Utah Fund of Funds (an economic development program aimed at providing access of alternative and non-traditional capital to Utah entrepreneurs).



"Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers and associated institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition."

Michael S. Porter, "Clusters and the New Economics of Competition", Harvard Business Review

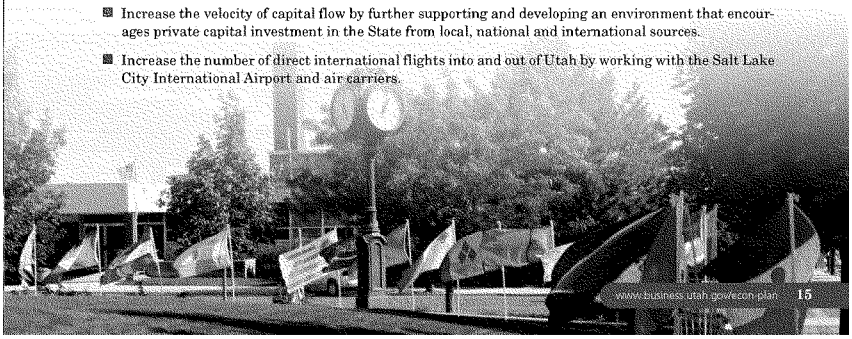
The key is to bring industry, talent, government, universities, technology and capital together around industry sectors that possess the greatest opportunity for success. Their collective excellence allows all companies within the cluster to grow and thrive, resulting in increases in the standard of living within a region.

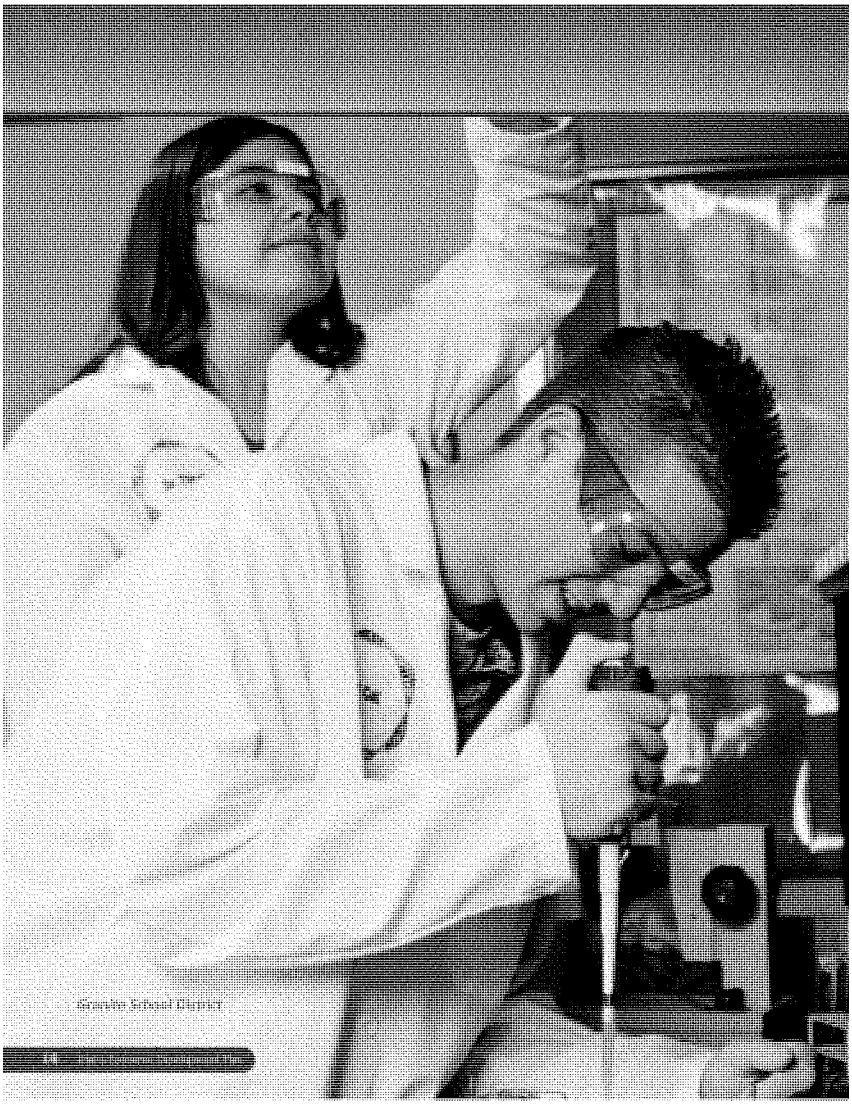

SALT LAKE CITY, DOWNTOWN RISING
The City Creek Center is scheduled to be completed in 2012

OBJECTIVE THREE

Increase National and International Business

- Double exports in the next five years and increase international business and tourism by mentoring and training Utah companies to compete globally, facilitating trade missions and trade shows, and strengthening international and diplomatic relationships.
- Promote Utah's image through targeted business, tourism, and film marketing and public relations efforts.
  - Build critical mass within each of the State's strategic industrial clusters by promoting the vibrancy and strength of Utah's business environment and recruiting targeted businesses.
  - Develop a Utah ambassador program made up of business organizations and individuals located inside and outside of the State in order to receive input and to improve the recruitment of targeted businesses and business leaders to Utah.
  - Establish a business-marketing and public relations committee to improve the State's effort in promoting Utah's many business friendly attributes and incentive programs.
  - Grow Utah's tourism industry and increase statewide visitation by continuing to promote Utah as a premier tourist destination (www.utah.travel).
  - Market Utah as the premier leisure and business travel destination by creating a customer service program through which all Utahns and tourism-related companies will promote the "Utah Life Elevated℠" brand.
  - Attract major motion pictures and television series to the State by using the Motion Picture Incentive Fund and continuing to promote Utah as a premier film location (www.film.utah.gov).
- Increase job creation and capital investment in the State by ensuring that Utah's incentive programs are competitive, sustainable, and used selectively.
- Increase the velocity of capital flow by further supporting and developing an environment that encourages private capital investment in the State from local, national and international sources.
- Increase the number of direct international flights into and out of Utah by working with the Salt Lake City International Airport and air carriers.





OBJECTIVE FOUR

Prioritize Education to Develop the Workforce of the Future

- Excite our students and champion our teachers to ensure that we prepare our students for the jobs of the future by coordinating economic development plans with the Excellence in Education Commission and providing input on the Commission's recommendations. (www.governor.utah.gov)
- Ensure that the curriculum taught in public education (K-12) is rigorous and aligned with workforce needs in order to prepare students for higher education and future Utah jobs.
- Connect higher education, industry and government to identify industry workforce needs and ensure plans are in place that will deliver a trained and ready workforce for the future. For example continuing the partnership between workforce development, economic development, and higher education to conduct Utah Cluster Acceleration Partnership (UCAP) projects.
- Support and promote jointly-funded technology incubators and encourage the creation of additional hands-on educational programs for K-12 and higher education students, such as BioInnovation Gateway (BiG) and the Workforce Innovations in Regional Economic Development (WIRED) initiatives.
- Ensure Utah remains a national leader in preparing students for the global economy by continuing support for the K-12 "dual immersion" language programs (currently over 7,000 students are enrolled in 40 different dual immersion programs).

THE BOTTOM LINE...

We have every reason to be optimistic about the future. Our State has faced challenges before and we have always come out stronger. While current challenges are unique, they also provide unique opportunities. Taking advantage of these opportunities will require maximizing our unprecedented partnerships throughout the State. I look forward to partnering with you to accomplish our goals and realize our vision:

Utah will lead the nation as the best performing economy and be recognized as a premier global business destination.

APPENDIX A

GOVERNOR HERBERT – 4-POINT PLAN SUCCESSES

Despite the recent economic challenges we have been experiencing, Utah has weathered the economic storm and we are on our way to economic recovery. This past year we were able to find efficiencies in state government in order to balance our state budget without raising taxes and holding public education harmless. We've seen an increase in the number of jobs available, maintained a AAA bond rating, and have an unemployment rate that is significantly below the national average. Last year I announced that my first and highest priority as governor will be the economy of Utah. I instructed the Governor's Office of Economic Development (GOED) to focus on four key objectives:

1. **Strengthen and grow existing Utah businesses, both urban and rural.**
2. **Increase innovation, entrepreneurship and investment.**
3. **Attract national and international business.**
4. **Prioritize education to develop the workforce of the future.**

While there is still much more work to be done, the following is a report on our progress in these four objectives over the past twelve months.

APPENDIX A

OBJECTIVE ONE

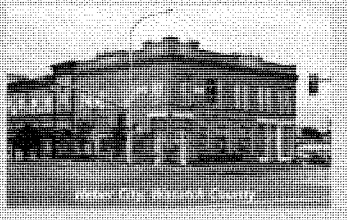
STRENGTHEN AND GROW EXISTING UTAH BUSINESSES, BOTH URBAN AND RURAL

- Maintained Utah's corporate business environment by not raising taxes.
- Our International Trade and Diplomacy Office (ITDO) assisted 400 Utah companies to do business internationally and trained 940 companies through 20 training and mentoring events.
- GOED approved 12 post-performance incentives to companies. These 12 projects are expected to result in:
  - 4,000 jobs created or retained
  - Over $477 million in capital investment
  - Over $1.5 billion in new state wages
  - Over $397 million in new state revenue
    - $300 million to the Education Fund
    - $97 million to the General Fund
- The Procurement Technical Assistance Center (PTAC) program worked with Utah clients to achieve record-breaking contract awards that resulted in $501 million and 10,000 jobs created or retained.
- PTAC hosted their fourth annual Procurement Symposium where over 350 businesses learned how to sell to the government and military.
- The United States Air Force selected Hill Air Force Base to maintain both the F-35 Joint Strike Fighter and the Predator unmanned aerial systems.
- The United States Army selected Dugway Proving Ground to conduct unmanned aerial systems operations. This project will create over 300 jobs.
- Utah received $450,000 in Bio National Scenic Byway grant awards for projects in rural areas of the State.
- The Utah Broadband Mapping, Analysis, and Planning Project (UBMAPP) was established to introduce a state-of-the-art interactive Web map of the broadband systems in the State and develop a comprehensive broadband plan.

OBJECTIVE TWO

INCREASE INNOVATION, ENTREPRENEURSHIP & INVESTMENT

- The Utah Fund of Funds conducted its annual Medical Device Symposium and the Annual Utah Fund of Funds Middle Market Symposium.
  - The Medical Device Symposium attracted world-class inventors, innovators, physicians, and students and had nearly double the attendance of the previous year.
- Continued to foster high-powered research and commercialization collaborations by expanding the number of world-class USTAR innovators recruited to the University of Utah and Utah State University from 25 to 31.
- USTAR Technology and Outreach teams completed projects with more than 150 companies and organizations, including assistance in market analysis, market entry, prototyping, and fundraising.
- Provided technology commercialization grants to 25 entrepreneurial opportunities with 15 of the 25 involving collaborations between industry and regional higher education institutions.
- Partnered with industry to conduct four "Concept to Company" contests that provided awards and services to 12 companies for their innovative business ideas.
- Over 50,000 students participated in one or more of the Workforce Innovation and Regional Economic Development (WIRED) initiative programs.



Annual Utah Fund of Funds Symposium

APPENDIX A

OBJECTIVE THREE

INCREASE NATIONAL AND INTERNATIONAL BUSINESS

- GOED and the Economic Development Corporation of Utah assisted 19 companies with relocating or expanding in Utah.
- GOED officially launched the West Coast Business Marketing Initiative aimed at branding the State of Utah as a premier business destination for companies interested in relocation or expansion.
- From January 2010 - June 2010, Utah exports increased 42% from the same period of the previous year. Utah was the only state in the nation that showed positive growth in exports from 2008-2009.
- The Utah Office of Tourism received the Travel and Tourism Research Association's (TTRA) J. Dennard Shelton Professional Marketing Award for the 2009 "Life Elevated" summer campaign.
- The 2010 Official Utah "Life Elevated" Scenic Calendar was honored with nine Gold Awards in the 2010 Regional and World Calendar Awards competition, hosted by the Calendar Marketing Association.
- For 2010, 47 German beer operators are featuring Utah with 330 specific Utah beer products listed in summer catalogues - up 7% from 2009.
- Traveler spending for 2009 is estimated to be at $6.2 billion, generating $720 million in state and local tax revenues (about $700 per Utah household).
- Visitation to Utah's National and State Parks increased in 2009. National Parks increased 2.9%, National Monuments and recreation areas increased 3.7%, State Parks increased 4.8%, and Welcome Centers increased 3.4%.
- Several luxury resorts opened in Utah in the past year, including Amangiri near Lake Powell, Best Western Bryce Canyon Grand, Waldorf Astoria Park City, and St. Regis Deer Crest Resort in Park City for a total of more than $500 million spent on construction and over 1,200 full and part-time peak season positions created.
- Construction spending will be approximately $1 billion with the opening of the Montage Deer Valley in December.
- The Utah Film Commission approved 16 film incentives which resulted in 1,083 jobs and $51 million in direct economic impact.

OBJECTIVE FOUR

PRIORITIZE EDUCATION TO DEVELOP THE WORKFORCE OF THE FUTURE

- Identified efficiencies in state government to balance the State's budget and hold public education funding harmless.
- Supported 22 high school technology programs, with research projects contracted from local life science companies, to ensure students have an opportunity to understand science and math in a relevant business manner.
- Successfully completed a Utah Cluster Acceleration Partnership (UCAP) project with the aerospace cluster resulting in strategic plans and career pathways for key aerospace sectors, and began UCAP projects for energy and digital media.
- Herbert Science Gateway (HSG) began operations as a life science workforce development and business incubator offering students from six school districts a hands-on experience with the science companies.
- Continued to leverage the Workforce Innovation and Regional Economic Development (WIRED) initiative focused on creating education programs that help provide a well-qualified workforce for the life science industry, including awarding 20 engineering scholarships to the Mathematics, Engineering, Science Achievement (MESA) program.

APPENDIX B

PROGRESS REPORT ON THE 2004 ECONOMIC DEVELOPMENT PLAN

1. **Revamp Utah's Tax Structure**
   - HB 74 (2004 Session) – Allows a taxpayer to subtract the applicable amount of business income in the form of income that increases the withholding of the sales factor.
   - HB 105 (2004 Session) – Reduced the sales tax on food.
   - HB 4001 (2004 Special Session) – Phase one of Individual Income Tax Reform.
   - SB 203 (2007 General Session)
     - SB 203 phase two income tax reform with limited credits.
     - $100 million in personal income tax reduction.
     - 1% phase-out of sales tax (1% across the board).
     - $40 million in food sales tax reduction.
     - $50 million in general sales tax cut.
     - $50 million in targeted special tax reductions.

2. **Improve the Competitive Environment for Small and Medium-Sized Companies**
   - Health Insurance Reform
     - Shifting our health system to a consumer-based system.
     - Development of a web-based Utah Health Exchange is a business portal that connects consumers to the information needed to make informed health insurance purchases.
   - The Procurement Technical Assistance Center (PTAC) assisted Utah companies in securing government contracts at several levels.

3. **Recruit Businesses to Our State**
   - Special Projects Adam, Elan, Edwards Life Sciences, Goldman Sachs.
   - Implemented the RDO Utah, a web-based tool that is GIS-based to enable site selection information to match the business needs, customized sites.
   - Established the Wasatch Business Marketing Initiative – a specific targeted plan designed to attract those companies in the West Coast that have an interest in expansion or relocation.

4. **Attract More Capital**
   - Successfully launched the Utah State Fund of Funds, a $200 million State of Utah pension fund-sponsored program aimed at providing Utah entrepreneurs access to alternative sources of venture capital.
   - Over 1,000 Utah companies have been supported either by funds provided or assistance. There are 80 Utah companies that have received capital from the Utah Fund of Funds, generating funds such as Adobe, Lagoon, and GOOD. Several ancillary deals have been done with firms outside the fund portfolio, the majority generated by the Fund such as Lockheed and Lagoon.

5. **Promote Growth in Target Industries**
   - Successfully launched the Utah Science Technology and Research (USTAR) program that provided capital investment for research facilities and hiring a research team for University of Utah and Utah State University. This program raises the confidence in our universities and their capabilities that contribute with an influx of new international research and talent.
   - Focused on emerging industry clusters in areas of new competitive edge such as life sciences, software development and information technology, aerospace and aviation, defense and homeland security, financial services, energy and natural

APPENDIX B

enterprise, and outdoor products. Growth zones within these sectors where particular attention is placed include advanced composites, nanomaterials, renewable energy, digital media, medical devices, natural products and dietary supplements, systems management and analytics and coding.

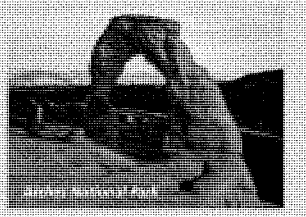
- The goal of the Economic Clusters Initiative is to make Utah a hyperconnective region in focused industries. The Economic Clusters Initiative is a catalyst to bring people, ideas, and resources to our greatest opportunities for success. This is done by taking proactive, research-driven steps to identify industry clusters and government-to-industry or industry-to-industry sectors that present the greatest competitive advantage. The end effect is that these focus areas allow to create higher paying jobs, strengthen education and raise the standard of living in Utah.
- Over 10,000 additional employees in target industries have been created since 2000 with clusters indicating average growth rates being 20% of the Utah average. The Life Sciences and the Software Development and Information Technology Clusters have demonstrated significant growth the past several years and continue to demonstrate Utah's strength in these sectors.
- Total wages in cluster industries grew by 40% since 2000, compared to a statewide total wage growth of 30%.

B. Enhance Utah's National and International Image

- Increase Utah's visibility and credibility with KBIs and government leaders from around the world.
- Implement creative and robust advertising, education, and public campaigns to promote the State domestically and internationally.
- Created comprehensive international marketing and public relations programs in the United Kingdom, Germany, France, and Japan, including production of international pieces in Spanish, English, German, French, Spanish, Italian, Japanese, and Chinese. International efforts have resulted in an average 6% Utah increase of guided and Utah tour packages from 2000 to 2006.
- Earned media value from international public relations efforts increased from $10 million in 2000 to $22 million in 2010, an increase of [illegible] percent.
- Research by Strategic Marketing & Research Inc. indicates a strong success with the theme branding and marketing efforts in demonstrably improved various images of Utah.
- Business Facilities Magazine, 2010, ranked Utah as the top [illegible] for the top [illegible] of [illegible] in the Business Facilities Site Rankings and "Annual Best Working Categories." Utah's history and about the most dramatic improvement of any state in the nation.
- For the second year in a row, one of the most widely respected business and economic studies in the country, Milken Institute's Best Cities, ranked Utah the 10 most business friendly state in the nation.

C. Capture Global Opportunities for Utah Companies

- Expand upon the "Silicon Slopes Global Cities" concept and model, which brings academia, government, and private industry together to develop a "one-stop shop" for entrepreneurs and businesses seeking assistance with international business.
- Implement a targeted strategy, primarily focused on East Asia, aimed at trade, culture, and educational partnerships in Canada, China, India and Mexico.
  - These are of the top [illegible] economies and Utah's top two trading partners (Canada, India, China).
  - Two countries (India) growing emerging markets (China, India).



APPENDIX B

- Quick Facts and Figures
  - Canada (Utah's #1 trading partner)
- 2005-2006 Exports increased by [illegible] million to [illegible]
  - China (Utah's #2 largest trading partner)
- 2005-2006 Exports increased by [illegible] million to [illegible]
  - India (Utah's #3 trading partner)
- 2005-2006 Exports increased by [illegible] million to [illegible]
  - Mexico (Utah's #4 trading partner)
- 2005-2006 Exports increased by [illegible] million to [illegible]

9. Economic Overview

- Utah is internationally recognized for such economic and social advantages that 2006 promises to increase the [illegible] as a consequence from the Utah Office of Business [illegible] advertising efforts.
- Approximately [illegible] million [illegible] million [illegible] for [illegible] and [illegible] from [illegible] of [illegible] in [illegible] from [illegible]
- Visitors to Utah significantly increased [illegible]
- [illegible]
  - Economic Boom Tax Cut [illegible] million, approx. [illegible]
  - The Manufacturing Equipment Boom Tax [illegible] million, approx. [illegible]
  - The top five [illegible] in the history of Utah [illegible] from [illegible] to [illegible]. Utah has experienced a record number of [illegible] exceeding [illegible] for [illegible] a [illegible].
  - State [illegible] in [illegible] [illegible] and [illegible] [illegible] up [illegible] from [illegible].

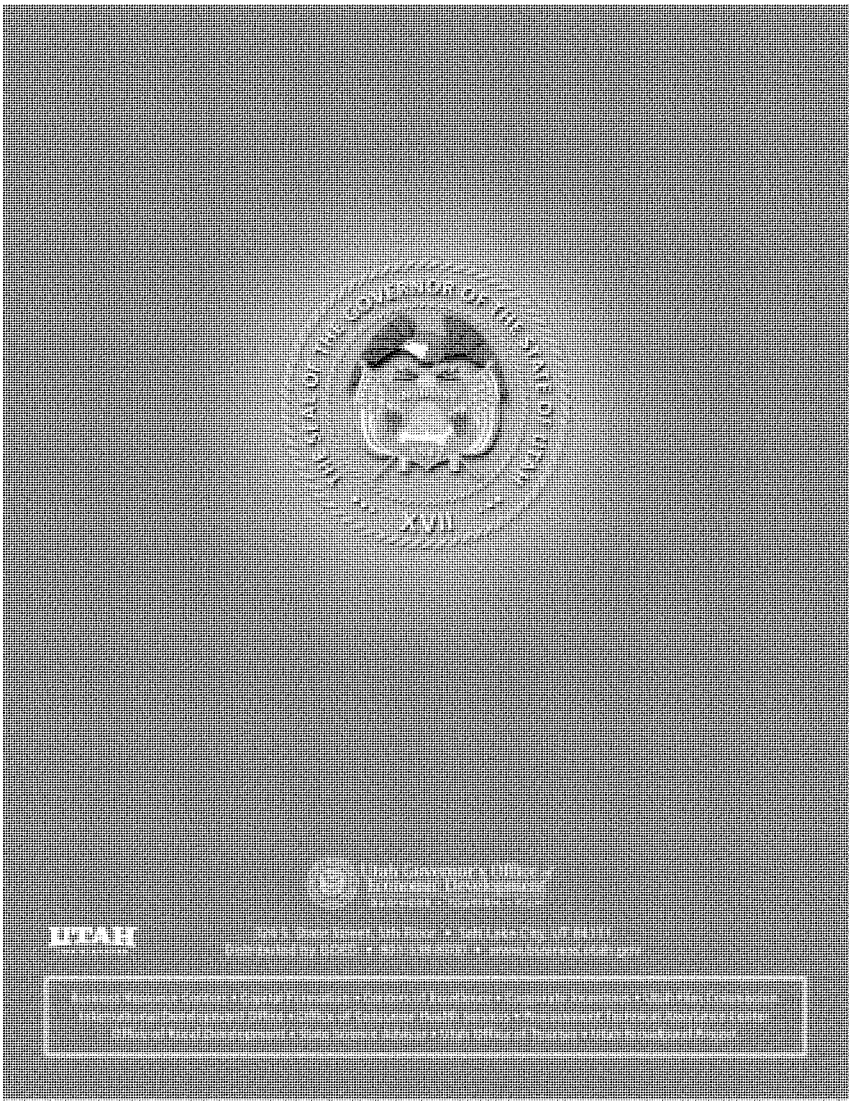
10. Strategies Economic Development in Rural Communities

- Implemented the Rural Fast Track (RFT) Program (RD [illegible]) which was [illegible] of the Industrial Assistance Fund to [illegible] in rural [illegible] to [illegible] companies to receive incentives for creating high paying jobs in the rural areas of the State and to further promote business and economic development in rural Utah. Since its [illegible] start, the RFT program has offered [illegible] and created [illegible] job incentives for rural Utah.
- Created the Rural Broadband Service Fund (RBSF), which is a [illegible] to be used for grants to providers for deploying broadband services to rural Utah areas. To date, [illegible] projects in [illegible] have extended high speed internet to approximately [illegible] potential subscribers.
- Implemented the Rural Development Grant (RDG) program as part of a significant update of the State's rural development strategy. Under the RDG program's [illegible] approach, rural communities take the lead in creating an integrated, community-based strategy focused on local assets and capabilities and apply for matching funds from the State's Rural Development Office.
- Established the Governor's Rural Partnership Board which directly interfaces with the Governor and [illegible].
- Supported the review process of Enterprise Zone legislation to provide tax credits to expand business and create jobs.

11. Make State Government More Efficient

- Initiated an efficiency plan for state operations through [illegible] and "Balanced Scorecard" with assistance from the Utah Policy Partnership, through which every state agency has created and [illegible] performance metrics for each program.
- Governor Herbert formed the Utah Advisory Commission to Optimize State Government ("Enterprise Commission") to assist the State in delivering services as effectively and efficiently as possible. The Commission presented 30 recommendations that would result in approximately $[illegible] million in immediate annual savings and increased [illegible] recommendations that would substantially [illegible] of a [illegible] dollars to savings for the Citizens of Utah and its taxpayers.

FALL 2010



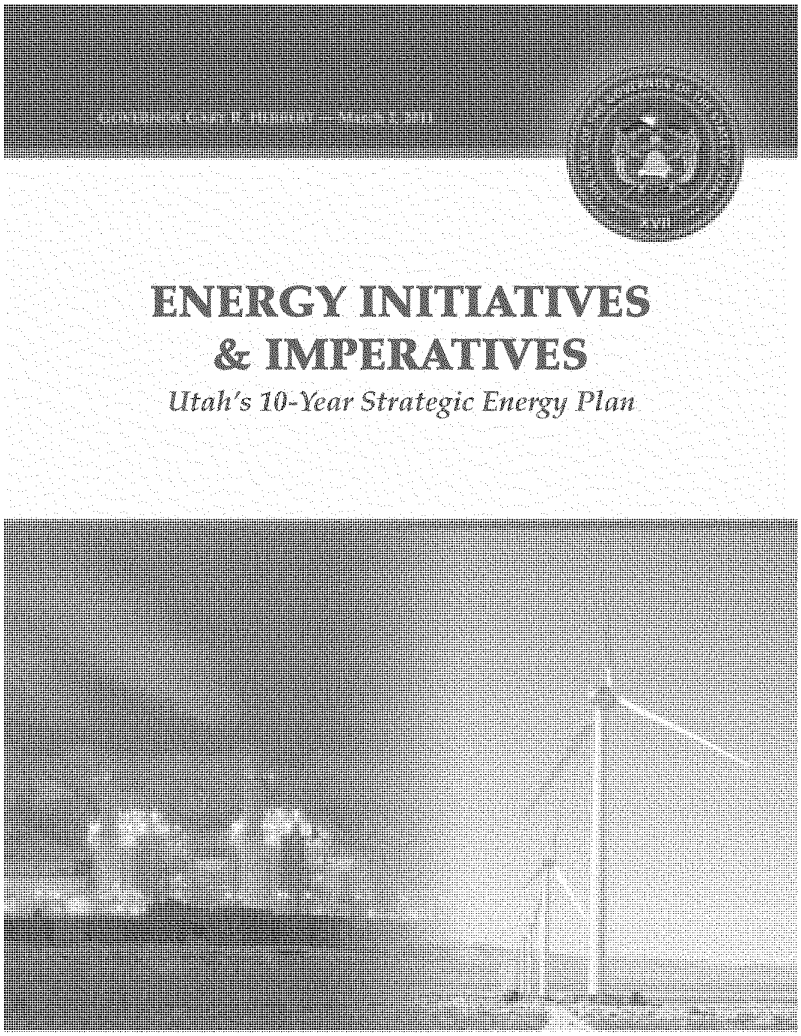

ENERGY INITIATIVES
& IMPERATIVES
Utah's 10-Year Strategic Energy Plan

TABLE OF CONTENTS

Executive Summary 2

I. Introduction 10

II. Current and Future Energy Demand 10

III. Background Information on Utah's Energy Resources 11

IV. Economic Development and Energy Jobs 18

V. Energy Development and Our Natural Resources 21

VI. Energy Efficiency, Conservation, and Demand-Response 27

VII. Transmission, Infrastructure, and Transportation 31

VIII. Developing and Applying Technology and Science 35

Task Force & Sub-Committee Members 41

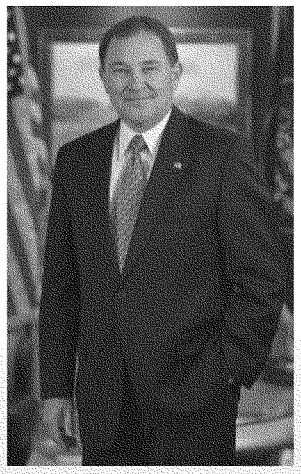
EXECUTIVE SUMMARY

Governor Herbert's 10-Year Strategic Energy Plan

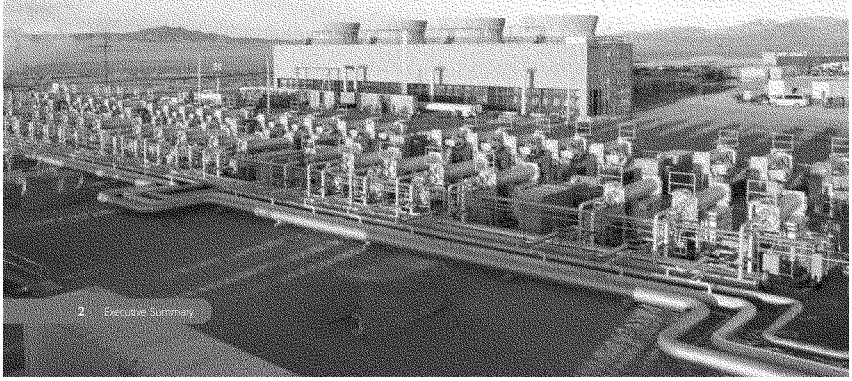
In his 2010 State of the State address, Governor Gary R. Herbert announced his intent to create the Utah Energy Initiative—a 10-year strategic energy plan that combines Utah's rich abundance of diverse natural resources with our innovative and entrepreneurial spirit—to ensure that Utah is at the forefront of solving the world's energy challenges.[1] Utah will seek to excel in job creation, innovation, entrepreneurship, global business, and quality workforce and have a stable and sustainable business-friendly environment. Under the Governor's leadership, the state has received several awards and accolades. Most recently, *Forbes Magazine* named Utah the best state for business and careers. One key factor in their decision was our low cost of doing business, especially our competitive energy costs.

While rich in energy resources, Utah is also known for its National Parks, State Parks and unrivaled natural beauty. It is critical that while we strive for energy development that it be done in conjunction with preserving the quality of life that draws people to live and play in Utah.

This Energy Plan has been developed by a Task Force appointed by Governor Gary Herbert. In turn the Task Force relied upon Subcommittees[2] and input from numerous private and public individuals, officials and organizations. Four public hearings were held throughout the state and input was solicited from all residents interested in energy development, economic development, human health and environmental issues. Based on this input, the plan will be implemented in accordance with the following five guiding principles:

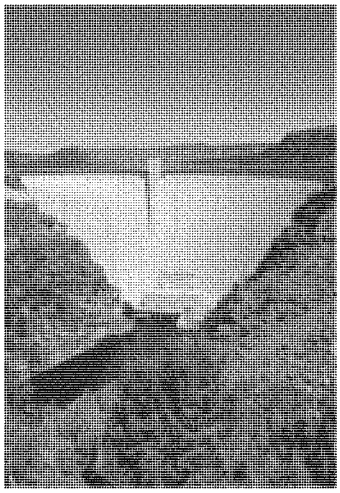


Governor Gary R. Herbert



Guiding Principles

1. Utah's economy is dependent upon responsible energy development. Governor Herbert, his Cabinet and his energy policy task force will consider and thoroughly examine the potential for development of all energy resources—allowing the free market to drive while the state provides appropriate legislative and regulatory oversight.
2. Energy development in Utah will carefully consider the impacts on human health, environmental impacts and impacts on wildlife habitat. An effort to avoid, minimize, or mitigate these impacts will be made regardless of energy resource.
3. Governor Herbert's Energy Plan is not a static document; it ushers in an ongoing open and transparent public discussion about best practices. The Governor and his Cabinet will work hand-in-hand with local government, federal agencies, Native American Tribes, environmental organizations, energy producers and utilities, business, and the public to determine the best path forward.



4. Utah will work to keep utility costs low while recognizing that longer term price stability and relative affordability will require significant and ongoing investment in energy infrastructure.
5. Through expanding Utah's energy independence and providing export opportunity, Utah can stabilize its economy and provide for further economic expansion.

This document describes a 10-Year Strategic Energy Plan that seeks to strengthen Utah's economy by setting the following goals:

Goals:

1. Meet the projected energy growth demands over the next decade by making balanced use of fossil fuels and alternatives and renewable resources in a market-driven, cost effective, and environmentally responsible way.
2. Ensure Utah's continued economic development through access to our own clean and low-cost energy resources.
3. Develop the best new cutting-edge technologies, particularly those that enable us to utilize precious natural resources with an elevated environmental consciousness, and deploy them in Utah, the nation, and the world.
4. Create new and support existing energy related manufacturing opportunities and jobs in Utah.
5. Modernize the regulatory environment to support sustainable power generation, energy transmission solutions and energy conservation.
6. Promote energy efficiency, conservation and peak consumption reductions.
7. Facilitate the expansion of responsible development of Utah's energy resources, including traditional, alternative and renewable sources.
8. Pursue opportunities for Utah to export fuels, electricity and technologies to regional and global markets.
9. Enhance and further integrate partnerships between industry, universities, state government and local communities—especially those in energy-rich rural communities-to address future energy challenges and opportunities.[3]
10. Collaborate with other western regional states to present a strong and unified voice to federal regulatory agencies on energy and public land issues.

Modeling:

Given the vigorous nature of energy development resources, technology and potential impacts on human health and the environment, a key element of the Plan will be creating a methodology for evaluating resources, costs, and economic impact on a continuous basis. The PI+ model from Regional Economic Models, Inc. (the REMI model) is one tool identified that will be used to forecast economic impacts of resource development in a timely manner.

REMI is a dynamic model which generates annual predictions to 2050 and includes a detailed economic structure. While REMI has thousands of input variables, the change in energy prices resulting from various policies will be central. REMI includes the price of natural gas, electricity, and other energy for residential, commercial and industrial users as inputs. Other inputs that may be affected by different policies include home prices and industry production costs. In particular, REMI models the labor market as a process in which labor supply and labor demand are matched through wage adjustment. Employment by industry is determined in the labor market. Gross domestic product (GDP), personal income, and labor income are also estimated. REMI is an effective tool for energy scenario analysis precisely because it generates estimates of employment, GDP, and income resulting from different policy decisions.

This Executive Summary and Plan contain recommendations, next steps and additional investigations needed to achieve the ten goals above. This report does not contain answers to all of the challenges identified, but it provides a roadmap to accomplishing that objective. Over the next ten years, as Utah continues to develop a robust, diverse portfolio of energy resources and related economic development, there will surely be changes and additions to the 10-year Strategic Energy Plan and opportunities for stakeholders to collaborate in building a stronger, more secure energy future.

Energy Resources and Demand

Utah's current energy resource consumption includes traditional fossil fuels and renewable resources, as summarized in Figure 1. In 2009, residents, businesses, and industries consumed approximately 27,411 gigawatt-hours (GWh) of electricity and 131 billion cubic feet of natural gas.

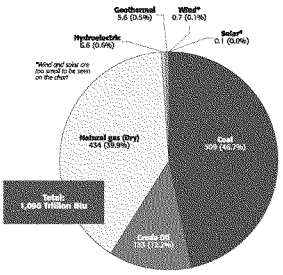


Figure 1. Energy production in Utah by source in 2009. Source: Utah Geological Survey.

The demand for energy in Utah is increasing. Rocky Mountain Power's total Utah load is expected to increase from approximately 4,700 megawatts (MW) in 2011 to approximately 5,600 MW in 2020. Questar projects that natural gas consumption in Utah in the residential, commercial, and industrial sectors will increase from 170 million Dth in 2011 to 200 million Dth in 2020. Based on

Table 1

Utah's Projected Fossil Fuel Energy Growth—Next 10 Years.
Source: Rocky Mountain Power, Questar, Utah Geological Survey

	2011	2020	Percent Change	Annual Rate
Electricity Load (RMP) (MW)	4700	5600	19.1%	1.9%
Natural Gas (Questar) (million Dth)	170	200	17.6%	1.8%
Petroleum/Transportation (mbbl/yr)	45	52	15.56%	1.15%

Table 2

Utah's Current Annual Production Rates and Proven Reserves of Conventional Fossil Fuels

[All values rounded to one decimal in this report]

	Petroleum	Natural Gas	Coal*
Proven Reserves	256 mbbl	6.7 tcf	2[illegible] mt
Yearly Production Rates	45 mbbl	0.331 tcf	21 mt
Remaining Years of Reserve at Current Production Rates	6 years	20.1 years	61 years

mbbl = million of barrels, tcf = billion of cubic feet, mt = million of tons

*Including Conservative Federal lands, 256 mbbl proven reserves, 21 years proven reserves at current production rates

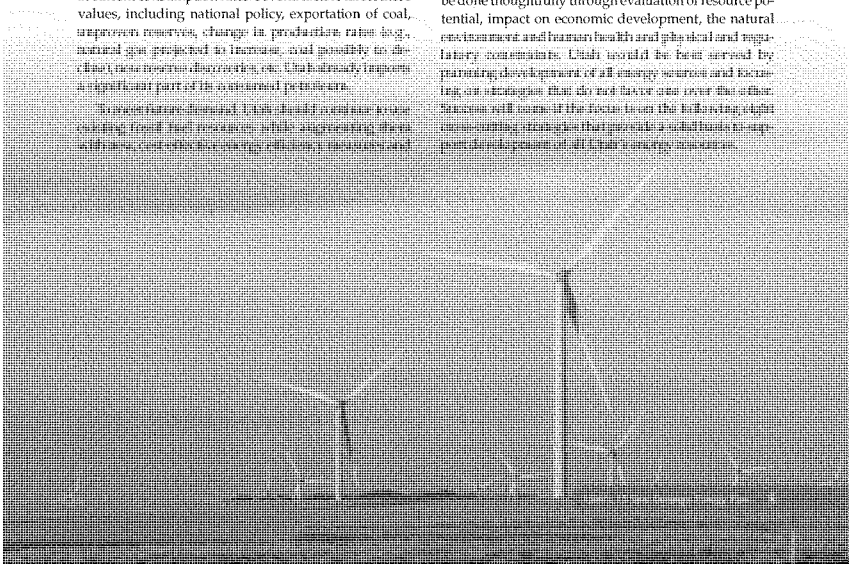
increases in consumption over the last ten years, petroleum-based transportation fuel use is projected to increase from 45 million barrels/year to 52 million barrels/year during the same period.[1] These figures are summarized in Table 1.

Table 2 summarizes Utah's proven reserves and current consumption rates for petroleum, natural gas and coal. It also shows remaining years of proven reserves at current consumption rates. Several factors affect these values, including national policy, exportation of coal, unproven reserves, change in production rates (e.g., natural gas projected to increase, oil possibly to decline), new reserve discoveries, etc. Utah already imports a significant part of its consumed petroleum.

To meet future demand, Utah should continue production of fossil fuel resources while augmenting them with new, cost-effective energy efficiency measures and alternative and renewable energy resources as they become more economically feasible.

How Utah Will Accomplish Its Energy Goals

The State of Utah should work to meet the energy demand of 2020 with a balanced use of Utah's abundant energy resources. Development of resources should be done thoughtfully through evaluation of resource potential, impact on economic development, the natural environment and human health and physical and regulatory constraints. Utah would be best served by pursuing development of all energy sources and focusing on strategies that do not favor one over the other. Success will come if the focus is on the following eight conservation strategies that provide a solid basis to support development of all Utah's energy resources.



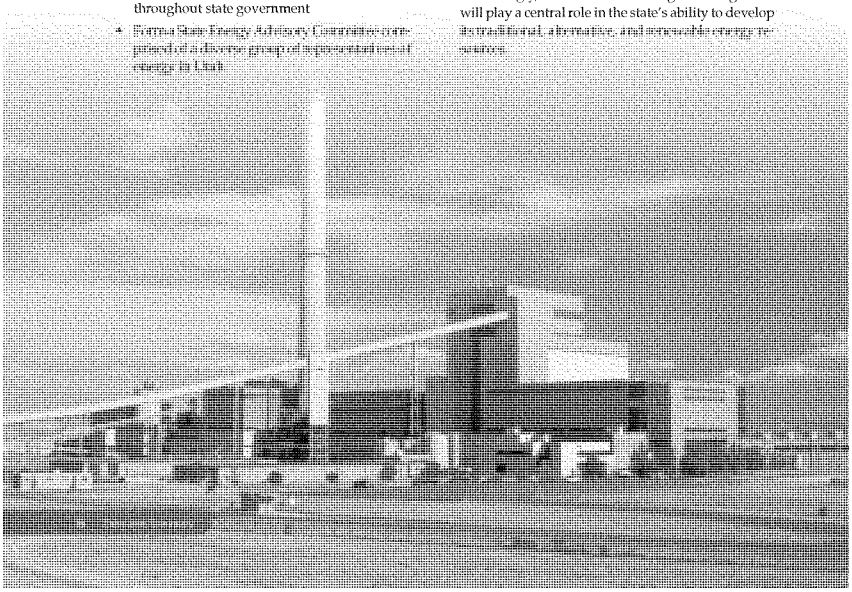
1 It is recommended that Utah establish an energy office, administered by the Governor's Energy Advisor, with an Advisory Committee to oversee the implementation of the Governor's Energy Plan. This structure will address the evolution of the state's energy policy and act as an advisory body to the Governor. The Committee will respond to emerging issues in the energy arena and make recommendations on any necessary changes in state policy in response to emerging issues. This committee will develop the next steps related to the energy policy recommendations, identify and evaluate scenarios to be evaluated using economic models, and oversee the action items identified by the Governor.

Recommendation:

Streamline government processes and policies for executing the Plan. A clear and predictable policy voice creates a business friendly environment and intergovernmental alignment yielding investment in energy development and job creation

- Create a an energy office by consolidating existing energy functions currently fragmented throughout state government
- Form a State Energy Advisory Committee comprised of a diverse group of representatives of energy in Utah
- Shape policy discussions to make informed decisions
- Provide continuous policy analysis on resources, economic development, transmission and constraints on development
- Implement this Energy Plan and assure state government agencies are working seamlessly to accomplish goals as outlined

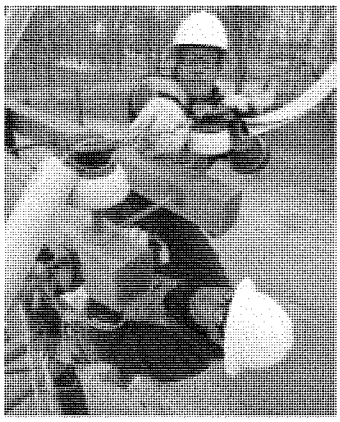
2 Utah should create an effective strategy for the legitimate use of Utah's public lands for energy development purposes by working with federal agencies to navigate the balance between economic and environmental sustainability. The federal government owns and manages approximately 60% of Utah's surface lands and a larger portion of the mineral estate. Many of these public lands include pristine air sheds, national parks and wilderness areas, important water resources that are essential to local communities, wildlife habitat and riparian zones, world-renowned archeological and culturally significant sites, nationally recognized scenic areas and prized recreational locations. Accordingly, Federal Land Management Agencies will play a central role in the state's ability to develop traditional, alternative, and renewable energy resources.



Recommendation:

Act to keep Utah's Public Lands open for responsible energy development

- Continue to work directly with federal officials, Western Governors' Association, National Governor's Association and other groups to advocate for energy development on public lands
- Designate access to public lands for energy development as a priority for the Governor's Public Lands Policy Coordination Office
- Utilize the Governor's Balanced Resource Council to facilitate agreement on energy and environmental concerns
- Assure that state agencies are taking lead roles in developing plans and strategies on how to address impacted resources under state jurisdiction and regulation (e.g. air quality, wildlife, archeology)
- Coordinate efforts with local government, State and Institutional Trust Lands, state agencies and interest groups to identify potential issues and work towards solutions
- Partner in joint efforts to leverage regional support with other western states for land rights



3 Utah's research universities and regional colleges, the energy industry, and nearby national energy laboratories all contribute to development and deployment of energy technologies and work force capabilities. These efforts will be enhanced through greater coordination.

Recommendation:

Strengthen Utah's role in research and development of energy technology by making this a primary focus for the Governor's Energy Advisor with higher education, industry and other research partners

- Develop a "Research Triangle" of Utah's three research universities to expand interaction with regional technology leaders through collaborative efforts lead by the Governor's senior energy official and senior energy research officials from each of the universities
- Place emphasis on clean technology for fossil fuels (i.e. gasification, carbon capture and sequestration, unconventional fuel, etc.) and the interface with other energy forms
- Increase collaboration between the Research Triangle and nearby national laboratories, particularly the Idaho National Laboratory
- Continue to attract world class researchers to connect higher education to deployable technologies
- Collaborate with DOE Energy Commercialization Center and associated technology transfer or commercialization agencies within the Research Triangle and regional colleges

4 Government tax incentives are a powerful economic tool that can influence behavior and business decisions. Incentives should be used strategically in coordination with Utah's energy plan, and where they have the most beneficial impact on Utah's economy.

Recommendation:

Review the role of tax incentives for businesses to relocate to and expand in Utah and their potential impact on job creation, energy availability and the growth of energy production

- Assess how tax incentives may further foster energy production and the manufacturing sector connected to the energy industry
- Use economic modeling (REMI) to best determine the economic impacts of future development

5 Increase energy development through coordination and transparency in the regulatory and licensing process. Utah's regulatory framework and process should be reviewed and revised to accommodate future demand. Within various state agencies there are competing requirements and a lack of standard policies and regulations related to application processes, timelines and paperwork requirements.

Recommendation:

Align Utah's agencies to better meet and facilitate responsible energy development.

- Establish a single point of contact for energy developers for information on all state and local permit and ordinance requirements and regulations
- Empower a new coordinating council of state agencies to work on energy development issues and activities
- Instigate process improvement in state agencies that regulate the energy industry to assure greatest efficiency and protection to public health and environment
- Develop a Utah long-range transmission plan
- Strengthen the State's role in authorizing and facilitating transmission/infrastructure projects
- Adjust Utah's regulatory framework and process to address Utah's future energy demand and the role of emerging technology

6 Utah should have a state-wide program aimed at reducing energy consumption. Energy not consumed as a result of efficiency is a cost effective resource. Demand-side management (DSM) strategies reduce consumption during peak demand, resulting in lower costs because of avoided or delayed investment in new electrical generation and new natural gas supplies.

Recommendation:

Maximize Utah's commitment to energy efficiency and demand side management.

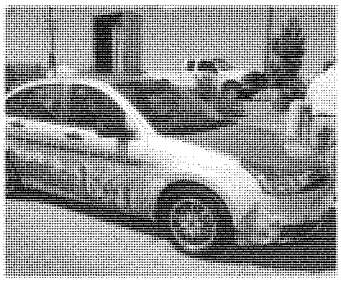
- Support education and communication programs that enhance public awareness of energy efficiency and promote energy code training for new and existing energy professionals
- Encourage utilities and regulators to expand energy efficiency and demand response programs through state policy
- Analyze financial incentives to enable investment in energy efficient construction and retrofitting

7 Utah should diversify transportation fuels and build a transportation infrastructure and a fleet to meet the needs and demands of future generations. Utah's dependence on out of state sources for crude oil—72% used for transportation from out of state sources—may create a future fuel crisis. It is critical to our economy, air quality and our quality of life that Utah diversifies our transportation model.

Recommendation:

Utah should pursue energy independence for transportation fuels by developing a framework for reducing its dependence on outside sources for transportation fuels and the inherent impacts this dependence has on economic development.

- Support augmentation of Utah's fuel supply with nontraditional fuels
- Promote research and commercialization of clean technology for nontraditional fuels and alternative fuel vehicles (USTAR and Research Triangle)
- Analyze current and future pipeline capacity for oil and gas



- Assure that the State of Utah is engaged in transportation planning that promotes non-motorized and public mass transit infrastructure

8 Utah should review the need for additional base load sources of energy to supply electrical needs for our future. Given future demand projections, current and projected environmental regulations and constraints, and Utah's unique mix of energy resources, the foundation for future base load growth should be laid now.

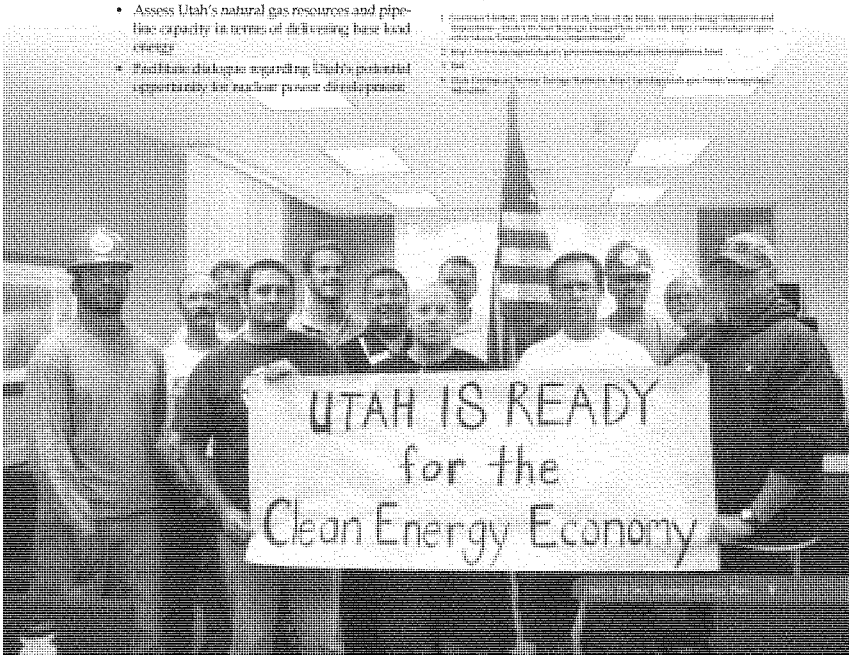
Recommendation:

Coordinate with major local and municipal utilities to develop a long term strategy to broaden Utah's supply of base load electricity

- Examine future coal supplies, the impacts of additional regulation on coal fired power plants and the potential of clean coal technology
- Assess Utah's natural gas resources and pipeline capacity in terms of delivering base load energy
- Facilitate dialogue regarding Utah's potential opportunity for nuclear power development
- Evaluate Utah's role in energy storage strategies and capabilities for renewable energy sources including compressed air storage

SUMMARY:

Energy is one of Governor Herbert's top priorities. The Utah Energy Task Force was appointed by the governor to develop a 10-year strategic energy plan. Eight recommendations have emerged from the comprehensive stakeholder driven process to help shape Utah's energy future. The plan takes into consideration our abundant natural resources, economic development objectives and the importance of environmental sustainability. It is intended to be a working document to which modifications will be made as new information is realized. Energy development is an essential component to the vitality and success of the state and Utah will strive to lead our nation in the development of traditional, alternative and renewable energy resources.



UTAH ENERGY INITIATIVE

Governor Herbert's 10-Year Strategic Energy Plan

I. INTRODUCTION

The energy industry in Utah is the second largest component of state gross domestic product. Utah has a vast supply of diverse energy resources. These resources foster job creation and economic development through exploration, development, production, research and manufacturing. Additionally, Utah's low cost energy has been a driver in attracting businesses to locate in Utah. The revenue from energy development is the backbone of Utah's strong economy, providing funds for education to develop the scientists, engineers, technicians, entrepreneurs, and workforce that match the opportunities of a strong economy and a vibrant quality of life

II. CURRENT AND FUTURE ENERGY DEMAND IN UTAH

Utah's current energy resource production base includes traditional fossil fuels and renewable resources, as summarized in Figure 1.

In 2009, residents, businesses, and industries consumed approximately 27,411 gigawatt hours (GWh) of electricity and 131 billion cubic feet of natural gas. With the exception of crude oil, Utah currently produces more energy (including electricity, transportation fuels, and fuel for residential, commercial, and industrial sectors) than it uses. In 2008, Utah produced 29% more energy than it consumed.[1] Rocky Mountain Power's (RMP) Utah load is expected to increase from approximately 4,700 megawatts (MW) in 2011 to approximately 5,600 MW in 2020. Questar projects that natural gas consumption in Utah in the residential, commercial, and industrial sectors will increase from 170 million Dth in 2011 to 200 million Dth in 2020.[2] Based on increases in consumption over the last ten years, petroleum-based transportation fuel use is projected to increase from 45 million barrels/year to 52 million barrels/year during the same period.[3]

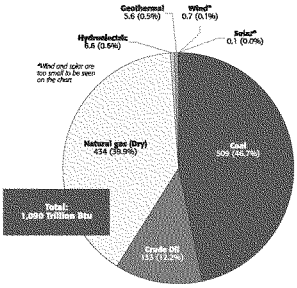


Figure 1. Energy production in Utah by source in 2009. Source: Utah Geological Survey.

Table 1 shows Utah's projected energy demand growth for three of the four fossil fuels (all but coal). Coal reserves are at least sufficient to last this coming decade; and in general, existing coal plants will likely continue to produce electricity through the decade. The coal use may remain about the same, but this energy is accounted for in the electricity.

Table 1

Utah's Projected Fossil Fuel Energy Growth—Next 10 Years. Source: Rocky Mountain Power, Questar, Utah Geological Survey

	2011	2020	Percent Change	Annual Rate
Electricity Load (RMP) (MW)	4700	5600	19.1%	1.9%
Natural Gas (Questar) (million Dth)	170	200	17.6%	1.8%
Petroleum/Transportation (mbbl/yr)	45	52	15.56%	1.15%

This report notes that RMP provides about 80% of the State's electrical power, the balance coming principally from public municipals. Thus, the values in Table 1 will be low. Further, Utah is not self-sufficient in petroleum and imports about 72% of its petroleum consumed.

Figure 1 shows that currently, nearly 99% of Utah's energy production is from these three conventional fossil fuels. Renewable resources provide only 1.3% of the total.

While it is anticipated that renewable and alternative energy sources will likely grow at more rapid rates than the conventional fossil fuels, by 2020, Utah's energy will still be dominated by fossil fuels. To illustrate this, these 10-year projections for Utah can be compared to the federal government's energy plan which goes to 2035.[4] The U.S. Energy Information Administration projects a 14% increase in consumption from 2008 to 2035, an annual growth rate of only 0.5%, significantly less than projected for Utah's growth rate (Table 1). The U.S. also projects a significant growth rate in renewables and biofuels. It also projects small increases in coal and natural gas with declining reliance on imported petroleum. Currently, the conventional fossil fuels provide 84% of the U.S. energy demand. By 2035, the U.S. projects the fossil fuel percentage will drop from 84% to 78%. This is an important observation for Utah's 10-year energy plan. The U.S. has an aggressive program to expand renewable and alternative energy sources. Yet, even by 2035, the U.S. will still be principally dependent on these three fossil fuels. It is very likely that, even with aggressive efforts toward renewable energy sources, Utah must continue to rely principally on fossil fuels over the next 10 years.

To meet future demand, Utah should continue to use existing fossil fuel resources and augment with new, cost-effective energy efficiency, renewable, and alternative energy resources to the extent it is technically and economically feasible, and continue the research and development of clean and secure energy through research centers around the State, e.g., the Bingham Entrepreneurship and Energy Research Center in Vernal.

Utah's dependence on imported transportation fuels is a concern over the next ten years. Utah currently imports about 72% of its petroleum to meet transportation needs. This is similar to U.S. imports of its petroleum which is considered to be a national crisis. As discussed elsewhere in this report, Utah has vast reserves of oil shale and oil sands in the Green River formation in eastern Utah.

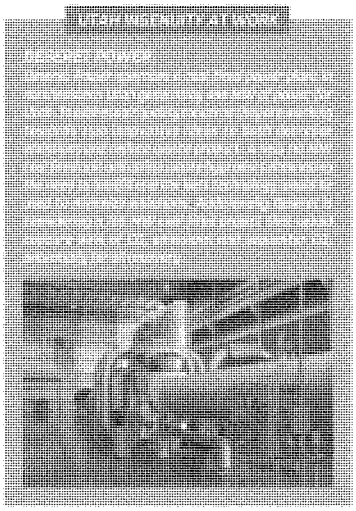
Newer, cleaner technologies have been developed to produce liquid transportation fuels from these unconventional resources.[5] Shale oil has been and is being commercially produced in Brazil, China and Estonia.[6] A single small oil shale plant would have the capacity to produce 6,000 bbl/day of oil, which is about 11% of Utah's daily consumption of about 53,000 bbl/day.[7]

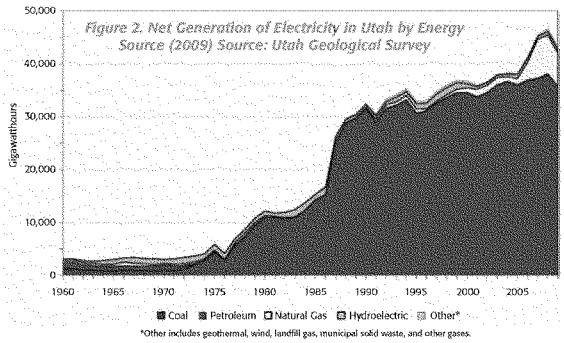
III. BACKGROUND INFORMATION ON UTAH'S ENERGY RESOURCES

A. Status of Utah's Energy Resources

Utah's energy portfolio should include fossil fuels, alternative fuels, renewable resources, and energy efficiency. Diversifying Utah's energy base not only provides jobs and revenues, but also critical resources and energy to fuel Utah's broader business and industrial sectors.

Coal: In 2008, Utah produced its one-billionth ton of coal. In 2009, Utah ranked 13th in the nation in the production of coal at 21.9 million tons and coal made up about 47% of Utah's total produced energy resources.





Coal also accounts for 41% of the energy consumed by Utahns.[8] There are estimated to be over 3,722 jobs in Utah's coal production industry, including direct and related support jobs (this figure does not include indirect jobs).[9] Utah's most economic coal reserves are located in the three coal fields forming an inverted "U" primarily across Sevier, Emery, and Carbon Counties. Utah currently has about 202 million tons of coal reserves under lease at active mines, while state-wide recoverable coal resources total about 15 billion tons (this number does not take into account economic or land use constraints).[10] Another estimate from the Bureau of Land Management Price Field Office resource management plan indicates statewide coal reserves at 14.3 billion tons or greater than 50 years at current production rates. The majority of Utah coal, 68% in 2009, was used in state, while 32% was shipped out of state. Foreign exports, mostly to Asia, peaked in 1996 when 5.5 million tons, or 19.7%, of Utah coal was shipped to foreign markets. This export market ceased to be economic as Australia and China increased production.[11] Utah's research universities are evaluating carbon capture and related technologies with direct application to Utah's coal-fired generation.[12]

From 1973 to 1988, electricity generation increased from approximately 3,000 GWh to over 30,000 GWh. Utah became a net exporter of electricity. Coal-fired power plants comprised about 95% of total net generation as the amount of hydroelectric generation declined. Today, approximately 82% of Utah's total net generation of electricity comes from coal-fired power plants, with 16% from natural gas, and 2% from hydroelectric, geothermal, landfill gas and biomass, wind, and solar.[13] Utah consumes about 60% of the electricity that is generated in the State. The resource mix consumed in Utah, as the Utah Geological Survey notes, is more accurately reflected in the fuel mix of Rocky Mountain Power, which serves 80% of the electricity (MWh) and 75% of the electric customers in Utah. That fuel mix includes approximately 58% coal, 17% natural gas, and 13% renewables (including hydroelectric).[14] The remaining electricity customers are served by two municipal groups, UAMPS and UMPA, and by an association of rural electric cooperatives. They have a similar fuel mix as Rocky Mountain Power, but with a larger percentage from hydroelectric power.

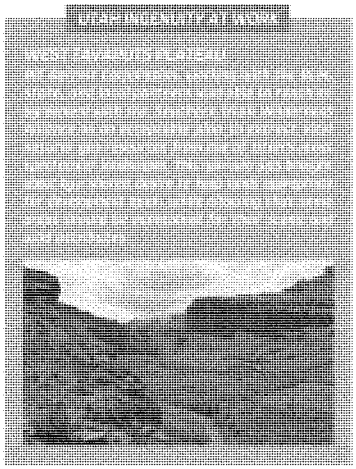
Utah's proven coal reserves, adjacent to operating mines, have been steadily decreasing, from a high of 429 million tons in 2000 to 202.5 million tons in 2009. There are three existing ways of estimating coal reserves. Reserves adjacent to active coal mines are the most conservative estimate, but also the most accurate estimate of readily available coal. During this same period, 2000 to 2009, the number of mines decreased from 13 to 8.[15] Business-sector investments in coal-fired generation, including carbon capture and sequestration, appear unlikely until there is certainty regarding federal carbon regulation. The cost of compliance with additional air-pollution controls at existing plants is also under review. More restrictions are anticipated in the next few years, which will also decrease the probability of investment in new coal mines, or new coal-fired electric

generation. Furthermore, as some Western states evaluate the generation and importation of electricity from cleaner sources (including renewables and natural gas), electricity portfolios may change. The technology and cost of integrating intermittent, non-dispatchable renewable resources, as well as the need to ensure reserve generation to back-up intermittent generation, are factors in the diversification of electricity resources in Utah and across the Western Interconnect.

Crude Oil (Petroleum Products): In 2008, Utah ranked as the 13th largest producer of crude oil in the United States. In 2009, crude oil made up approximately 12% of Utah's total produced energy resources. Crude oil also accounts for 33% of the energy consumed by Utahns.[16] Utah has five refineries with over 150,000 barrels per day of refining capacity making gasoline, diesel, jet fuel and related products. While Utah is a net exporter of energy, it imports approximately 72% of the crude oil that is processed in its refineries. Imports come principally from Canada, along with Wyoming and Colorado. The refineries monetize Utah crude oil production. They are a significant source of jobs both for full time employees and contractors. Refineries are regional businesses exporting products to adjoining states. Though they are also significant consumers of natural gas and electricity, they provide transportation fuel reliability and accessibility in Utah. The environment in which they work is competitive because of the number of individuals and firms involved in the industry. This industry needs stability in regulation and taxation to invite the investment of necessary capital to continually modernize and make their operations more efficient.

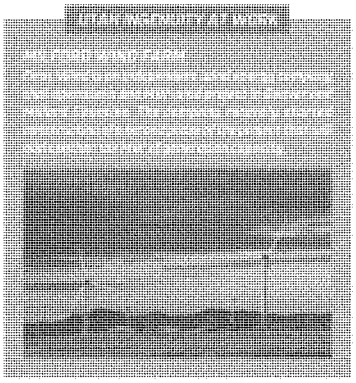
Natural Gas: In 2007, Utah ranked as the 8th largest onshore producer of natural gas in the country. In 2008, Utah's natural gas was mostly used for home heating (nearly 29%) and by the electric utility sector (nearly 25%). Natural gas makes up approximately 40% of Utah's total produced energy resources. Natural gas also accounts for 24% of the energy consumed by Utahns.[17] There are estimated to be over 13,222 jobs in Utah's oil and gas industries, including direct and related support jobs of extraction, wells operations, distribution, transportation, refining, construction and manufacturing (this figure does not include indirect jobs).[18]

Future energy projections place significant demands on natural gas production in Utah. Natural gas demand has historically come from the residential home heating, commercial, and industrial sectors. In 2008, those sectors consumed approximately 137 billion cubic feet (bcf) of natural gas.[19] Natural Gas vehicles consumed only approximately 240 million cubic feet. Even a doubling of transportation fuel use would have little impact on consumption. However, natural gas consumption for electricity generation has increased steadily since the late 1990s, totaling more than 55 bcf from all utilities in 2008, generating approximately 16% of Utah electricity production.[20] Rocky Mountain Power currently estimates that its Utah natural gas plants will consume approximately 62 bcf in 2020 for electricity generation, an increase of over 45 % from the approximately 42 bcf consumed by RMP plants in 2009.[21] In 2020, Rocky Mountain Power's production of electricity from natural gas in Utah is projected to reach 9,000 GWh, compared with production in Utah in 2009 of 5,300 GWh.[22] Doubling Utah's natural gas-fired generation will require new natural gas production, which will require more efficient lease sales and permitting of natural gas exploration. Delays related to Resource Management Plan approvals must be resolved, and the approximate 18-month backlog on federal drilling permits must be reduced. State and federal agencies are already working together with industry to identify and reduce ozone and fine-particulate pollution that has been identified



in some regions of oil and natural gas development. Future considerations should include recognition that renewables, particularly wind and solar generation, do not completely replace fossil fuels in the fuel mix, but usually rely on natural gas as a backup and peak-day contingency. Additional natural gas will also be needed should significant wind generation be developed in Utah. Wind's unpredictable nature means grid operators and planners must construct a shadow grid, particularly gas-peaking units, to stand as a reserve generator for those times when wind resources are not delivering their potential capacity. An increased reliance on natural gas for electricity generation also means that there is a need for additional pipeline capacity.

Unconventional Fuels: Utah possesses unprecedented oil shale and oil sands resources. There have been wide-ranging estimates of the volume of resources in the Uinta Basin. The Utah Geological Survey's 2009 evaluation estimates that a continuous oil-shale interval that averages 35 gallons per ton contains an in-place resource of 76 billion barrels of shale oil.[23] Tar sands potential includes 14-15 billion barrels of measured in-place oil, with an additional estimated resource of 23-28 billion barrels.[24] The 2005 Rand Corporation Report indicates that, "the largest known oil shale deposits in the world are in the Green River Formation, which covers portions of Colorado, Utah, and Wyoming. Potentially recoverable oil shale resources include 500 billion barrels to 1.1 trillion barrels of oil. For policy planning purposes, it is enough to know that any amount in this range is very high. Present U.S. demand for petroleum products is about 20 million barrels per day.[25] The largest volume of deposits of bitumen is in Utah, which has measured reserves of 8 billion to 12 billion bbl and total resources in place, including speculative ones, of 23 billion to 32 billion bbl."[26] The 2008 Rand Corporation Report on oil sands notes that "U.S. resources of bitumen have not been heavily exploited and are not characterized as thoroughly as resources in Canada (USGS, 2006). Major deposits of bitumen (i.e., larger than100 million barrels) in the United States can be found in Alabama, Alaska, California, Kentucky, New Mexico, Oklahoma, Texas, Utah, and Wyoming."



Uranium: Utah's San Juan County has a history of uranium mining dating back to the 1950s. Currently the Nation's only licensed and operating uranium mill, the White Mesa Mill, is located south of the community of Blanding, Utah. Uranium mined in Utah, in addition to Uranium mined in the Arizona Strip, is being transported to White Mesa for processing. There is the potential nuclear power plant project in Utah that would depend on this ore, additionally a market exists currently and may grow as additional plants are brought on line around the country.

There are more than 150 jobs in Utah's uranium industry, including direct and related support jobs in uranium mining and milling (this figure does not include indirect jobs).[27] Future job growth in Utah is dependent on the growth of the nuclear power industry, nationally and in Utah. Additionally, job growth in Utah is dependant on the area known as the Arizona Strip remaining open for uranium mining. Currently the Bureau of Land Management is proposing to withdraw over 1 million acres from development.

Hydroelectric: In 2008, hydroelectric made up 0.5% of Utah's total produced energy resources. Hydroelectric also accounts for 0.7% of the energy consumed by Utahns.[28] Hydroelectric power comprises about 1.5% of electricity produced. There are estimated to be 1,142 jobs in Utah's hydroelectric industry, including direct and related support jobs (this figure does not include indirect jobs).[29]

Geothermal, Solar, Wind and Biomass: In 2008, geothermal made up 0.5% of Utah's total produced energy resources. Geothermal also accounts for 0.8% of the energy consumed by Utahns. Utah is one of only six states where electricity is generated from geothermal resources.[30] In 2010, Utah's wind generation capacity was

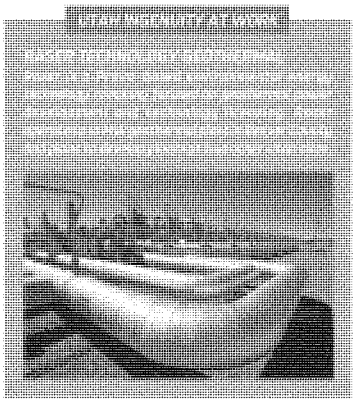
224 megawatts (MW), most of which is exported to California. In 2009, only 0.1% of Utah's electricity need was met by wind power. Solar energy generation makes up 0.1% of total produced energy in Utah and 0.01% of the energy consumed by Utahns. In 2009, biomass made up 0.5% of Utah's total produced energy resources. Biomass also accounts for 0.8 % of the energy consumed by Utahns. In 2008, Utah ranked 45th in the nation in percent of total net electricity generation from renewable resources.[31] Currently, there is only a minimal renewables manufacturing component taking place in Utah. About 35% of the estimated jobs are directly related to manufacturing and production of equipment/supplies related to the industry. By comparison, for Utah-specific manufacturing jobs, average employment is 4,155 jobs in plastics and rubber, 12,318 in fabricated metal, and 3,574 in composites.[32]

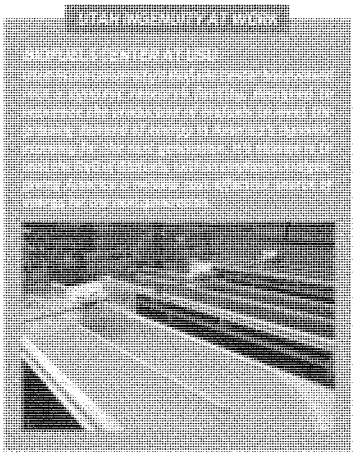
While Utah may possess considerable renewable energy potential, many legitimate challenges currently impact the development of these resources. Among these challenges are the substantial investments in transmission infrastructure to connect these widespread resources to the grid, as well as policy, economic, technological and regulatory considerations. Combined, these challenges render many renewable energy projects in Utah not cost effective when compared to other resource options. Nevertheless, renewable energy represents a small, but growing, portion of Utah's energy generation portfolio, with a statewide installed renewable energy capacity, including hydroelectric generation, of 570 MW, with an additional 142 MW currently under contract.[33] Some of these resources are consumed in-state, while others are exported to surrounding states. Utah's renewable energy resource potential varies by technology and location.

The numbers found in the Utah Renewable Energy Zone Task Force Report (UREZ) represent the upper boundary of what is theoretically possible, but does not identify what is reasonably probable and economic. Ongoing efforts by members of the Committee support the premise that commercially viable renewable energy projects exist and should be developed in Utah as they are demonstrated to be cost effective. Utah's policymaking authorities, public demand, cost, the utility regulatory and planning arenas, and continued coordination among stakeholders should collaborate to identify pathways to address existing challenges to renewable energy development. Given growing energy demand and constraints on current energy supply, renewable energy could play an important role in Utah's energy future if these challenges are sufficiently addressed, though not likely having a major impact in the next 10 years.

It should be noted regarding Utah's renewable energy resources that to date, Rocky Mountain Power (RMP) has found potential renewable energy projects in Utah to be less cost-effective than projects in surrounding states. Current regulatory policy in the State applies a least-cost risk adjusted standard to RMP in providing electric service to its Utah customers. Under this standard, RMP has directed the majority of its investment in renewable energy generation facilities to areas located out of state, with the bulk of investment being directed to wind facilities in Wyoming. Under the current least-cost standard, RMP will invest in renewable energy facilities located in Utah (such as the Blundell geothermal facility located in Beaver County) to the extent they are found competitive from a cost effectiveness standpoint.

Also worthy of note regarding renewable energy facilities in general are the operational challenges of implementing renewable energy resources into an electrical system. By their very nature, energy production from renewable facilities is intermittent and can be random and unpredictable. Solar facility production is impacted by cloud cover and shading from nearby structures, while production from wind facilities can drop





off in a matter of minutes as the wind ceases to blow. Also, production from renewable energy facilities may or may not occur at the time it is most needed - when demand on the electrical system peaks. Because electric utilities are expected to provide service on a continuous basis, renewable energy facilities need to be backed up by production resources which can be dispatched 1) in a short period of time; and 2) at the time the energy is needed. Presently, RMP backs up its wind resources primarily with natural gas-fired generation and power purchases from the market, both of which add cost to the provision of electric service. The development of battery storage technologies, which is not a mature technology on a utility scale at this time, will improve the ability of renewable energy facilities to deliver energy at the time it is needed.

Compressed Air Energy Storage (CAES) as a Renewable Energy Resource. The 2010 Legislature, through SB 104, designated air that is compressed and stored using renewable energy to be classified as a renewable energy resource under certain conditions. While there are no operating CAES facilities in Utah, the legislation was based on the potential for compressed air storage in proximity to potential renewable energy resources. A compressed natural gas storage facility, using storage in salt domes, is being permitted in Millard County. The CAES process uses stored compressed air, with the addition of natural gas combustion, to run turbines to generate electricity. This approach will not likely have a significant impact on Utah's energy production in the next 10 years.

Biofuels: There are currently approximately 75 direct jobs in Utah's biofuels industry at 9 project sites. The projects include both start-up and operational status, and the jobs types are R&D, manufacturing, engineering and operations.

Biomass Utilization. Utah's biomass energy potential is only partly realized at this time. Currently, landfill gas, municipal solid waste combustion, and some experimental algae and anaerobic digestion processes constitute biomass energy utilization. The numerous national forests and wide expanse of public domain produce an excess of wood, beetle kill waste, and forest undergrowth waste. The web-based Coordinated Resource Offering Protocol (CROP) provides potential wood users with information on wood fiber available within economical haul distances from federal and non-federal lands. Additionally, crop residue and animal waste associated with agricultural operations provide a potential resource that can be used for direct combustion or gasification, though significant contribution to Utah's energy needs by 2020 is not likely.

The Algae Biofuels Program at Utah State University is designing new ways to grow algae without needing fertile soil or rain. The approach uses sunlight to its fullest potential, conserves water, produces oil 50 times faster than regular crops, and can co-produce electricity.[38]

Nuclear Power Generation. This resource deserves additional evaluation, but will likely not be available for electricity generation in this 10-year strategic plan. The feasibility of future nuclear energy development in Utah will be impacted by the emerging role of nuclear energy nationally, as well as water, waste disposal, size of the plant, rail access, transportation of spent fuel, transmission costs, and available certified designs. Important impacts on the economic basis for developing new nuclear-energy projects include the possibility of forthcoming taxes or cap-and-trade programs to restrict carbon emissions, cost of compliance with regulations to control other air pollutants, the instability of natural gas prices, and the possible reduction in the use of coal as a base-load electric generation fuel. Converting the current interest in building new nuclear energy plants in the United States into a

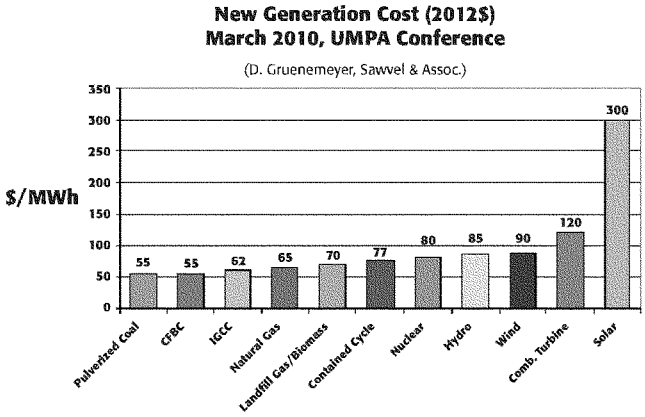


Figure 3. Estimated Costs of Energy Generation.
Source: D. Gruenemeyer, Sawvel and Associates.[35]

series of new plant construction projects is dependent on public acceptance (this is particularly true in Utah), regulatory certainty, water availability, and the ability to finance. This new environment will provide a context for encouraging nuclear energy development in Utah. Furthermore, if environmental concerns or policies curtail the development of future coal and/or gas-fired plants, or increase their net generating costs, this would provide an additional incentive to consider nuclear as a component of the State's base-load electrical generation. Nuclear has the potential to become a re-emergent industry within the United States. Utah should assess and develop its capacity to serve and supply the development of this industry, including the state's manufacturing capability and uranium ore reserves. There are proposals to develop nuclear power in Utah, but there is not a proposal that has moved through the permitting process.

B. The Cost of Energy

It has been noted above that Utah has enjoyed low energy costs and that these low energy costs have been important in Utah's economic development. As Utah's energy portfolio changes over this next decade, cost of power will be a vital factor in maintaining Utah's economy.

Over the next decade, it is likely that Utah's energy cost will rise. Increases have/are occurring in some energy sectors such as motor fuels and electricity. Causes include costs of feedstock fossil fuels, costs of increasing regulation, impacts of supply and demand, the economic climate in the U.S. and other costs. Government expenditures through incentives, loans, tax credits and grants, several of which are mentioned in this report relating to development of renewable energy, will also impact energy cost. As larger fractions of Utah's energy are produced from alternative and renewable resources in the years to come, energy costs will rise. Figure 3 shows current typical generation costs for several energy resources, with pulverized coal plants being the least costly and solar energy the most costly.

Differences in costs among the various resources are dependent on the time period, the location, federal subsidy, pending regulations and other factors. But the comparisons of Figure 3 are current, realistic estimates for the State of Utah. As Utah implements its 10-year plan, implications of energy cost increase for various alternatives can be evaluated with the REMI Model.

IV. ECONOMIC DEVELOPMENT AND ENERGY JOBS

Utah has abundant conventional energy resources, including three large oil fields with an estimated 286 million barrels in oil reserves. Utah is home to two large natural gas fields, and Utah's proven natural gas reserves total 6.7 trillion cubic feet (tcf).[36] In 2009, the State ranked 13th in the nation in the production of coal at 21.9 million tons. Utah currently has about 202 million tons of coal reserves under lease at active mines, while state-wide recoverable coal resources total about 15 billion tons (this number does not take into account economic or land use constraints).[37] Another estimate from the Bureau of Land Management Price Field Office resource management plan indicates statewide coal reserves at 14.3 billion tons or greater than 50 years at current production rates.

Table 2 summarizes Utah's proven reserves and current consumption rates for petroleum, natural gas, and coal. It also shows remaining years of proven reserves at current consumption rates. Several factors affect these values, including unproven reserves, change in production rates (e.g., natural gas projected to increase, coal possibly to decline), new reserve discoveries, etc. Utah already imports a significant part of its consumed petroleum.

Conventional energy and mineral resources have historically served as the backbone of Utah's energy production. For example, in 2009, over 96% of electricity generated in Utah was fueled by coal and natural gas, 82% of which was coal and 14% natural gas.[38] Of the electricity generated in Utah in 2009, approximately 37% was exported out of state.[39] That is not to say, however, that the State's electricity needs are served only by the in-state coal and gas fired plants. Rocky Mountain Power, the State's largest electric utility provider, supplies electricity to the State through a diverse portfolio that includes coal, natural gas, hydro, geothermal, wind, wholesale market purchases and other generation resources. For example, in 2009, Rocky Mountain Power-owned wind plants produced over 2,000 GWh of electricity. Generation resources located in Utah contribute to Rocky Mountain Power's portfolio, including some Utah renewable resources, primarily from geothermal and hydro resources. Utah possesses an array of renewable resources. Most renewable resources are used to generate electricity. About 2.5% of the State's electricity generation comes from renewable resources, approximately 26% of which is from geothermal, 65% from hydroelectric, 3% from biomass, and 6% from wind, with a small fraction from solar.[40] New studies indicate meaningful renewable resource capacity in the State.[41]

Fostering jobs, manufacturing strengths, and innovative entrepreneurial enterprises emanating from Utah's energy sector is critical to success in future employment and investment opportunities. Department of Labor employment numbers as of June 30, 2010, provide the following baseline (Table 3) for Utah's energy and natural resource industries.[42]

The energy sector contributes substantially to state tax revenues, thereby enhancing and stimulating various employment sectors of the State beyond energy. Also, a significant amount of energy development takes place on State School and Institutional Trust Lands generating direct revenues that support K-12 public

Table 2

Utah's Current Annual Production Rates and Proven Reserves of Conventional Fossil Fuels

	Petroleum	Natural Gas	Coal[a]
Proven Reserves	286 million	6.7 tcf	202 mt
Yearly Production Rates	45 million	0.131 tcf	21 mt
Remaining Years of Reserves at Current Production Rates	6 years	51 years	10 years

[a] mt = million of tonnes, tcf = billions of cubic feet, mt = millions of tons

Percentage expressed (based on mt) 202 mt proven reserves, 21 mt yearly production rate

Table 3

Employment Baseline for Utah Energy and Natural Resource Industries. Source: U.S. Department of Labor.

Total Employees	22,926
Percentage of Utah's Total Workforce	1.9%
Total Wages (2008)	$1,391,142,470
Percent of Utah's Total Wages	3.1%
Percent of State's Average Monthly Wage	150%
Number of Companies/Firms	1,109
Total Patents (2005-2009)	152
Venture Capital Deals (2005-2008)	20
Public Deals (2005-2009)	11

Table 4

Revenue from Energy Development for Utah. Source: Headwaters Economics (2008)

Production Value	Production Taxes	Property Taxes	Royalties	Total Revenue
$3,751,395,980	$77,074,318	$39,786,879	$251,799,166	$368,660,363

education programs. A Headwaters Economic Study, Energy Revenue in the Intermountain West, identifies the following revenues (Table 4) from energy development for Utah.[43]

In 2009, the estimated value of energy and mineral production in Utah was $6.8 billion, about $2.6 billion less than the record high of the $9.4 billion in 2008. With a Gross State Product (GSP) of approximately $109 billion, energy production and its overall influence accounts for 7-10% of Utah's GSP.[44]

Developing Utah's energy resources creates a demand for jobs. Energy development in Utah enables the State to attract new jobs and manufacturing and improve its economic development and employment landscape. The ability to attract jobs is directly related to energy costs, availability of resources, and quality of life in Utah. According to the U.S. Energy Information Administration, Utah consistently has the second lowest electrical and heating energy costs in the country, due in large part to the low costs of coal-fired electricity generation and natural gas. This competitive advantage over other states is one way Utah is able to recruit new and expand existing business, particularly high-tech manufacturing. A September 2008 study, *Fossil Fuel Extraction as a County Economic Development Strategy*, compared 26 energy-focused counties in the West. Four Utah counties were included in the study: Carbon, Duchesne, Emery and Uintah. The study shows quite clearly that as energy production/development jobs surged, "the principal growth came from direct energy-related occupations and largely in occupations indirectly associated with energy development."[45]

The study raises both a concern and an opportunity: energy-focused counties, and by extension the State, need to have strategies in place to adequately balance their reliance on energy as an economic and employment driver. Utah can do much to attract future energy-related jobs and manufacturing by taking specific actions to eliminate barriers and provide enhancements to companies locating or expanding in Utah. In general, development will broaden and diversify Utah's energy economy. Energy development in Utah communities can become a strong stimulus to create vital and growing economic conditions.

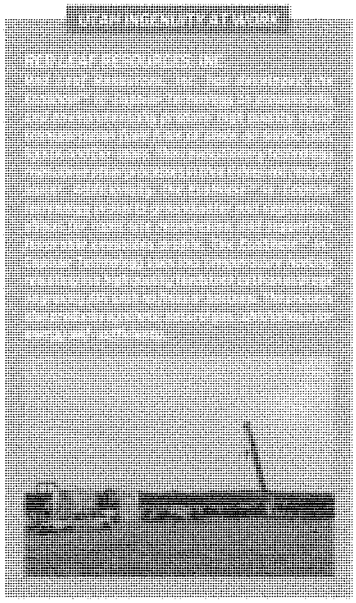
As Utah's energy portfolio is diversified, the demand for new energy-sector employees will increase. Utah's

energy employment reflects its historic strength in conventional energy resources. Efforts are underway to meet the demand for contemporary skill sets in power generation and transmission for the electric utility sector. Over 42% of the technician level workforce in sub-station management, metering, and line technology will retire within the next five years. The State should ensure that industry is engaged in developing, promoting, and assisting with contemporary skill training workshops and programs in conjunction with regional education centers in order to provide qualified "work-ready" employees to fill the retirement gap.

In 2007, Utah ranked 34th in the nation for the number of green jobs. The State of Utah has started to allocate funds through the State Department of Workforce Services, Salt Lake Community College and the Applied Technology Colleges to establish curriculum, certification and degree programs to prepare Utah's workforce in green jobs. The Utah Cluster Acceleration Partnership has established four pathways for green (sustainable energy, renewables, and energy efficiency) job training - Green Construction, Alternative Fuels, Energy Management, and Renewable Transmission. The State of Utah opened the Intermountain Weatherization Training Center in Clearfield for training and certifications of staff from public agencies and private companies. The State is investing to help train thousands to become certified solar installers, certified wind-turbine maintenance workers, certified energy management workers, and alternative-fuel vehicle technicians.

Until renewable energy becomes cost-effective, the State should carefully consider whether or not to subsidize renewable energy development in an effort to grow Utah's renewable energy sector. The committee needs to evaluate the renewable energy potential in Utah based on technological and economic feasibility. Any subsidies warranted to incentivize renewable energy development should be approved by State policy makers, i.e. the legislature and the governor. To the extent the state wants to encourage renewable energy development without mandates or incentives, legislation should be developed which enables utilities to offer renewable energy tariffs to their customers who want a greater share of renewable energy as part of their usage mix than is provided by the utility. Rocky Mountain Power is supportive of this concept and supports a thorough, holistic review of potential renewable tariffs for customers who want them. Currently, under its Blue Sky program, Rocky Mountain Power encourages customers to voluntarily purchase renewable energy certificates ("RECs") that represent the environmental attributes of electric power produced from renewable energy projects.

Because of Utah's world-class conventional and unconventional fossil fuel resources, the State possesses unique opportunities for attracting job growth in the areas of research, development, demonstration and deployment of new technology innovation through business relocation and start-up companies. While the State is making great strides through its Utah Science, Technology, and Research (USTAR) efforts in basic research and development, more investment and support is needed to take technology innovation to the next level using demonstration/pilot projects on the resources in Utah.



The State should continue to attract significant domestic and international investment funding. Such funding provides essential opportunities to help supplement the shortage of "seed" funding and second- and third-phase funding.

Utah can be a national leader in energy resource management, environmental and technical training. Utah's expertise in resource and environmental management has great potential to attract high-skilled, high-paying jobs.

In summary, Utah's energy jobs are in the research and development, investment, technology, exploration, extraction, development, production, transmission, distribution and manufacturing industries, as well as professional support services. These jobs help to support Utah's position of being one of three states in the United States that is a net exporter of energy. If coal-fired generation and hydroelectric resources decline, new and expanded industry and jobs will be needed in these rural communities. State government should promote continued state and federal land access for exploration, extraction and production of crude oil and natural gas, investment in unconventional fuels technologies and development and the recruitment of manufacturing of renewable energy production components. Utah must show an unwavering commitment to the future energy economy that includes balancing fossil fuel development with development of renewable and alternative energy.

V. ENERGY DEVELOPMENT AND OUR NATURAL RESOURCES

Utah has the resources necessary to diversify its energy portfolio to provide affordable, sustainable, and secure energy now and in the future. Utah's Energy Plan includes workable strategies to sustain its economy and protect its quality of life and environment.

A. Land Ownership

Federal Lands — The federal government owns and manages approximately 60% of Utah's surface lands and a larger portion of the mineral estate. Accordingly, federal land- management agencies will play a central role in the State's ability to develop its oil, gas, coal and renewable energy resources. It is also true that the State's public lands include pristine air sheds; national parks and wilderness areas; important water resources that are essential to local communities and wildlife habitat and riparian zones; world-renowned archeological and culturally significant sites; and, nationally recognized scenic areas and prized recreational locations. Conflicts inevitably arise between industry, conservation organizations, and state and local leaders over how and where energy development should occur on Utah's public lands and what resources should be protected for their environmental and cultural values. These conflicts have triggered costly legal and administrative challenges that impact energy development in Utah. Energy development is a legitimate use of our public lands. To be successful in achieving the Governor's energy-development objectives, Utah officials will need to develop

strategies to work with the federal agencies and navigate the balance between economic and environmental sustainability. Although some progress has been made in resolving conflicts on federal lands regarding energy exploration and development, many Utah officials who are active in this area believe that conflict resolution is still a long laborious process.

State Institutional Trust Lands Administration (SITLA) — At statehood, Congress granted Utah millions of acres of land to be held in trust by the new state to provide financial support for public schools. These school trust lands are managed by the School and Institutional Trust Lands Administration (SITLA). SITLA manages approximately 3.4 million surface acres. In addition, SITLA manages another 1 million split estate oil and gas acres. Revenue from school trust lands is deposited into the Permanent School Fund, a perpetual endowment that distributes income annually to each K-12 public school in Utah.

Energy development is the largest component of SITLA's contribution to education funding. The SITLA's greatest source of existing revenue, accounting for over half the revenue to the trust, is natural gas production, followed by coal. SITLA has leased over 90,000 acres of trust lands for oil shale exploration, with initial development of commercial projects beginning. SITLA also has an expanding renewable energy portfolio. Over 100,000 acres of geothermal leases are in place, and the first new geothermal power plant built in Utah in the last 20 years was constructed on state trust lands in Beaver County. Leases for utility-scale wind and photovoltaic solar projects are also in place. Finally, the unique Western Energy Hub project near Delta will be wholly located on trust lands. This project will store massive quantities of natural gas in engineered underground salt caverns, providing energy flexibility to industrial and power generation customers throughout the West. The Western Energy Hub project also contemplates developing underground compressed air energy storage, an innovative technology that can largely solve problems of intermittency with other renewable energy sources, thus supporting further development of wind and solar projects in Utah.

One critical issue for SITLA is access to and through federal public lands. The millions of acres of proposed wilderness in Utah have trapped over 1 million acres of state trust lands - almost 1/3 of the entire trust portfolio - in areas that are restrictively managed by the federal government, and to which access is highly limited. In the event that Congress and current and future administrations choose to continue managing federal public lands largely for wilderness, there needs to be an efficient legislative process for exchanging state trust lands out of proposed wilderness for consolidated blocks of federal land that can then be managed by SITLA for energy and economic development.

B. Air Quality

Much of Utah enjoys clean air for many days of the year. However, due to topography, weather patterns, and a highly urbanized population, Utah also suffers some of the worst air quality days in the Nation. It will be critical for human health and the environment and economic development to implement energy development in a way that takes this unique situation into account. Additionally, the Environmental Protection Agency (EPA), in implementing the Clean Air Act, is continuing to strengthen the Nation's air quality standards for most pollutants. This will result in higher costs for coal and natural gas plants.

The natural byproducts of burning coal and, to a lesser extent natural gas, include air pollutants permitted and regulated by the Clean Air Act: particulate matter, sulfur dioxide, and oxides of nitrogen. The emissions are permitted and regulated through the Clean Air Act.

Throughout the West, the energy-production sectors have been viewed as major contributors to visibility impairment, especially in the national parks. Recent plans to address regional haze have resulted in substantial controls on emissions of sulfur dioxide. The full implementation of the regional haze plans will result in additional improvements as emissions from electrical generation are reduced.

Oil and natural gas drilling and production may impact air pollution. The Uinta Basin has recently recorded elevated levels of wintertime ozone. If these levels continue, they may impact attainment of national ambient air quality standards. It may be that energy development contributes to the Uinta Basin's elevated ozone levels, although the causes of the high ozone readings are still being investigated. Monitoring from Vernal, Utah, indicates that fine particulate pollution may also be a problem in the winter with cold pool temperature inversions.[46]

C. Transportation and Air Quality

Transportation accounts for more than half of the air pollution along the Wasatch Front.[47] The combined criteria pollutant inventory for Davis, Salt Lake, Utah and Weber Counties in 2009 indicates that 51.9% of total an-

nual emissions of criteria pollutants originated from the on-road mobile sector (cars, trucks and buses). Ozone and PM2.5 are responsible for acute spikes in air pollution and unhealthy air days in Utah as confirmed by the Utah Division of Air Quality's (UDAQ) monitoring network along the Wasatch Front. Both ozone and PM2.5 emissions are related to on-road mobile sources. Ozone and PM2.5 are respiratory irritants that can trigger asthmatic episodes and cause acute respiratory symptoms in sensitive individuals at concentrations that approach and exceed the National Ambient Air Quality Standards. Both pollutants are statistically confirmed risk factors for a number of respiratory and cardiovascular conditions. Since acute spikes in concentrations of air contaminants are predictable based on reasonably reliable weather forecasts, it is particularly beneficial to eliminate all nonessential driving to protect personal and public health when the UDAQ announces its yellow and red action alert days.

Transportation is also the largest consumer of energy in Utah at 31%.[48] Saving energy and cleaning Utah's air will improve public health, thereby reducing costs. It will also bolster economic development efforts by helping to attract new companies and jobs, reduce Utah's dependence on foreign energy sources, and generally improve the quality of life of all Utahns. This can be accomplished through strategies that include changing the vehicles used or eliminating the energy used to power those vehicles; managing vehicle traffic with technology, engineering and community design; and finally, individual actions and business decisions. Implementation of these strategies should also include meaningful metrics for success, such as reducing particulate matter (PM2.5) and ozone levels in the air.

Utah should seek to improve vehicle technology/efficiency and alternative fuels (refueling) infrastructure. Utah can reduce emissions and non-attainment air-quality days by encouraging adoption of emission-reducing technologies. A barrier to increased alternative-fuel vehicle use is inadequate refueling infrastructure. The State should consider ways to incentivize alternative-fuel vehicles and to make refueling infrastructure more accessible.

Alternative-fuel vehicles proven to reduce vehicle emissions and increase fuel economy include electric, electric hybrids, bio-fuels, bio-diesel, propane, hydrogen, compressed and liquefied natural gas (CNG and LNG), and hydraulic hybrids, often with increased transportation costs. New technology continues to expand this list. Even gasoline- and diesel-powered vehicles are producing fewer emissions due to improving technology.

The State should continue its support of results-driven economically sound solutions and not favor one technology over others. However, reducing emissions and eliminating non-attainment days will depend on adoption of new technologies. If incentives are appropriate, they should be based on full-fuel-cycle efficiency since those technologies are the ones most likely to be developed and receive market support.

Fuel consumption and air pollution can be reduced through more efficient traffic flow, using engineering and technology to effectively manage all modes of traffic and maximizing the effectiveness of Utah's transportation systems. This includes continued implementation of proven ideas such as HOV/HOT lanes, reversible lanes, innovative intersection design, transit-vehicle signal pre-emption and signal coordination, especially during peak hours.

Strategic ideas such as dynamic speed control, peak-hour use of shoulders, and increasing Park-and-Ride lots (both private and public) should be reviewed. All traffic-operation plans should include a thorough evaluation of the proven energy-saving, air-quality and safety benefits of reduced speed limits.

Changing behavior is difficult, but communication strategies and tactics that provide awareness and education, supported by incentives, marketing and promotions can succeed in reducing unnecessary travel, particularly the number and duration of solo-driver trips. Existing programs like TravelWise, Rideshare and Idle-free, along with events like the Clear- the-Air-Challenge, Bike Month and Free-Fare Day are beginning to show effectiveness in promoting, encouraging, and ultimately increasing alternative-transportation use. Programs such as Safe Routes to Schools, Student Neighborhood Access Program (SNAP), and Walking School Bus, all of which encourage walking or pooling to schools, need more resources to increase awareness. It is critical to educate and promote the benefits of more energy-efficient transportation with such tools as the TravelWise Tracker.[49] The tracker allows people to measure the money, emissions, and energy saved by using TravelWise strategies.

The State could help reinforce and encourage behavior change by more public education about air-quality indicators and using electronic signage as triggers to promote transportation alternatives such as using public transit, telecommuting, flexible work hours, trip chaining, biking, walking, carpooling, vanpooling and work at home opportunities.

Many of the traffic-reducing strategies listed can be enhanced by business practices in the private and public sectors. Managers should implement policies that encourage and even coordinate ride sharing, telecommuting and flexible work schedules. Parking subsidies can be eliminated and given to employees as cash or transit passes. Above all, educational and promotional material should feature Utah's leaders at every level of state government and private business as examples of smart travel.

The State should assist communities in choosing land-use options that reduce per-capita energy consumption, improve air quality, and make it easier for people to get from one place to another. Utah's population is projected to double over the next 30 years, with vehicular travel increasing at twice that rate. As the population and economy grow, Utah has an opportunity and responsibility to design communities in ways that support energy-efficient transportation and commerce, reduce congestion and long commutes, and remove physical barriers to using public transportation. Vision Dixie[50] in Washington County and Envision Utah's Quality Growth Strategies[51] along the Wasatch Front are good examples of community input in the development of alternatives for transportation, infrastructure, land use, planning, and zoning.

The State should work with local government to entice people to walk and cycle more often by designing accessible, safe and interesting paths and destinations. Government services should be located in neighborhood centers that draw people by offering a variety of public services and private businesses. Neighborhood economic centers should reduce commutes by bringing jobs and housing closer together, with the added benefits of community cohesion and vitality. Seamless connections

should be made from these neighborhoods to mass/public transit.

Transportation costs can be further reduced by emphasizing new building construction in already-developed areas. Collectively known as walkable neighborhoods, transit-oriented development, and the "Envision Utah 3 Percent Strategy," these strategies are thoroughly examined in the summary document for Wasatch Choices 2040 Project[52] and are designed to respond to changing demographics, increasing energy use and market demand for more residential choices.

A better balance of regional travel choices between auto, public transit, bicycling and walking is imperative. Transportation's share of growing oil-consumption is a concern. Transportation accounts for approximately 25% of total energy demand worldwide (32% for Utah) and 81% of Utah's petroleum consumption.[53] Better load share among the available energy sources will be part of the solution.

In the process of allocating public funds for transportation, the priority should be projects that demonstrate the greatest science-based, long-term benefit. Mass transit should be given meaningful consideration. Providing more convenient, reliable and affordable travel options and infrastructure that supports biking and walking will reduce the amount of time people spend in their cars, saving energy and reducing air pollution.

As Utah provide a more balanced transportation system, it will need to expand pricing and land-use policies, well connected bikeways, and vehicle miles traveled (VMT) reduction strategies, throughout the region to support this system.

D. Water Consumption and Quality

Limited quantities of water may be available for new energy development. Most areas of the state are closed to new surface- and ground-water appropriations (especially new consumptive appropriations) and those that are still open are primarily for ground water in relatively small quantities. What little may be currently available will undoubtedly decline over the next decade.[54] Water currently used at other facilities or by other water users may be purchased for use in energy development in the future. This is how water resources were developed for the Huntington, Hunter, and IPP power plants. Technology and efficiency advances in the energy industry may provide additional water for existing power plants or reduce the demand for water at new power plants in the future.

Given Utah's population growth and projected economic growth over the next decade, the possibility of increased drought, and with limited new water resources available, water consumption of energy resources should be given careful consideration. The State of Utah may wish to calculate the water consumption associated with different energy portfolios that can meet projected electricity demand over the next decade.

As an arid state, an energy portfolio that encourages low water-use technologies should be considered. Importantly, power plants located in water-scarce regions may rely on dry cooling systems, which use air to cool and condense steam, or hybrid wet-dry cooling systems. Dry or hybrid cooling is typically a less-efficient means of power plant cooling than water, and thus typically increases the cost per kilowatt-hour of electricity. Dry or hybrid cooling can be more or less cost-effective, depending upon the type of electrical generation (nuclear, solar, etc.), and is not the current baseline technology.

The development of primary fuel sources such as oil, oil shale, tar sands, natural gas, and biofuels also consume water. Specific information on the water quantity and quality and the impacts of technology for developing many of these resources, particularly tar sands and oil shale, is limited. Additionally, the water used to develop biofuels can vary tremendously. There are currently a dozen or more different technologies under consideration for these fuel resources. It is unlikely that all technologies will be developed. Water issues, including water availability, water pollution effects of specific technologies, and potential pollution from spent shale waste sites, need to be evaluated as commercially viable technologies emerge and are developed.

In May 2009, the U.S. Department of Energy (DOE) published a report titled "State Oil and Natural Gas Regulations Designed to Protect Water Resources" from a study by the Ground Water Protection Council. This report identified key messages and suggested actions for regulating oil and gas activities, including hydraulic formation fracturing and coordination of State water-quality protection and oil and gas agencies. Utah already has most of these water-quality protection measures in place, including an MOU between the DEQ Division of Water Quality and the DNR Division of Oil, Gas and Mining, which was established in 1984 and updated in 1986 and 2010.

Additionally, the EPA has launched a Hydraulic Fracturing Study in order to assess potential impacts of this method of recovering natural gas on drinking water and human health. Study results should be released in 2012.

Nuclear wastes, including uranium mining, uranium milling, low-level, and high-level wastes, can impair surface and groundwater resources if they leak from impoundments and disposal sites. As with other waste-management units, best available technology combined with ground-water monitoring is used to minimize the discharge of contaminants from the waste source by applying control and containment technologies such as liners, leak-detection systems, leak-collection systems, and pump-back systems. These issues need to be reviewed regularly by DEQ, with remedial actions recommended if problems occur.

E. Archaeology

Energy extraction and transportation generally require construction and ground disturbance, which can be damaging to historic and archaeological resources. Federal and state statutes require the responsible agencies (e.g., land owners and permitting agencies) to consider the effects of their actions on cultural resources, and to allow the State Historic Preservation Office (SHPO) to comment. With advance planning, use of the state's web-based GIS database of archaeological and historic resources, and consultation with interested parties, along with on-the-ground survey, most of the potential conflicts can be avoided. Recent successes such as the West Tavaputs Programmatic Agreement and the Questar Pipeline Nine Mile Canyon Project demonstrate that energy development and transmission can occur without compromising fragile archaeological and historic resources. Advance planning, using the best available data, and inclusion of all interested parties, are critical components of a successful strategy.

F. Wildlife

Energy development has the potential to negatively impact wildlife, critical wildlife habitats and migration corridors. The most acute problem occurs when an energy project negatively impacts a federally-designated endangered, threatened or candidate species. One example is the potential for wind, solar, oil, gas, and coal bed methane development to negatively impact sage grouse and the sagebrush ecosystems they inhabit. Sage grouse inhabit numerous Utah energy-development sites and were recently designated by the US Fish and Wildlife Service as "candidate species" for Endangered Species Act Protection. Extensive study indicates energy-development-related activities may negatively impact sage grouse and critical sage grouse habitat. These impacts include tall-structure avoidance, habitat loss and fragmentation, predation, human disturbance, road networks, increased noise, reduced nesting success, effectiveness of vocalizations, lek attendance by males and females, shifts in nesting habitat selection away from energy-development infrastructure, and reduced sage grouse breeding populations.

The State of Utah, partnering with the Western Governors Association, is developing a Decision Support System (DSS) that will make crucial habitat and wildlife corridors available in the form of maps.[55] The State of Utah is also engaged in developing Best Management Practices approaches to reviewing energy projects. Conservation groups are compiling a series of Best Management Practices to assist land managers, conservationists, utilities and developers in the process of zoning, siting, building, and operating renewable energy installations in a way to minimally impact wildlife and their habitats. They are also identifying the highest priority areas for conservation and ecosystem services in the region and then using a blend of land offsets and mitigation strategies to attain "no net loss" of biodiversity values. The analysis of the specific impacts of new energy development on wildlife and critical wildlife habitats will need to be thoroughly assessed through science-based processes at the project-site level. Once impacts are avoided and minimized, remaining impacts must be mitigated and long-term wildlife monitoring implemented to measure mitigation success.

G. Carbon Management

As the debate on climate change continues, Utah must participate in this discussion to represent Utah's energy mix and to assist in developing complementary policies to address environmental pollutants. Congress and the last four administrations have not developed a policy on carbon emissions, and it seems less likely to occur in the immediate coming years. Uncertainties in possible future legislation impact decisions at the state level, including Utah, where decisions on energy projects totaling several billions of dollars will be made during the next decade. Local western utilities are including assumptions in their integrated resource plans on carbon emissions to help guarantee the plans reflect factors that may negatively impact the cost of energy. This is a risk-management exercise for them, and not an endorsement of what scientific factors should, or will be used to establish a national policy on carbon.

The EPA is moving forward with regulating Greenhouse Gases (GHGs) through the Clean Air Act. This is

based on the Endangerment finding, which includes six gases (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) - collective known GHGs. EPA's phased-in approach through the Tailoring Rule limits regulation initially to facilities already permitted and emitting at least 75,000 tons per year. The effect of this regulation will be increased cost to energy production and ultimately to the consumer - though cost estimates vary depending on source. Again, any such regulations should be accounted for when determining cost/benefit of future energy sources.

VI. ENERGY EFFICIENCY, CONSERVATION AND DEMAND-RESPONSE

The Governor and the Legislature have established energy efficiency as a priority and urged state and local governments and utilities to promote and encourage cost-effective energy efficiency and conservation.[56] Utah is making notable progress in energy-efficiency efforts and was recently recognized by the American Council for an Energy-Efficient Economy (ACEEE) as one of the "most improved" states and the highest-ranked in the region.[57]

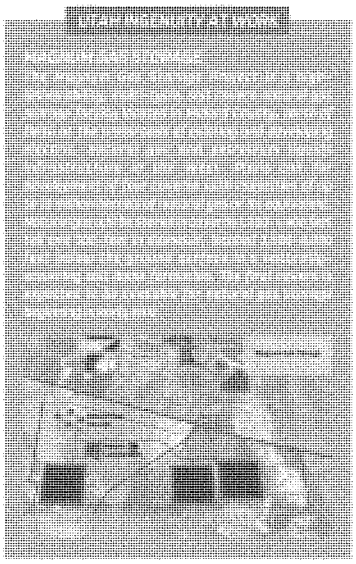
Models and studies recognize energy that is not consumed as a result of energy efficiency as a cost-effective resource. Recent national studies conducted by the McKinsey Company and the National Academy of Sciences show, respectively, cost-effective energy-efficiency technologies and building practices could reduce energy consumption 23% by 2020[58] and 30% by 2030.[59] These studies align with Utah-based analysis. Rocky Mountain Power and Questar Gas studies show that the maximum achievable cost-effective potential for energy efficiency would reduce natural gas consumption by 20% (21.4 million decatherms, Dth) by 2013[60] and electricity consumption by 1,641 GWh by 2020.[61]

A. Education and Public Awareness

A barrier to widespread adoption of energy efficiency and conservation is the lack of public and building official awareness and understanding about energy, energy-efficiency technologies, practices and programs. Rocky Mountain Power and Questar Gas have excellent energy-efficiency and demand-side management programs and effective marketing campaigns. Other energy-education efforts underway in Utah include some by municipal utilities and utility cooperatives, the State Energy Program, the Utah Building Energy Efficiency Strategies (UBEES) partnership, Utah's Weatherization and HEAT programs, and nonprofits such as Utah Clean Energy.

Public and building official's awareness could be increased through the following methods:

- Developing and implementing a State-sponsored, Governor-led, single-messaging communication program, modeled after the Slow the Flow and PowerForward programs, that works with existing utility efforts to raise public awareness and understanding about the importance, cost-effectiveness and risk management opportunities of energy efficiency and recognizes excellence in energy efficiency
- Requiring energy-code education as part of continuing-education credits for building officials, contractors, and trades; and providing funding and other incentives to local building departments



to train staff in the science of building energy demands, controls and efficiency and in code implementation and enforcement

- Increasing the minimum hiring standards for building-plan reviewers and inspectors to include energy-management degrees, certificates, IECC training or equivalent
- Educating home buyers regarding the importance of energy efficiency in general and providing specific information about the energy efficiency of homes they are building or buying
- Helping low income households to maximize energy efficiency and reduce energy impacts on household budgets

B. Demand Side Management and Load Control

While the impact energy efficiency can have is significant, it cannot entirely obviate the need for new production facilities, transmission lines, pipelines or transportation facilities. Each new customer added to a utility's system increases the demand on that system. In addition, demand is increasing as existing customers install high energy consumptive appliances, such as central air conditioners, large screen televisions and computer systems, etc. to their homes and businesses. Energy efficiency programs can contribute towards meeting this growth in demand.

Demand-side management (DSM) strategies enable energy users to reduce consumption during periods of peak demand. This reduces costs because of avoided or delayed investment in new electric generation and new natural gas supplies. Questar Gas's 2009 DSM programs confirm annual energy savings of 1,086,200 Dth, while Rocky Mountain Power's DSM Programs achieved 247.8 GWh of first year energy savings, or 1.2% of 2009 sales, in 2009.[62] In 2009, Rocky Mountain Power spent $45.6 million to acquire these savings. In addition, Rocky Mountain Power spent $12.5 million in 2009 to acquire 155.9 MW of load control resources.

For close to a decade, Rocky Mountain Power has worked with its customers to reduce electricity use through demand-response (load control) programs. By actively controlling specific equipment such as residential and small commercial air-conditioning and irrigation pumps, the utility is able to reduce the long-term need for new electricity generation. In 2010 Rocky Mountain Power had approximately 100,000 customers (roughly 25 - 28 percent of qualifying homes and businesses), representing over 112 megawatts, under direct load control. The company also had about 43 megawatts of irrigation pumps under direct load control. Customers participating in these programs allow, under terms and conditions approved by the Public Service Commission of Utah, Rocky Mountain Power to leverage the existing infrastructure by curtailing usage of customers' equipment (irrigation pumps and air conditioners) at times when demand for electricity is high.

The state could enhance DSM and load control programs by:

- Identifying innovative demand-response programs and removing barriers that limit participation in these programs
- Designing demand-response programs that have been shown to increase participation significantly

- Supporting increased participation in cost effective distributed generation

C. Industrial Sector

Utah industries currently benefit from energy prices among the lowest in the nation. While these prices have helped make the industries cost competitive, they also create a barrier for investment in energy efficiency, i.e., multi-state industries receive a higher return for investments made where energy prices are higher.

Possible strategies to advance energy efficiency in Utah's industrial sector include:

- Provide a well-designed and integrated technical assistance program, addressing both electrical and natural gas energy efficiency. It should leverage existing resources and new energy-efficiency/green-workforce training programs to include industrial energy management.
- Increase efforts to pursue energy-efficiency opportunities that involve recovering wasted energy to generate power. These opportunities could be evaluated for capturing energy otherwise unused in industrial processes.
- Encourage utilities and their regulators to continue or begin offering cost-effective programs to support industries' energy efficiency investments.

D. Financial Incentives

In many situations, incentives are sufficient to encourage industries, businesses, and residential consumers to pursue individual energy-efficiency measures, but barriers remain for obtaining significant energy savings on a whole-plant, whole-building or whole-house basis. Utah businesses and residential consumers used 13,944 GWh of electricity[63] and 103.8 million Dth of natural gas in 2009.[64] The utilities, as well as the State, could offer incentives to customers who retrofit or purchase high-efficiency appliances, motors, lighting, increased insulation, more energy-efficient windows, and other equipment. Home energy retrofit programs offered by the State and Salt Lake County also provide homeowner financing. Financing programs try to match the loan payment with the energy bill savings; however this is difficult with Utah's low energy costs. The State's Utah Home Performance program is based on the contractor delivering a whole package energy analysis, home improvement, and financing program to the homeowner. Salt Lake County's Energy Smart program is an interest rate subsidized loan program serviced by Community Development Corporation of Utah, a 501(c)(3) organization.

Additional financial incentives to be considered include:

- Provide tax credits, tax deductions and/or rebates to industries, businesses and home owners, landlords and condominium associations for investments made in energy efficient equipment, processes, retrofits, etc.
- Create a no/low-interest loan program for industrial energy-efficiency capital projects, such as that provided by the Colorado Governor's Energy Office, or providing a volume cap allocation for tax-exempt funding from the Olene Walker fund
- Include energy-efficiency and conservation requirements in state/local tax incentives for new businesses
- Consider a job-creation tax incentive for hiring resource efficiency/energy managers at industrial facilities
- Encourage banks to include evaluating energy costs as part of the mortgage application and develop low-interest loan services for energy-efficient retrofits, such as DOE's PowerSaver Loan Program
- Require a home energy rating for all homes listed for sale or rent

E. New Construction

New home and new commercial building design and construction should be energy efficient. Utah is one of the fastest growing states in the nation. As such, more than 198,000 residential building permits[65] and an estimated 22,000 commercial building permits have been issued over the last ten years, and construction continues even during the economic downturn. These new homes and buildings will be part of the Utah landscape for decades to come. It is critical that steps be taken to ensure these buildings incorporate cost-effective energy-efficiency measures at the time of construction rather than burdening owners and utilities with the cost of retrofits.

The State of Utah will continue to lead by example in energy efficiency. The Division of Facility Construction and Management (DFCM) established Leadership in Energy and Environmental Design (LEED) Silver certification as a minimum standard for all new

state-building construction. In 2010, DFCM also installed $4 million in renewable energy projects (mostly solar) with American Recovery and Reinvestment Act economic stimulus funding; established private/public partnerships with energy service companies (ESCOs) and utilities to fund energy efficiency improvements in existing buildings; benchmarked or tracked energy use in over 90% of large buildings under their management through EnergyStar's Portfolio Manager; used a re-commissioning platform for tuning up buildings; established a $2.5 million energy-efficiency revolving loan fund that is currently fully subscribed; established a statewide employee energy behavioral program "Think Energy" and employee E-teams; and continued to track the "Working 4 Utah" initiative that has shown a 10% energy use reduction.

Constructing buildings to current or above energy code standards reduces the occupant's energy costs and puts downward pressure on utility rates by deferring investment in new energy generation that would otherwise be needed to meet rising demand. Utah's commercial and residential buildings use 42% of its total energy, more than either the industrial or transportation sectors. Increasing energy efficiency in Utah's new buildings will potentially save $1.17 billion between 2001 and 2020.[66] The economic cost to builders to achieve such savings has not been determined and should be analyzed.

Building energy codes dictate minimum standards for the design and construction of all new and renovated buildings. The codes impact energy use for the life of the building. Utah's statewide building codes are adopted by the Legislature and enforced by local jurisdictions. Many Utah builders are effectively ensuring energy efficiency is a component of all new and retrofitted homes and buildings.

Energy codes are not effective if those codes aren't properly implemented by the design and construction industry or enforced by local building departments. To effectively do their jobs, everyone involved in building design, construction, plan-review and on-site enforcement must be aware of the latest building-science technologies and codes. Compliance tools and training materials that support energy codes are available through the U.S. Department of Energy's Building Energy Codes Program. The Utah State Energy Program, supported by Rocky Mountain Power and Questar Gas, provides energy code training. However, qualitative observations in 2010 reveal Utah's compliance rate could be improved.

The Task Force makes the following recommendations to improve energy efficiency in new construction:

- Encourage builders' participation in programs that encourage continued improvement. Voluntary programs that encourage more energy-efficient construction and renovation, such as EnergyStar for Homes, provide the opportunity for better-than-code products
- Use the most current Utah state energy code for both residential and commercial construction
- Improve and clarify the administrative feedback loop for code enforcement professionals between local jurisdictions and the Uniform Building Code Council, and develop a resolution process for consensus-based code enforcement disputes
- Approve development fees or allocating a portion of the DOPL's fund created from surcharges associated with construction as a funding source for energy-efficiency code enforcement at the local level
- Encourage and fund programs that provide whole-house and building systems energy analysis and significant whole-house or whole-building retrofits
- Encourage government and non-government organizations to utilize energy service companies as a financing mechanism for energy-efficient retrofits, re-commissioning, and ongoing commissioning

F. Regulatory Changes

Utah's regulatory framework is most effective in focusing its efforts on reducing overall energy consumption, managing peak loads through best practices, and supporting energy-efficiency and demand-response programs, consumer education, and utility rate design to promote energy efficiency and conservation. It is also important to ensure that utilities are not disadvantaged or economically harmed as a result of state energy and economic policy decisions. Utah's regulatory environment, consistent with Utah statutes governing its operations, has provided support and recovery of costs directly incurred by public utilities associated with cost-effective energy-efficiency and demand-response programs. Both Questar Gas and Rocky Mountain Power have robust and active advisory groups, established within Public Service Commission processes, to provide recommendations on program design, scope, and implementation. This collaborative effort is an important ingredient to the ongoing success and achievement of these programs. Ongoing work should:

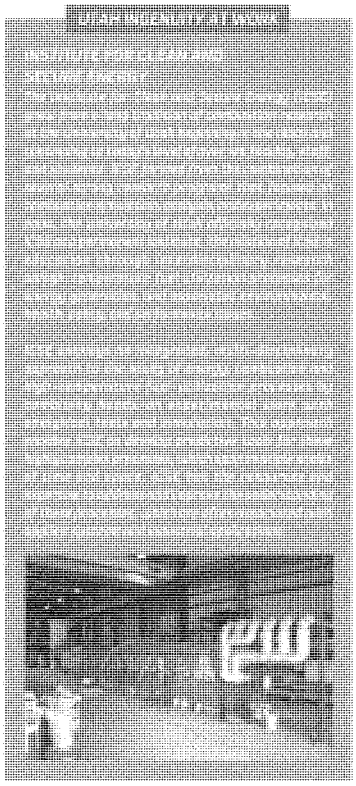
- Continue encouraging all customers and suppliers to pursue all cost-effective energy efficiency through its current regulatory culture
- Make greater efforts to ensure all system and environmental benefits provided by energy efficiency are fully and appropriately valued in the planning, acquisition and regulatory decisions. Likewise, the costs and challenges associated with energy efficiency should be fully and appropriately considered as well
- Consider establishing energy-efficiency targets and/or utility incentive programs for successful management of energy-efficiency and demand-side response programs
- Pursue additional analysis and evaluation of utility and ratepayer impacts of high- efficiency scenarios
- Consider rate recovery mechanisms that balance the first-year costs of energy-efficiency programs while benefits are accrued across many years. Alternative rate recovery mechanisms may be necessary to give energy-efficiency resources comparable treatment to supply-side generation resources that are amortized over multiple years. Impacts this approach may have on a utility's financial condition should be considered as part of this effort.

VII. TRANSMISSION, INFRASTRUCTURE AND TRANSPORTATION

Historically, energy producers have focused on providing competitive costs while balancing other factors and risks. Increasingly other requirements and public policy objectives have become more predominant in thinking about the new energy economy and climate change. Infrastructure providers find themselves caught between customers who have become accustomed to low energy costs and continue to demand low costs, and those policies that promote renewable energy, conservation and the green economy with the potential for incrementally higher energy costs.

In Utah, peak demand for electricity rose steadily through the 1990s, with significant increases in the years prior to 2008. While growth has slowed significantly, consumer demand for electricity is still growing. The demand for natural gas has followed a similar path since natural gas is now increasingly being used for electricity and faces the same challenges.

Electric and natural gas transmission is a key part of any state's overall energy policy, but it is the most difficult component of the energy delivery system to construct. Long planning timelines, large geographic footprint, complex permitting from multiple jurisdictions and huge capital costs make energy transmission



the most complex and highest risk enterprise an electric utility can undertake. Regardless of the energy policy selected, the mix of generating resources utilized-fossil fuels, nuclear, wind, solar or geothermal-all require robust transmission capacity to move electricity and natural gas to where customers need it.

Electrical transmission is accomplished by above-ground high voltage lines. The last major additions to the electric transmission network in the Western U.S. were made some 20-30 years ago. While some companies have begun major transmission additions or proposed major projects, the huge capital cost of transmission is a barrier to new investment. Because State policies still require that most transmission construction costs be borne by the retail customers of the load serving entity that construct them, few investor- or consumer-owned utilities have committed the large capital investment required for such projects, despite a pressing need. Likewise, private investors have been reluctant to propose projects of their own or commit funding to projects proposed by others.

During the summer of 2009 Rocky Mountain Power served approximately 85% of the total electrical peak demand in the State of Utah.[67] The peak demand in the Wasatch Front of Utah (Ogden area to Spanish Fork area) is 80% of the peak electrical demand for the entire State. This area is Rocky Mountain Power's largest and highest density urban load center. It also represents some of the Company's greatest challenges in providing safe, adequate and reliable transmission service due to large population and established communities, land use (both existing and future planned), and the limited geography available to site and construct transportation facilities.

There are approximately 150 electrical interconnection points to Rocky Mountain Power's transmission system alone. The Company provides transmission services to more than eight other transmission owners and load serving entities. There are eight major electrical transmission paths that interconnect the State of Utah to bordering states. All of these existing paths are currently fully subscribed for transmission usage and have constraints and limits regarding their ability to serve the State long term.

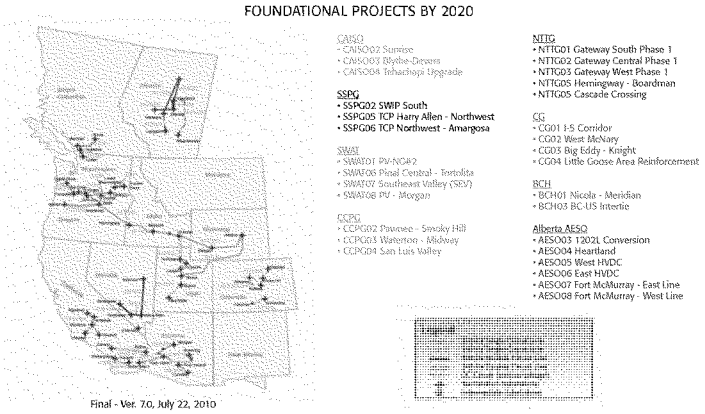


Figure 4. Proposed western foundational transmission projects by 2020. Western Electricity Coordinating Council.

Figure 4 is a map of planned electrical transmission projects (Foundational Projects) currently in the Regional planning review process within the Western Electricity Coordinating Council (WECC)[58] and projected to be developed over the next 10 years. These projects are being proposed by a number of sponsors, including electric utilities and independent power producers and private investors. Utah's transmission plan should be developed in coordination with sub-regional and WECC transmission plans, and Utah should work with other states/provinces in the Western Interconnection to capitalize on synergies among transmission development in other states/provinces.

Natural gas transmission is accomplished by underground pipes, which have seen dramatic growth in the last 30 years. Natural gas export capacity from the Rockies has increased from 1.8 MMcf/day in 1980 to 8.1 MMcf/day in 2010. With the addition of the Ruby Pipeline and the Kern River expansion, which are scheduled to be completed in 2011, pipeline export capacity in the Rockies will be 10.4 MMcf/day. Pipeline transmission capacity inside Utah has dramatically increased as well, with new transmission capacity from Questar Pipeline and Kern River Pipeline. Questar Gas is also spending significant capital to replace and expand intrastate high-pressure feeder lines. Tables 5 and 6 provide more detailed information. Whether Utah is a net importer or exporter of natural gas in the future is dependent on development of resources in-state and regional and national market forces.

Transmission of coal and gasoline are typically by train or truck. Leaks in oil pipelines in the Salt Lake Valley have been of particular concern.

Table 5

Existing natural gas transmission and distribution pipelines in Utah. Source: Questar Gas.

Pipeline	Miles of Gas Transmission Pipeline	Miles of Gas Distribution Pipeline	Total Miles of Gas Pipeline	Utah Interstate Pipeline Interconnections
Kern River	[illegible]	[illegible]	[illegible]	[illegible]
Northwest Pipeline	[illegible]		[illegible]	[illegible]
Questar Pipeline	[illegible]		[illegible]	[illegible]
Questar Gas[a]	[illegible]	[illegible]	[illegible]	[illegible]
Total Company Transmission	[illegible]	[illegible]	[illegible]	[illegible]
Total Transmission Gas[b]	[illegible]			

Table 6

Proposed transmission pipelines in Utah. Source: Questar Gas.

Pipeline	Project Name	Miles of Gas Transmission Pipeline	Pipe Diameter	In Service Date	Description
Kern River	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Questar Pipeline	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
El Paso Natural Gas	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

To develop renewable energy projects within the State's borders, additional transmission capacity would need to be built. To build a clean energy economy, gain more energy independence and promote development and jobs, Utah will need to develop its own large-scale renewable energy projects. A major obstacle to getting these sources on the grid is the availability of transmission to collect the output of these renewable resources from remote locations. Utah's regulatory framework is not currently set up to make this possible.

Potential barriers to transmission infrastructure development include financing, integrated planning across all levels of government and permitting procedures. Funding methods, sources, and options need to be explored and implemented, while building on previous state-based efforts. A long-range transmission feasibility study of a large-scale renewable energy projects in the state should be considered. Such a plan would include significant stakeholder input upfront. Substantial public and private sector participation, combined with the utilization of natural and cultural resource data early in planning and budgeting can help secure as much public support as possible. This, in turn, would reduce the probabilities of suits against any future projects that may be built as a result of the plan, facilitate permitting, and produce more efficient siting and mitigation practices, thereby saving time and resources.

With the projected increase in travel and population, there is a need to expand the State transportation system, as defined in the Utah Long Range Plan. The Utah Department of Transportation (UDOT) maintains over 6,000 miles of highway infrastructure and 35,000 miles of road within the State of Utah. Currently there are 1.6 million drivers. This number is expected to grow 65% to 2.6 million by 2030. Population is expected to grow from 2.5 million residents to 4.1 million residents by 2030. See Figure 5. The amount of travel has increased faster than the rate of growth of the population. UDOT estimates that it will require $10.2 billion between now and 2030 to maintain the physical condition of the highway system at its current level.

There may be opportunities to both improve the energy transmission network and the transportation system that offers both overall efficiencies and reduced impacts through better coordination and planning.

RECOMMENDATIONS TO SUPPORT TRANSMISSION DEVELOPMENT:

Consider alternatives to current regulation and funding sources to encourage transmission line and pipeline construction in areas that promote economic development or renewable and alternative energy resource development. State economic regulation requires that investments be prudently made, competitive cost (risk adjusted) and used and useful for existing and future customers. Federal and state regulation requires nondiscriminatory application of all tariffs to transmission users. If stakeholders decide it is in Utah's best interest,

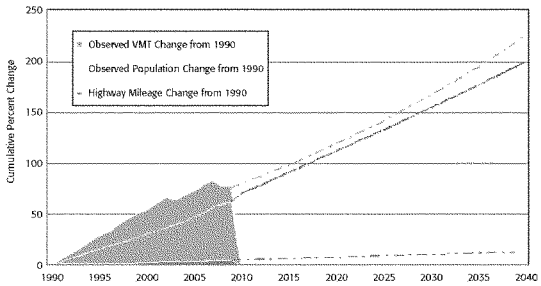


Figure 5. Comparison of population growth, increase in vehicle miles traveled, highway mileage change in Utah. Utah Department of Transportation.

legislation could be developed that creates a state authority and funding vehicle that would be granted to transmission companies or developers to build lines that are found to be not economic by state utility regulators.

The State needs a clear process for siting and permitting transmission infrastructure projects. Local opposition can impede the development of infrastructure projects, which are critical and vital for the economic health of the State and its communities. Review the authority for the Utility Facility Siting Board that would specifically address local zoning and conditional use requirements and determine modified language that would allow the Board to review proposed permitting requirements.

Inadequate coordination among state agencies involved in siting and permitting activities can impede the development of infrastructure projects. There are competing requirements and lack of standard policies relating to linear facilities within various State agencies. Strengthen the State infrastructure departments mission and support, review all state agencies' roles in successfully completing facilities development, and consider options for better coordination among state and federal agencies.

Public interest multiple infrastructure corridors cannot be secured without funding and right-of-way acquisition. Infrastructure providers do not generally have mechanisms to acquire future rights-of-way that meet state law and provide a return on that long term investment. Develop funding methods to acquire long-term multiple infrastructure corridors. Review the statutory framework to identify options to provide funding to acquire Utah interest in joint corridors.

Infrastructure should be built in a way to minimize environmental and social impacts. Federal, state and private land owners often prefer impacts to be located elsewhere. Work with the Governor's office to create a forum to balance infrastructure and the environment in the management of public and private lands. Create a team to develop specific language and recommendations that the State can take to federal land managers.

Encourage strong energy efficiency, demand-side management measures and distributed generation to minimize the need to build additional transmission. Fixed cost recovery is a problem and stakeholders disagree on the appropriate level of spending on demand side management measures. Create a multi-dimensional stakeholder group to further discuss the issues. Utilities work with stakeholders to develop policies that encourage demand reduction and energy efficiency participation at optimal levels. Consider policy changes recommended by the stakeholder group.

VII. DEVELOPING AND APPLYING TECHNOLOGY AND SCIENCE

Utah's heavy reliance on fossil fuels, coupled with rapid growth in the demand for energy and new environmental regulations, calls for a strategic energy plan to secure Utah's energy future. To stimulate economic growth, protect the environment, and develop the State's vast energy resources, Utah must invest in its energy research and development infrastructure and improve coordination of the State's research universities, national energy laboratories, energy research and development industry, energy-related university spin-off companies and other key partners to collectively contribute to the

development and deployment of energy technologies and work force capabilities.

Access to low-cost energy is a key incentive for businesses to expand in Utah and to locate in the State. However, Utah is facing a potential risk from carbon and green-house gas emission legislation on the cost of electricity in the state. Rapid growth in the demand for energy, coupled with new environmental regulations, will lead to higher costs for energy, which in turn could negatively impact the State's competitive position for job creation, as well as business attraction and retention.[69] While the electricity in Utah is primarily generated from fossil fuels, accounting for 96 percent of Utah's total energy production in 2009, a significant portion of this generation is exported to other states. Electric power providers serve the State with a portfolio of resources (coal, natural gas, hydroelectric, wind, geothermal, purchased power, etc.) that are included in customers' electricity prices and mitigate the exposure to economic effects of federal regulation of carbon dioxide and other greenhouse gas emissions. Development of new energy resources is becoming increasingly costly and challenging while Utah's energy demand growth, competition for water resources and air quality issues place additional upward pressure on energy prices. While the state's energy costs will continue to increase, other states will likely also experience similar pressures.

To address these challenges and take advantage of its vast energy resources and talented workforce, Utah will have to take several key steps:

- Enhance the State's energy research facilities and continue to attract world-class researchers to the state

- Align the State's main research universities - University of Utah (U of U), Utah State (USU) and Brigham Young University (BYU) - into a powerful energy research and development triangle
- Connect this "Research Triangle" with global industry, national laboratories and regional universities to effectively commercialize new energy technologies and develop Utah's conventional, alternative and renewable energy resources
- Empower Utah's education system to expand its ability to train, attract and retain the skilled talent necessary to grow Utah's energy economy

Utah's Research Triangle will optimize the role of the U of U, USU, and BYU as innovation leaders in energy economy. The faculty, staff, students, and facilities are engaged and respected on a global basis, and Utah's research universities are among the nation's leaders in many areas of energy research and development. Their separate capabilities are impressive, yet their efforts could be more effective, through increased collaboration. The research universities investment in developing and deploying energy technologies includes research faculty and programs; research labs and related infrastructure; commercialization offices; and coordination with industry, national labs, regional universities, and State commercialization and economic development agencies. The research universities will also work closely with Utah's other universities, such as Weber State University, Utah Valley University and Southern Utah University, where notable energy research initiatives have already been established.

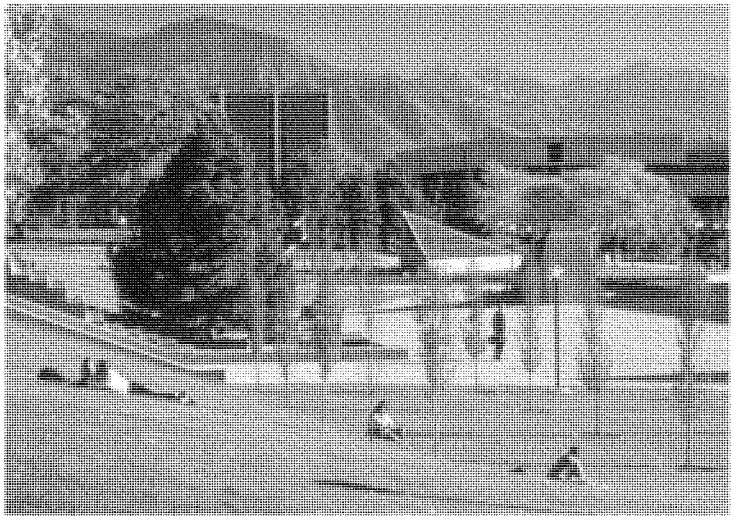
Utah's Research Triangle is well connected nationally and internationally and has access to regional energy industry technology leaders with a global reputation for implementing and commercializing technologies developed within the Research Triangle. Closer collaboration between Utah's research universities, industry, national labs and state agencies will help achieve even greater returns on Utah's investment in energy research and development. Improved collaboration will also improve deployment of technology to develop Utah's natural energy resources affordably with minimal environmental impact. Additional information regarding specific research at the universities is also available in the Subcommittee's full report.[70]

A. The University of Utah

The University of Utah (U of U) is Utah's largest research institution and is ranked among the top 30 public research universities in the nation. Best known for its health sciences research, the U of U has also established itself as a leader in energy research. The U of U is home to two of the nation's leading energy research institutions, the Energy & Geoscience Institute (EGI) and the Institute for Clean and Secure Energy (ICSE). EGI is a leader in fossil fuel, geothermal and carbon sequestration research. EGI research projects cover the globe and 70 of the world's leading energy companies support its research. EGI is continuing to expand both its applied research in hydrocarbons, as well as geothermal and carbon management applications for both government and industry. ICSE is a leader in fossil fuel combustion, gasification and computer modeling research. ICSE utilizes its impressive off-campus pilot-scale research facilities, and partners with industry to commercialize new technologies for responsibly utilizing conventional and unconventional fossil fuel and biomass resources. ICSE's carbon mitigation program includes oxyfuel combustion, chemical looping and gasification. The University of Utah also has emerging energy research programs in such areas as solar power, renewable energy storage, biofuels and smart-grid technologies. The Technology Commercialization Office at The University of Utah manages the commercialization of energy technologies produced at the university. The University of Utah will work closely with the Energy Commercialization Center to promote its successful model for bringing university-based renewable energy and energy efficiency technologies to market.

B. Utah State University

Utah State University (USU) is Utah's land-grant institution and home to several world-class research, development, demonstration and deployment platforms. USU is proficient in the areas of natural resource



management and mitigation, agricultural development, animal and veterinary science and water resource management. Further, the University plays host to Energy Dynamics Laboratory, Colleges of Engineering and Science which are national leaders in bio-fuels, environmental monitoring and sensing, waste-water treatment, hybrid energy systems, electrical engineering, nuclear, geothermal, and wind profiling. USU also has the ability to address environmental issues and socio-economic issues. Finally, USU is a world leader in the area of space sensing and imaging, with a 50-year history of designing, engineering, constructing, calibrating and deploying satellites and sensing equipment for NASA, JPL, and US Department of Defense. Much of this work is now being brought to bear on terrestrial efforts related to weather, environment and energy both in the academic and commercial areas. The USU Technology Commercialization Office is tasked with commercializing USU energy technologies. USU is uniquely equipped to test and deploy energy technologies in rural Utah through its rural partnerships and extension program. USU has just opened the Bingham Energy Research Center in the Uintah Basin; the center serves as a research center and to educate the workforce in energy-related careers.

C. Brigham Young University

Brigham Young University (BYU) is a private university engaged in substantial research and commercialization activities regarding environmentally sound energy resources. Research is both applied and academic with considerable strength in combustion, biomass, gasification, clean coal, and carbon management. Central to BYU's capability is the Advanced Combustion Engineering Research Center (ACERC) and the Technology Transfer Office (TTO). The ACERC has a global reputation for modeling and experimental work on clean coal combustion and has expanded to focus on sustainable energy. The TTO is a national leader in commercializing technology and products efficiently. BYU also has numerous initiatives in hybrid energy technologies and carbon management with expertise and intellectual property in both carbon capture and storage.

D. Research Partners

Utah's research universities seek closer research collaboration with all of the Nation's laboratories. In particular, the Idaho National Laboratory (INL) is collaborating with the State's universities on numerous projects and has established a formal relationship with USU. The Research Triangle can benefit greatly by expanding this relationship with INL, as well as pursuing collaboration with additional Department of Energy national assets in the region and energy space such as Los Alamos, National Renewable Energy Laboratory, Oakridge National Laboratory, National Energy Technology Laboratory, and others.

INL, with its headquarters in southeastern Idaho, is one of ten multi-program national laboratories. It is a unique resource serving as one of America's premier energy research laboratories with a mission to develop and advance clean, smart and secure energy systems essential to national security, economic prosperity and environmental sustainability. INL has lead responsibilities for the Nation in nuclear energy research but also engages in research regarding development of fossil, renewable, and integrated energy systems. In particular, INL is conducting applied research and demonstration, helping to reduce the risks associated with deployment of innovative energy technology.

INL is dedicated to collaborating with regional research institutions, government, and industry in addressing current and anticipated energy challenges. As part of this effort, INL has been building key relationships in the Western Energy Corridor, a transnational region containing world-class energy resources strategic to North American energy security and regional economic development. Utah is key to the Corridor and hosts many of these resources.

Utah's energy industry research and development leads in such fields as geo-mechanics, new material technology and clean coal technologies. Examples of the leaders developing technology in the State include TerraTek, Ceramatec and Combustion Resources. TerraTek is a global leader in geo-mechanics laboratory testing and analysis provides multidisciplinary expertise in geosciences and engineering. Its expertise lies in unconventional gas recovery, drilling and completions performance, core-log integration and rock mechanics. Ceramatec is a national leader in developing new materials technology for the energy industry. Its focus is energy and environmental (clean-tech) areas, including industrial applications of ionic conducting ceramics and electrochemistry and fuel reformation and synthesis. Regionally, Combustion Resources' clean coke demonstration plant converts regional carbonaceous materials such as coal, coke fines, and chars into high-grade metallurgical coke.

Utah is blessed with regional universities and colleges that grant bachelor degrees in science, technology, engineering, math, and commercial subjects that support energy producers, users, and research with a skilled work force. These institutions provide for a full spectrum of training from high school through post-doctoral education.

The eight Utah College of Applied Technology (UCAT) campuses, Salt Lake Community College, and other institutions of higher education offering energy-related technical training fill an essential role in developing and maintaining a technically-trained Utah workforce. These institutions focus on the safety, regulatory, implementation, production and other technical certifications that energy employees must possess. Typically, several technically-trained employees function as support to each researcher and engineer in the energy industry occupations.

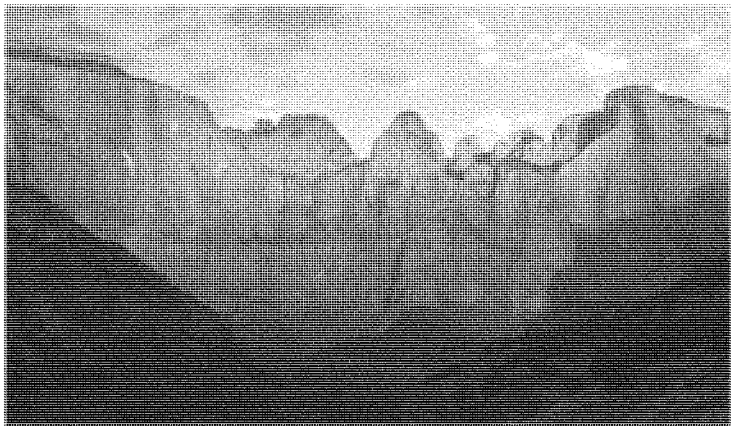
E. Research Initiatives

- The U of U, USU, and BYU should collaborate and optimize research capabilities and efforts. Recognizing the accomplishments and addressing the challenges of this collaboration will be the focus of semi-annual meetings convened by the Governor's senior energy official and attended by each university's senior energy research official at the State Capitol.
- INL should be invited to provide a senior staff member to participate in the Utah Research Triangle semi-annual meetings. Other national laboratories may be invited in the future.
- The Research Triangle will review the report and conclusions of the Utah Cluster Acceleration Partnership and implement findings appropriate to optimizing the welfare of the State of Utah and regional partners. The Utah Cluster Acceleration Partnership has worked extensively with industry, academia, and government to accelerate and support the expansion of Utah's energy industry and to fashion a well-trained workforce possessing the critical skills needed by this industry.
- The Research Triangle will expand its interaction with regional technology leaders through collaborative efforts lead by the Governor's senior energy official and senior energy research official from each of the

Universities towards commercialization and implementation of technology to meet Utah's energy challenges.

- Directed by the Governor's senior energy official and senior energy research official from each university, the team will collaborate with industry to form plausible solutions to energy challenges. The efforts include collaboration with Idaho National Laboratory and the Utah Cluster Acceleration Partnership to encourage energy career trainings and skilled workforce. To implement this recommendation, on an annual basis, the research universities will alternately host a Utah Energy Symposium to present topics related to Utah energy resources, reserves, new developments, new installations and facilities, and other emerging topics.
- Funding that encourages collaborative efforts in the research and development community is currently insufficient to promote and enable significant collaborative research. The Governor's senior energy official and the senior research official associated with energy at each of the universities will propose appropriate budget items at the state and federal level specifically focused on promoting cooperation between the Research Triangle in energy research and technology.
- The Department of Energy's national laboratories present significant opportunities to collaborate on critical research and development needs for the State, region, and Nation. The Research Triangle should expand its interaction with Department of Energy national laboratories ,and specific funding should be identified to promote opportunities for appropriate collaboration in the State and Nation's interest.
- Utah is positioned with natural resources, research institutions, capable industry, and regional support to conduct meaningful demonstration scale projects that can lead to cost effective commercial and environmentally sound energy development. Demonstration-scale research projects supported by the State of Utah should be conducted by unprecedented partnerships between the Research Triangle, national laboratories, industry, and the public sector to capitalize on the region's rich resources to meet the region's energy needs in an environmentally sensitive manner.

Implementation of these recommendations will significantly improve Utah's energy research, development and deployment performance and foster unprecedented collaboration between academia, government, laboratories, and industry.



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Ted Rampton, Utah Association of Municipal Power Systems
Mark Richards, Intermountain Wind and Solar
Clarence Rockwell, Navajo Utah Commission
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FOOTNOTES

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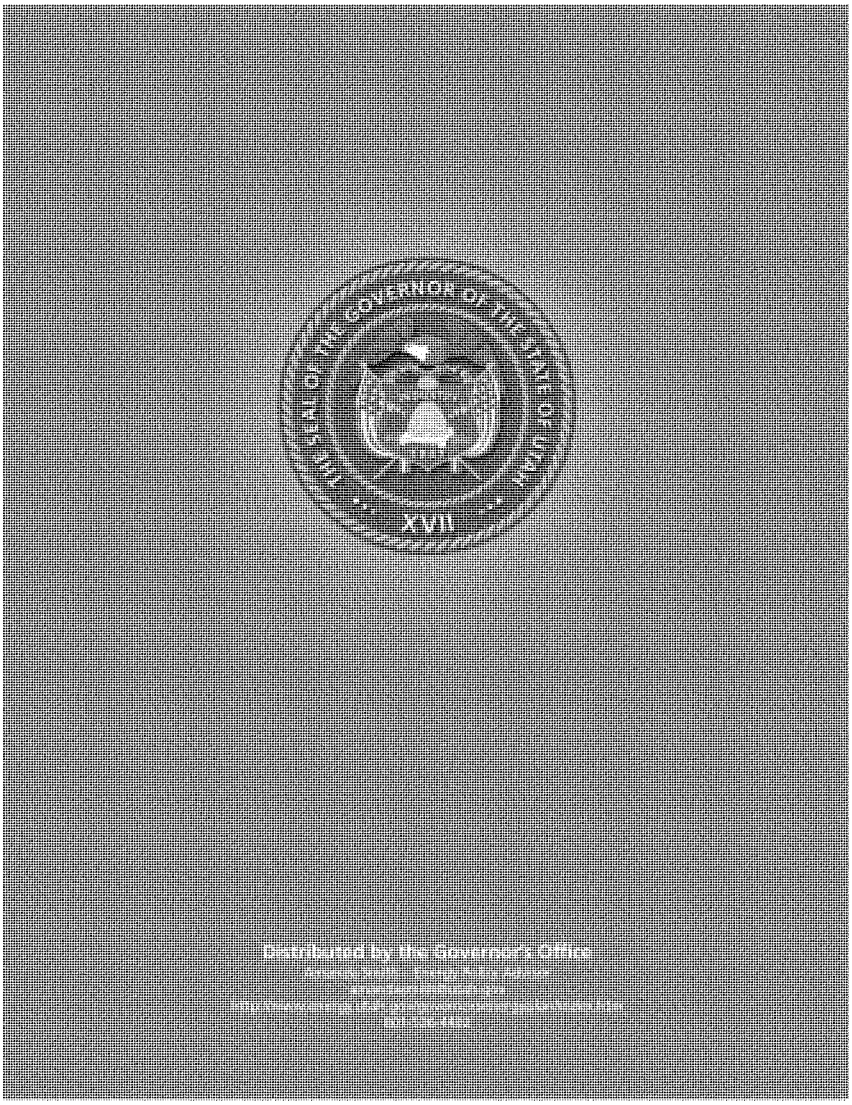

Prepared by the Governor's Office

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PUBLIC LANDS POLICY COORDINATION OFFICE

KATHLEEN CLARKE
Director

May 4, 2012

Bob Abbey
Director
Bureau of Land Management
1849 C Street NW, Rm. 5665
Washington, D.C., 20240

Re: Draft Programmatic Environmental Impact Statement
Possible Land Use Plan Amendments for Oil Shale and Tar Sands
77 FR 5833

Dear Director Abbey:

Oil shale and tar sands are vital to the future economic and energy balance for the State of Utah and the nation as a whole. Governor Herbert's Ten Year Energy Plan outlines strategies and objectives to facilitate balanced, responsible development of Utah's energy resources, [including oil shale and tar sands][1].The United States Geological Survey estimates that oil shale lands in Utah contain 1.32 trillion barrels of recoverable oil equivalent [2]. A viable, commercial scale and privately funded oil shale and tar sands industry is underway in Utah today, so it is with extreme disappointment and displeasure that the state sees the BLM in full retreat regarding the establishment of a complete commercial leasing program for oil shale and tar sands. This retreat is represented by the Preferred Alternative proposed for adoption in the Draft Programmatic Environmental Impact Statement. The Preferred Alternative proposes to reduce the lands available for leasing and to pull back to a Research Development and Demonstration (RD&D) program that does not meet the ultimate requirements of the law. In addition. the issuance in May of proposed rules to eliminate the existing royalty rate for the commercial leasing of oil shale will further erode implementation of a full leasing program as required under the Energy Policy Act of 2005. . These proposed changes to the 2008 allocation decision for the availability of land and the commercial leasing program are in direct opposition to the laws,

[1] http://www.utah.gov/governor/docs/10year-strategic-energy.pdf,
[2] Assessment of In-Place Oil Shale Resources of the Green River Formation, WY, CO and UT, USGS June 2011

plans and policies of state and local governments. The state will vigorously oppose these proposed changes to the current oil shale and tar sands program.

The state participated fully in BLM's 2008 NEPA analysis regarding the availability of lands for the leasing of oil shale and tar sands and the structure of a potential leasing program, as required by the Energy Policy Act of 2005. This process concluded with a Record of Decision in 2008 allocating certain lands through the BLM's Resource Management Plans as available for leasing The BLM also established the basic framework for a leasing program through adoption of leasing regulations, now found at 43 C.F.R Part 3900. (See 73 FR 69414, November 18, 2008) The state concluded its review of this earlier effort with the conclusion that the proposed RMP amendments were consistent with state law, policy and programs, as required under provisions of the Federal Land Policy and Management Act, and expressed full support for the establishment of a commercial leasing program.

Despite the adequacy and sufficiency of the previous Record of Decision and supporting documentation prepared under the provisions of the National Environmental Policy Act, the BLM has reversed the sound decisions it made in the2008 ROD. The decision to significantly reduce lands available for leasing appears to be predicated on the terms of a Settlement Agreement ("Agreement")drafted in response to litigation[3] brought by parties antagonistic to the development of adequate and sufficient domestic sources of energy. The BLM declares that this revisit of its previous decision is based on the need to take a "fresh look" at the land allocations made in the 2008 NEPA analysis in light of "new information which has emerged since the 2008 OSTS PEIS was prepared."[4] The Settlement Agreement states that BLM must publish a Notice of Intent to consider amending each of the land use planning decisions made by the 2008 OSTS ROD, including alternatives that met the plaintiff's goals. These goals, in general, require that BLM have the option to reject a commercial lease based upon "environmental or other resource considerations," and have the option to decline to offer a commercial lease unless it can be shown that "operations can occur without unacceptable environmental risk."[5]

Nowhere in the terms of the Settlement Agreement is there a requirement that the BLM select an alternative that furthers the goals of the plaintiffs. The BLM has misconstrued the intent of the Agreement and abrogated its decision- making responsibilities in favor of an alternative that it was only required to consider, not select.

In furtherance of the Settlement Agreement, the BLM proposes to eliminate the current provisions of the commercial leasing program in favor of a Research and Development program, reduce the amount of acreage available for leasing, and, shortly after the current period to comment on the DPEIS is closed, offer another rulemaking which will propose to "remove the royalty rate for oil shale production."6 The eleven day period between the closing of the comment period for the DPEIS and the potential publication of royalty rate provisions affecting oil shale and tar sands does not allow cooperating agencies the chance to include royalty rate and

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[3] *Colorado Environmental Coalition, et. al. v. Salazar*, Civil Action No. 09-cv-00091-JLK, Colorado.

[4] See Executive Summary page 1-1, 1-4

[5] Defendants' and Plaintiffs' Joint Motion to Administratively Close the Case, *Colo Env. Coalition v. Salazar*, page 3.

[6] *Id.*

commercial leasing aspects into their comments, thereby impermissibly segmenting the proposed rulemaking as envisioned by Congress. For this reason, the state requested an extension of the comment period, and advises the BLM that it expects the comments upon any proposed royalty rate adjustment be incorporated into the analysis of the issues within the DPEIS.

Summary of the DPEIS Review

The state has reviewed the Draft Programmatic Environmental Impact Statement accompanying BLM's current proposal. The state finds that the information contained within the DPEIS is procedurally deficient and cannot support the proposed Resource Plan Amendments Specifically, the state finds that the BLM has not been diligent in locating and considering information generated since the 2008 Record of Decision. This is unacceptable, particularly given the case with which this information may be obtained. The State of Utah finds that the DPEIS is incomplete, biased and does not meet the required "hard look" purpose of the National Environmental Policy Act. Any final EIS based upon the provisions contained in this Draft cannot support a decision by the BLM which would alter the provisions in the 2008 ROD concerning the availability of lands for oil shale and tar sands leasing. Decisions based on analyses in the DPEIS will be arbitrary and capricious as a matter of law, and will not be consistent with state law, policy or procedures if the Preferred Alternative, as identified in the DPEIS, is chosen as the final decision.

As a general point of discussion, documents currently prepared under the provisions of the National Environmental Policy Act have evolved in recent years into a format which is staggering in its ability to obfuscate information. These documents are so convoluted that the reader is unable to discern the validity and adequacy of the NEPA analysis on which the agency bases its conclusions, especially in the short time frame provided. Nonetheless, the state has been able to discern the following salient facts and identify a singular bias by BLM against information supporting the viability of the oil shale and tar sands industries, and local and state economies, instead favoring a particularly antagonistic position towards oil shale and tar sands development.

Focus of the Current Proposal

The Executive Summary for the DPEIS states BLM has decided to take a "fresh look" at the land allocations made in the 2008 review based upon the Settlement Agreement and upon "new information which has emerged since the 2008 OSTS PEIS was prepared." (ES-1) BLM further refines this fresh look to include a reconsideration of the 2008 allocations and determine whether it is "appropriate for approximately 2,000,000 acres to remain available for potential development of oil shale," with an equivalent decision for tar sands.[7] The BLM states that the reason for this reconsideration is specifically 1) the need to review new inventories for lands having wilderness characteristics, 2) the March 2010 decision of the Fish and Wildlife Service concerning sage grouse, and 3) the completion of studies related to Areas of Critical Environmental Concern (ACECs).

[7] Executive Summary, p. ES-1,

In a related action required under the Settlement Agreement, the BLM will propose amendments to the oil shale final rule to remove the royalty rate codified in BLM regulation (43 CFR 3903.52) and perhaps propose alternative adjustments to the royalty rate. These proposed royalty rate adjustments are not scheduled to be made public until mid-May 2012, after the comment period for the DPEIS has concluded.

As discussed further below, the state finds that there is no new information concerning lands with wilderness characteristics in Utah beyond that considered for the 2008 Oil Shale EIS or the 2008 Resource Management Plans. Management for Sage grouse and its habitat is being addressed through a massive effort by the affected states, the BLM, the Forest Service, and the U.S. Fish and Wildlife Service, with these efforts determining the needs of the species and the means to balance species protections with provisions for human needs. Any proposed discussion of sage grouse needs in the current DPEIS is not ripe for analysis, and any proposed restrictions due to sage grouse are premature. Any decision to amend currently operative RMPs, based on an issue currently undergoing such a massive review, would constitute an arbitrary and capricious decision.

The state finds that the BLM has not only based its decision on new information where none exists, but also has, to compound this egregious error, inexplicably ignored new information which supported the conclusions of the 2008 decision, and failed to analyze significant new information that would satisfy NEPA 's required hard look.

Congressional Mandate

The Energy Policy Act of 2005 (EPACT 2005), Section 369, is the driving force behind the BLM's original Oil Shale and Tar Sands (OSTS) Programmatic Environmental Impact Statement and the resource allocation decisions it supported. Section 369 of EPACT 2005 specifically states "not later than 18 months after the date of enactment of this Act... the Secretary (of Interior) shall complete a programmatic environmental impact statement for a commercial leasing program for oil shale and tar sands resources on public lands, with emphasis on the most geologically prospective lands within each of the States of Colorado, Utah, and Wyoming."

BLM advanced the purposes of EPACT 2005 through its conclusions in the 2008 OSTS Record of Decision and the accompanying decisions within 2008 Records of Decision for the Vernal, Price and Richfield Field Offices, along with adoption of the oil shale leasing regulations codified at 43 CFR Part 3900. These decisions successfully laid out the availability of land containing the resources and the framework of the regulatory structure for acquiring leases on BLM land for the development of these resources. The state believes that BLM did an adequate and thorough job in reaching the decision contained in the 2008 ROD. The state also applauds the agency's efforts in 2008 to conform with state and local laws as well as engage in significant cooperative exchanges with countless agencies and stakeholders.

The current proposal, and the supporting documentation found in the DPEIS, takes a huge step in the wrong direction. Congress did not ask BLM to determine if commercial leasing was appropriate or not, or to wait on a commercial leasing process in favor of some other

proposal. As noted on page 1-3, EPACT 2005 requires the BLM to complete a programmatic EIS, establish a leasing program, consult with the Governors, conduct lease sales and consider land exchanges. The current proposal does not meet those requirements and directly ignores both the mandate and timeline given to it by Congress under Section 369 of EPACT 2005.

In addition, the Preferred Alternative will push commercial leasing farther into the future by requiring more unnecessary planning and research and development before commercial leasing can be established. Therefore, the Preferred Alternative is at direct odds with and contravenes the directions given by Congress in the EPACT 2005 to establish an oil shale and tar sands commercial leasing program.

Precedential Value of the Settlement Agreement

BLM has clearly stated that this entire effort is the result of the settlement of litigation brought by various environmental groups. Litigation, by its very nature, excludes many stakeholders interested in the issue litigated. Because full public involvement is required by NEPA and other laws, the Settlement Agreement requires only that the BLM propose various adjustments to the existing regulatory and planning provisions. The provisions of NEPA require that other alternatives be considered as well, including the option of doing nothing, which in this case would keep the 2008 land allocation decision intact.

The Settlement Agreement itself is not determinative of the final decisions made in response to the current DPEIS. This means that the No Action Alternative is as viable as the alternatives identified in the Agreement. Yet the Agreement, which was made without the involvement of many of the relevant stakeholders, including the state, is apparently being used to drive a hasty decision. The BLM informed the state and other stakeholders that the calendar is tight, and there is no room for additional analysis and review. This rush to complete the DPEIS by an artificial deadline is arbitrary in light of the vast amount of information the BLM must analyze to adequately meet the requirements of NEPA.

Request of the State

As shown below, this rush to complete has produced numerous major and minor errors which combine to produce a flawed product. The state urgently requests the BLM:

- slow down the analysis;
- carefully analyze the information offered below concerning the maturity of the oil shale and oil sands industry in Utah;
- recognize the clear delineation of jurisdiction between the states and the BLM;
- review the impacts to the social and economic structure of the state and local governments;
- examine the needs of the industry within larger venture capital markets; and produce a complete analysis of impacts.

If necessary, the state requests the BLM and its attorneys petition the court for additional time, based upon the reality of completing the tasks and further analysis outlined below.

Consultation with the Governors

The provisions of EPACT 2005 require that the BLM consult with the Governors of the states involved in the creation of commercial leasing program. Specifically, Section 369 requires the BLM to

> Consult with the Governors of States with significant oil shale and tar sands resources on public lands, representatives of local governments in such states...to determine the level of support and interest in the States in the development of tar sands and oil shale resources.

During the preparation of the 2008 Record of Decision, the BLM met on several occasions with the representatives of the Governors of the three states involved, and as a result were advised of the necessary "level of interest." Utah advised the BLM that the level of interest in Utah was high, and that if necessary, the BLM should proceed with a commercial leasing program in Utah even if the other states were not interested. In stark contrast, no such meetings have taken place with the Governor of Utah or his representatives during the current PEIS effort.

Request of the State:

The State of Utah urgently requests meetings with the BLM which meet the letter and the spirit of the requirement of EPACT 2005 to consult with the Governors, and local government, to determine the level of support for a commercial program for the leasing of oil shale and tar sands. Only then will the BLM be able to fully analyze the social and economic impacts to the state as well as work with the state on decisions affecting a critical component of the state's economy. These meetings must include thorough discussion of all information and issues pertaining to a commercial leasing program, including royalty rates, the structure of the leasing program, and the availability of lands for leasing.

State Authority

The DPEIS reflects a lack of respect for state authority and capabilities. The BLM repeatedly asserts that it wishes to hold off on implementing a commercial leasing program until more information is available on the impacts of oil shale and tar sands operations.". BLM explicitly asserts on many occasions in the DPEIS that oil shale extraction processes are unknown and that it must delay allocations of lands for leasing pending further study In contrast, the state asserts that oil shale processes are fundamentally composed of discrete extractive operations that have existed for decades, all of which are covered by state authority and regulatory programs. For example, the BLM states that it requires more information on the impacts on water quantity and quality[8] from oil shale and tar sands operations. Yet information concerning a permitted commercial operation pertaining to water quantity and quality are readily available on the Division of Oil, Gas and Mining's website. The BLM, in cooperation with its state and local regulatory partners, can readily engage in the discussion of impacts to the natural, social and economic environments from these well-understood processes.

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[8] ES.7, found on ES-9.

The extraction of kerogen from oil shale. as proposed in Utah, is nothing more than a mining operation followed by a retort operation. Mining operations have existed in Utah for over a hundred years and the state has implemented the necessary regulatory controls to mine in an environmentally sensitive manner, using the latest in technology and management practices. Retorts have been used since ancient days to reduce ore and produce useful products. Oil shale and tar sand operations involve well-defined, basic extraction, processing, and upgrading techniques that have been in use in Australia, Brazil, Canada, China. Estonia. Ireland (commercially in Canada and Estonia), and tested for over 50 years in the U.S. Oil shale and tar sand development activities have existed on Utah State lands for many years with adequate protection of the environment under state regulatory programs sanctioned by the Office of Surface Mining and the Environmental Protection Agency.

Water is owned by the state in trust for its citizens and is subject to the state water appropriation system managed by the Utah State Water Engineer. The federal government must participate in the state's allocation system should it desire to quantify any water rights it may claim.[9] Water rights appropriations are for specific diversion or use proposals. A general water right for general use by the public lands is not allowable under state law. As discussed further below, the state believes and asserts that water is available for oil shale and oil sands development, both through existing water rights and through the general market system. The state's allocation system examines issues related to availability, prioritization, interference with other rights, and related factors. BLM's decision to defer analysis until it obtains further information on water availability imposes BLM vague desires onto the decision-making process of the state. The state will make decisions regarding the availability of water, not the BLM. The state will, consistent with the authority of the state water engineer, process applications to approve or transfer water rights for oil shale or any other use.

The same is true for air quality and water quality. The state has primacy for enforcement of the Clean Air and Clean Water Acts within the state and works closely with the EPA to insure the protection of these resources. The Utah Department of Environmental Quality, along with federal, state, and industry partners is currently studying issues related to air quality in areas containing the most geologically prospective oil shale resources, and will work to jointly find solutions to air quality issues in these regions.. An inventory of emission sources is underway in conjunction with studies of the factors surrounding the formation of ozone during the winter months in the Uintah Basin. Protection of water quality from underground or surface mining operations is well within the regulatory authority and expertise of the state. Although issues related to the particular soil chemistry and topography must be addressed, the state is perfectly capable of the project specific analysis and decision making necessary to address any environmental concerns. See the Addendum below for further information concerning the permitting process.

Request of the State for Further Analysis:

Surface and underground mining as well as retorting generates no major unknowns for BLM beyond those presented by other mining and refining operations. The State of Utah strongly requests that the BLM make use of the information readily available to it from its

[9] 43 U.S.C .Section 666.

regulatory partners and conduct the required environmental analysis of the impacts of well-known processes rather than continue to insist that the production of a refinable liquid product from oil shale is shrouded in mystery. The BLM must defer to the expertise and authority of the state in these matters, use available information about standard mining and retort processes for its environmental analyses, and stop insisting that it cannot make resource allocations at this time based on upon vague, ill-defined assertions that more information is necessary.

Lands with Wilderness Characteristics

BLM conducted inventories of lands for the presence of wilderness characteristics prior to the Record of Decisions made for the 2008 oil shale allocation decisions and all other management issues covered in the final 2008 RMPs. No inventories for wilderness characteristics have been conducted since that time. As part of the 2008 RMP decision process, the state commented on management prescriptions for the lands identified, in whatever manner, as possessing the characteristics of wilderness. At the time, the state informed BLM as follows:

The State of Utah has reviewed BLM's inventory of and proposed management for lands identified as possessing wilderness characteristics. The state does not believe that BLM has the authority to create a category of management based solely on the characteristics of wilderness. The characteristics of wilderness, or their constituent elements, were first recognized by the Wilderness Act of 1964 and passed to the BLM within the provisions of Section 603 of the Federal Land Policy and Management Act of 1976. The authority within Section 603 has now expired by its own terms. The state recognizes that recent court decisions have affirmed BLM's authority to inventory for wilderness characteristics, and have required the BLM to consider new information about these characteristics in its documents prepared under the National Environmental Policy Act. These decisions do not, however, consider or affect the BLM's statutory authority for management policies on the BLM lands. The state cautions BLM against an overly broad reading of these decisions. Management authority must be derived solely from the specific provisions of the Federal Land Policy and Management Act, (e.g. Areas of Critical Environmental Concern) or other specific federal legislation, and it is incumbent upon the BLM to carefully define its detailed legal rationale and reasoning for its proposed management policies, provisions and categories.

The DPEIS does not contain any such analysis of its authority to manage for wilderness characteristics. In addition, the DPEIS does not contain any new information on inventories for lands contained within inventories for wilderness characteristics. All inventories in the areas of concern in the DPEIS were completed prior to 2008. Because the BLM presents no new information regarding new inventories that would indicate the reasons for an increase, decrease or adjustment, related to the management of lands with wilderness characteristics, the BLM must carry forward the decisions made in the 2008 oil shale EIS and the 2008 RMPs for lands managed for wilderness characteristics. A decision containing new management prescriptions for lands with wilderness characteristics would be contrary to the decisions in the 2008 Records of Decision and would therefore be arbitrary and capricious, as it would not be supported by any significant new information.

Since 2008, the State of Utah has passed several laws which have bearing on this decision regarding the protection of lands with wilderness characteristics. First, Utah Code Section 63J-8-103(4) provides that the public lands should not be "segregated into separate geographical areas for management that resembles the management of wilderness, wilderness study areas, wildlands" and the like. Instead, state law indicates the need for BLM to simply adhere to the normal standard of preventing unnecessary and undue degradation to the land.

In addition, Senate Bill 83, passed in the 2012 General Session of the Utah Legislature, provides that certain areas of Uintah, Duchesne and Daggett Counties are designated as an Energy Zone, and managed for the primary purpose of the production of energy. Senate Bill 83 provides in part, as follows:

> *The lands comprising the Uintah Basin Energy Zone contain abundant, world-class deposits of energy and mineral resources, including oil, natural gas, oil shale, oil sands, gilsonite, coal, phosphate, gold, uranium, and copper, as well as areas with high wind and solar energy potential; and the highest management priority for all lands within the Uintah Basin Energy Zone is responsible management and development of existing energy and mineral resources in order to provide long-term domestic energy and supplies for Utah and the United States.*
>
> *The state supports a cooperative management approach among federal agencies, state, and local governments to achieve broadly supported management plans for the full development of all energy and mineral resources within the Uintah Basin Energy Zone.*
>
> *The state calls upon the federal agencies who administer lands within the Uintah Basin Energy Zone to fully cooperate and coordinate with the state and with Daggett, Uintah, and Duchesne Counties to develop, amend, and implement land and resource management plans and to implement management decisions that are consistent with the purposes, goals, and policies described in this section to the maximum extent allowed under federal law, ...[and to] refrain from any planning decisions and management actions that will undermine restrict, or diminish the goals, purposes, and policies for the Uintah Basin Energy Zone...and refrain from implementing a policy that is contrary to the goals and purposes [of the Energy Zone].*

BLM must give the provisions of this law full consideration based upon respect for the authority of the state to provide for the general welfare of the citizens of the state and must review and analyze the purpose and effect of the law in the DPEIS. Additionally the law is an expression of state planning for the resources of the area, and is entitled to consideration as part of the consistency review discussed below.

Because the BLM does not possess any new information about lands with wilderness characteristics from that available in 2008, a change in any type of management for the lands, from that finalized in the 2008 RMPs and the 2008 Oil Shale EIS, as is proposed by various alternatives within the DPEIS, would constitute an improper use of Secretarial Order 3310, issued December 23, 2010. Secretarial Order 3310 was defunded by Congressional action, which required that no funds may be used to implement or enforce the Order. In this case, the

BLM is proposing to restrict the availability of these lands for the commercial leasing of oil shale and tar sands based solely upon the existing, older inventory for the presence of wilderness characteristics. This clear expression of intent to manage for wilderness is the functional equivalent of the creation of wild lands as proposed within the Secretarial Order. Because the Congressional action clearly stated that the BLM may not implement or enforce Secretarial Order 3310, the DPEIS must be rewritten to reflect this fact.

Request of the State for Further Analysis:

The State of Utah requests the BLM revisit its analysis of the proposed management prescriptions concerning the existing inventories of lands with wilderness characteristics, and

- Recognize that no new information is available since the 2008 Records of Decision;
- Recognize the soundness of the decisions made in the 2008 for the Resource Management Plans Records of Decision and the Oil Shale Record of Decision;
- Adopt the intent of state law and policy upon the subject of wilderness and wilderness-like management;
- Adopt the intent of state law and policy concerning the Energy Zone; and
- Adhere to the Congressional moratorium requiring BLM not enforce in any manner Secretarial Order 3310.

The state specifically requests that the BLM adhere to the decisions made in the 2008 Records of Decision concerning lands with wilderness characteristics, and support BLM's previous sound decisions by adopting the currently proposed No-action alternative.

Sage Grouse

Eleven of the western states, including Utah, are engaged in a cooperative effort to review the status of the Greater Sage grouse within its existing range, and to determine the elements of plans, conditions or stipulations, along with other mechanisms, to preserve the sage grouse while allowing economic development and growth to occur. The state of Utah has been sponsoring programs to protect the sage grouse for years, but the latest coordinated effort is occasioned by the March 2010 decision of the U.S. Fish and Wildlife Service concerning the potential listing of the sage grouse under the provisions of the Endangered Species Act. The Fish and Wildlife Service determined that a listing was warranted but precluded by higher priorities. This decision is now set for review by the end of 2015.

As a result of the listing decision, BLM and the Forest Service have initiated, through a Notice of Intent to Prepare an Environmental Impact Statement, a massive effort to determine if amendments to various Resource Management Plans (BLM) and Land Use Plans (Forest Service) are required in order to address the issues raised in the FWS decision. This effort is scheduled to be completed in 2014.

The State of Utah provided comments to the BLM planning process, and stated as follows:

The Notice of Intent states very specifically that the reason for the entire effort is to respond to the decision by the U.S. Fish and Wildlife Service that the listing of the Greater Sage Grouse is "warranted, but precluded" by higher listing priorities, and that the FWS asserts that BLM and Forest Service lands are the key to sage grouse survival. To the contrary, the state firmly believes that sage-grouse populations in Utah are in good condition, are receiving significant management attention and, therefore, do not warrant listing under the Endangered Species Act. The state will challenge a proposed listing whenever and wherever necessary. The state requests that the BLM and Forest Service receive, review and fully analyze all evidence offered by the state and others in support of its position that a listing is not warranted as part of the analysis of the impacts of the EIS provisions and alternatives. The state specifically requests that the BLM fully analyze and explain the ability of the BLM and Forest Service to protect the species without the cooperation of other landowners, as discussed further below.

In fact, the state strongly asserts that a decision to list sage-grouse range-wide, but especially in Utah, would be a major setback to current conservation management activities. Sage grouse in Utah, while challenged, are biologically stable. Utah conservation efforts are being conducted at a scale that will likely be hard to match anywhere else across the species' range. Finally, organizational and funding mechanisms unique to Utah have fostered cooperation and focus for continued and long-term conservation into the future. The state is concerned that unnecessary restrictions imposed by the BLM and Forest Service will upset the successful efforts underway in Utah, to the detriment of the species.

To further the state's commitment to conservation of the sage grouse and economic health of the state, the Governor recently convened a Sage Grouse Working Group. This Working Group is comprised of representatives of the Governor's Office, BLM, Forest Service, Fish and Wildlife Service, National Resource Conservation Service, Utah's Office of Energy Development, School and Institutional Trust Lands Administration, Department of Agriculture and Food, Division of Wildlife Resources, and representatives of the oil and gas industry, transmission line industry, oil shale industry, ranching community, county commissioners, The Nature Conservancy, and Utah State University. The Governor's charge directed the group to provide recommendations for the protection of sage grouse, while continuing to provide for a healthy economy and protecting private property rights. The Working Group was recently briefed on issues related to the life cycle of the sage grouse and previous and ongoing efforts to protect the species, and expects to provide recommendations within a few months. These recommendations are expected to lead to a state sage grouse plan soon thereafter. The state will expect the BLM and Forest Service to adhere to the provisions of this plan, both as a matter of respect for state authority, and in compliance with BLM's Instructional Memorandum 2012-039, which requires the BLM to make use of state data related to wildlife.

The State of Utah, in response to these factors, is currently, through the Working Group, engaged in an effort to review habitat needs of the sage grouse and make determinations about the relative importance of the habitat against the presence of other human and wildlife needs. The state is doing this in addition to weighing other options concerning the need to list the

species. This process is expected to result in the designation of areas of greater and lesser importance. A similar process in the state of Wyoming resulted in the designation of areas as "core" and "non-core," which is a possible outcome of the Utah process as well. The state assumes the Wyoming results, approved by the FWS, are the origin of the term core within the DPEIS. The BLM also recently issued an Instructional Memorandum concerning management of the sage grouse, covering the interim period until the massive planning effort concludes. In it, the term priority habitat is employed, along with general habitat, which is presumably the source of those terms within the DPEIS.

The state is very disappointed, therefore, to see "core" or "priority" discussed within the DPEIS for the State of Utah, and maps prepared with "core" or "priority" habitat displayed. The state, which is the entity with management authority over the sage grouse, has not yet reached a conclusion about any habitat designations, and does not expect to do so until the Working Group process is completed. The legend for Figure 2.3.3-2,[10] entitled "Lands Excluded from Application for Oil Shale Leasing Under Alternative 2 in Utah," clearly shows lands defined as Core or Priority. The state has not yet made any such determination, and strongly objects to BLM making such a determination. The information contained in the DPEIS about core or priority sage grouse habitat in Utah, as evidenced by this map, and any analysis based upon the information, is wholly inaccurate, and must be altered to reflect the true situation.

Request of the State for Further Analysis:

Because the data concerning sage grouse habitat is inaccurate, BLM must remove all reference to it in the DPEIS, and replace it with the habitat types which result from the efforts of the state's decision after the Working Group's work is completed. The BLM and the FWS are both represented on the Working Group, and will have every opportunity to influence the final product. Proceeding with the current data does not advance a completely and correctly informed analysis, but only perpetuates the continued use of erroneous data and misinformed opinion.

NEPA Requirements – Social and Economic Studies

BLM has not presented a serious study of the social and economic impacts of the proposal as required by the provisions of the National Environmental Policy Act. The DPEIS contains discussion about the generic social effects of a boom and bust economic cycle, but does not contain a countervailing discussion of the social effects of limited and reasonable economic growth. The DPEIS discusses the history of oil shale development twenty years ago, but includes no discussion concerning current energy needs, the current pricing structure for oil and gas, and the corresponding ability of oil shale and tar sand operations to continue to contribute a larger share of a healthy economy in the eastern part of Utah, and for the state as a whole. The discussions in the DPEIS generically concerning boom and bust economic cycles, without any discussion of reasonable economic growth alternatives demonstrates the agency's bias against development of oil shale and tar sands.

The DPEIS must to include a discussion of the entire market process for creation of a viable oil shale and tar sands industry, including its role in the regulatory certainty needed to

[10] See page 2-38, DPEIS.

attract venture capital. The State of Utah expects the BLM to be an active partner in the marketing of opportunities to diversify the domestic production of the nation's energy needs, not hang its institutional head claiming ignorance of real world market realities.

BLM needs to revisit the analysis of socioeconomic impacts in the DPEIS and present additional analysis of the opportunities to encourage a viable oil shale and tar sands market. BLM has the resources and the expertise to evaluate the reasonable effects of simple mining and retort operations. BLM should immediately communicate with industry to determine the needs for certainty and about reasonable development opportunities. The state knows that if BLM delineates reasonable requirements for resource development, industry will participate. There is clear evidence that industry is engaging in oil shale and tar sands development in Utah. Based on past experience with oil shale and tar sands development on state and private lands in Utah, growth will be measured and moderate, which is a viable alternative to the boom and bust scenarios presented in the DPEIS.

The State of Utah understands the value of a balanced economy, and values the contributions of tourism to the state's economy. However, BLM must not assume that tourism is the only possible contributor to a stable economy in the Uintah Basin and elsewhere in Utah. BLM must recognize and analyze studies which demonstrate the value of oil and gas to the Uintah Basin, and examine the benefits the oil shale and tar sands industry could bring to providing a stable and robust economy in the area. BLM must examine the contributions of tourism, oil and gas, government and other existing industries in the area, then analyze the value that a moderate growth oil shale and tar sands industry might add to that by bringing additional diversity to the area's economy.

BLM must also not falsely assume that a viable tourism industry is put at risk by oil shale production in the Uintah Basin. This is not to say that BLM should not discuss tourism and outdoor recreation as part of a significant economic evaluation – it should. But BLM must also evaluate wages from the tourism industry against those of the energy industry and evaluate the prospects for employment, revenue and community stability based on those figures.

Other Economic Studies - Examples:

The state contracted with Utah State University and the University of Utah to complete a number of economic and social-attitude studies regarding the use of and values attributed to public land resources by Utah residents. These studies assess: general attitudes of the citizens toward the public lands, off-highway vehicle use on public lands, grazing on public lands, and economic impacts of oil and gas exploration and production. Below are short summaries of a number of these studies, which are available on the state's website.

A statewide survey of the residents of Utah, the *Utah Public Lands Study*, was conducted in the summer of 2007 by Utah State University. One focus of the survey involved assessing various ways in which residents engage in economic activities that are linked to public lands and resources. Other major purposes involved assessing attitudes toward public lands as part of the residents' quality of life and sense of community, and assessing attitudes and preferences regarding public land management.

Preliminary results from the *Utah Recreational Off-Highway Vehicle Use Study* conducted by Utah State University show OHV use becoming increasingly popular, but the number of trips taken per year declining. Recreational activities that OHV users participate in are diverse, including both passive (sightseeing and photography) and active (camping and hiking). Rider motivation includes stress relief and nature appreciation, along with achievement, stimulation, independence and socialization with others. The study also shows economic impacts broken out by direct and total impact to Duchesne, Uintah and Daggett counties as well as by regional gross output, employment, household income, and value-added income. A "Random Utility Model" will be used to measure change in the allocation of trips across counties, measure change in the total number of trips taken by Utah OHV users, measure change in economic value accruing to OHV users and generate trip-distribution information for use in economic impact modeling. Full results will be made available upon completion of the study.

The Utah State University study, *Trend Information for the Vernal RMP: Livestock Industry Issues* indicates that the trend in livestock grazing preference and authorized use in the Vernal Field Office Planning Area is downward. The permitted AUM level proposed in the Draft RMP Preferred Alternative is a reduction of 8,323 AUMs, a 5.7 percent reduction in preference from the current level. This reflects a reduction of 15,376 AUMs, (10 percent) from the level 16 years ago.

The Bureau of Economic and Business Research at the University of Utah has completed an economic impact study of the oil and gas exploration and production industry in the Uinta Basin titled *The Structure and Economic Impact of Utah's Oil and Gas Exploration and Production Industry: Phase I - the Uinta Basin.* The Phase I study shows that rapidly rising energy prices and the corresponding rise in oil and gas activity are causing an economic boom in the Uinta Basin. During 2006, the oil and gas exploration and production industry was directly responsible for 19.9 percent of employment and 34.8 percent of total wages in the Uinta Basin, while those figures rose to 49.1 percent of the employment and 60 percent of the wages in the Basin when the indirect (multiplier) effects were considered. The industry also has a sizeable fiscal impact on local governments in the Uinta Basin. Property taxes paid on producing oil and gas wells were $18.2 million in 2006 and accounted for 38.7 percent of all property taxes paid in the two counties.

Required Further Analysis Requested by the State:

These studies, and other similar work, should be discussed as part of the examination of the social and economic structure of the area influenced by the upcoming oil shale and tar sands mining activities. Only after such consideration can the BLM make reasoned analysis of the economic impacts of the required leasing program. BLM must not make decisions which may influence the structure and robust nature of local and state economies without an examination of the ability and desire of the local economy to face the challenges raised by the proposal. The DPEIS focuses almost entirely on the perceived perils of a boom and bust cycle. This is pejorative and misleading, and does not reflect a serious attempt to analyze the potential contributions, both positive and negative, from the proposed leasing program. BLM must step back, and redo the social and economic analysis with these factors in mind. Failure to do so

violates the provisions of NEPA requiring analysis of the social and economic impacts of a proposal to the same degree as the environmental analysis.

Support for the Mission of SITLA

Utah's School and Institutional Trust Lands Administration (SITLA) is an independent state agency responsible by law for management of lands granted to the State of Utah pursuant to the Utah Enabling Act, (Act of July 17, 1894, 28 Stat. 109), for the financial support of Utah's public schools and other state institutions. The United States Supreme Court has referred to this Enabling Act land grant as a "solemn compact" between the United States and the State of Utah that obligates the United States to take into consideration the purposes of the grant when managing federal lands.

The State of Utah is obligated by both the Utah Enabling Act and the Utah Constitution to act as a trustee in managing school trust lands. Among the fiduciary duties imposed by this trust on SITLA is the duty to manage trust lands in the most prudent and profitable manner possible, and not for any purpose inconsistent with the best interest of the trust beneficiaries. Revenues from school trust lands are deposited in the Permanent School Fund, a permanent endowment for public education. Interest and dividends from the Permanent School Fund are distributed to individual public schools statewide annually to supplement critical academic needs.

SITLA manages lands within the boundaries of the BLM Field Offices under discussion in the DPEIS. Most of these state trust lands are comprised of numbered sections 2, 16, 32 and 36 in each township, representing the grant of in-place school sections made by the Utah Enabling Act; however it also includes lands acquired from the federal government in a land exchanges. The significance of the checkerboard pattern of land ownership is that because most trust lands are surrounded by BLM lands, planning decisions made by BLM with respect to rights-of-way, withdrawals from mineral leasing, special designations (e.g. ACECs, management for wilderness characteristics, etc.) and other determinations inherently impact the state trust lands, making them an island within the surrounding BLM lands. BLM's decisions on how to manage its lands directly affect the ability of the State of Utah to manage state trust lands for the purposes for which they were granted by Congress, which was to provide revenue for public schools and other beneficiary institutions. BLM management is an issue of significant impact to Utah's school trust. For example, lands within the Vernal Field Office make up approximately 13 percent of Utah's total surface trust land portfolio.

Conversely, management by SITLA of state trust lands within BLM areas of special designations can directly affect the ability of BLM to achieve management objectives. SITLA is not obligated by law, for example, to manage its lands within BLM areas managed for wilderness characteristics or ACECs for environmental protection. SITLA development of inholdings consistent with SITLA's governing mandate may substantially defeat the purpose of the special designation.

Request of the State for Further Study

BLM has an obligation to include in its planning an effective and timely means of addressing the impact of federal land actions on in-held state trust lands. BLM must engage in a serious study of its need to support the purposes of the grant of lands to the state for the support of the common schools. Specifically, the BLM needs to rework the DPEIS to include effects of the lack of a leasing program upon the ability of the state, through SITLA, to expect a robust leasing program for oil shale and tar sands and the related expectation of revenue.

In addition, the DPEIS addresses the requirements of Section 369(n) of the Energy Policy Act of 2005(EPACT), Public Law 109-58, only in a cursory manner. Section 369(n) provides in relevant part:

> (n) LAND EXCHANGES.
> (1) IN GENERAL. To facilitate the recovery of oil shale and tar sands, especially in areas where Federal, State, and private lands are intermingled, the Secretary shall consider the use of land exchanges where appropriate and feasible to consolidate land ownership and mineral interests into manageable areas.
> (2) IDENTIFICATION AND PRIORITY OF PUBLIC LANDS. The Secretary shall identify public lands containing deposits of oil shale or tar sands within the ...Uintah...basin..., and shall give priority to implementing land exchanges within those basins.....

At page 1-6, lines 32-34, the PEIS states that the decision in the 2008 ROD that "the specific decision that the BLM will consider and give priority to the use of land exchanges to facilitate commercial oil shale development pursuant to Section 369(n) of the Energy Policy Act of 2005" will be carried forward through this planning process. This statement should be clarified to confirm that, pursuant to the EPACT 369(n) directive, BLM lands that are not made available for commercial leasing will nonetheless be available for state exchange, subject to other applicable laws applicable to federal-state land exchanges.

Consistency with State Law, Plans and Policies

The State of Utah is extremely supportive of the consistency review requirement, as provided in federal law (43 U.S.C. § 1712(c)(9)) and regulation (43 C.F.R. § 1610.3-2). Pursuant to this regulation, RMPs shall be

> *consistent with officially approved or adopted resource-related plans, and the policies and procedures contained therein, of ... State and local governments, ... so long as the ... [RMPs] are also consistent with the purposes, policies and programs of Federal laws and regulations applicable to public lands.*

BLM correctly notes this requirement, but then qualifies the requirement to be that of consistency with state and local plans, where possible.[11] The DPEIS also discusses the plans of the City of Rifle for economic development, and mentions that the final Record of Decision should consider consistency with the City's plans.[12] The state certainly believes that BLM

[11] Section 1.4.5, Page 1-21.
[12] Id.

should consider the views of the City of Rifle, but more accurately consider consistency with state and local plans, policies and programs as demonstrated to BLM through the Governor's consistency review.

As an explanation for the idea that BLM need only be consistent with state and local laws, plans, policies and programs, the BLM previously provided an interpretation of the consistency requirement.[13] BLM stated that the "RMP ... [must] be ... consistent ... to the maximum extent possible by law and [that] inconsistencies between Federal and non-Federal Government plans be resolved to the extent practical."[14] The BLM thereafter defined an inconsistency as anything that "cannot be resolved or reconciled where state and local plans conflict with federal law." The state strongly asserts that this interpretation does not fully recognize nuances of the consistency requirement, especially involving discretionary planning decisions of the BLM.

The state recognizes that federal law requires certain decisions and establishes parameters within which those decisions can be made. However, the BLM retains considerable discretion within these legal sideboards. State and local governments cannot demand that BLM act outside these sideboards, but when state and local governments' policies pertain to areas within BLM's lawful discretionary decision space, BLM is obligated to make its plans consistent with state and local policies to the maximum extent possible. Thus, it is inappropriate to dismiss state recommendations that fall within BLM's legally prescribed discretion simply because BLM disagrees with the balance struck by the state. To assume that BLM's discretionary choices constitute federal law has the immediate effect of determining that state plans, programs and policies which strike a different balance yet accomplish the same purpose as the BLM's choice are, a priori, in conflict with federal law. Instead, the state asserts that if its recommendations strike a slightly different balance between competing resource demands and this balance is within BLM's lawful discretionary decision space, the BLM must endeavor to make its final decision consistent with state and local government policies.

Request of the State:

The State of Utah provided a consistency review just prior to the 2008 oil shale and tar sands Record of Decision. The state indicated the decision was generally consistent with state law, policy, plans and procedures. Within the decision space laid out by the alternatives within the DPEIS, the no-action alternative, i.e. the status quo, would remain consistent with state and local plans. Other alternatives may not be. Fundamentally, the decision space allowed BLM in this matter is limited. EPACT 2005 requires the creation of a commercial leasing program for oil shale and tar sands within 18 months of enactment. The State of Utah supports this, and found the efforts of BLM in 2008 to be consistent with its laws, plans, policies and procedures. The state is not asking the BLM to step outside the law in retaining the status quo, and BLM has not demonstrated any information which would require a decision different from that made by BLM in 2008. Therefore, the BLM can easily accommodate the state's request that the Record

[13] See generally the 2008 RMP efforts.
[14] Vernal RMP EIS, p. 5-17

of Decision in the current analysis reflect consistency with the state's position. BLM should simply adopt the no action alternative at this time.

The BLM Relies on Outdated Information on Oil Shale and Tar Sands Resources in Utah

Although the BLM cites the U.S. Geological Survey reassessment of oil shale resources in Colorado, Utah, and Wyoming as one important reason for reevaluating the allocation decisions in the 2008 PEIS, the BLM did not use this new information in its analysis of the most geologically prospective resources. The DPEIS simply carries forward the data used for the 2008 PEIS. The 2012 PEIS would greatly benefit from the incorporation of new USGS resource assessments and new oil shale data resource data published by the Utah Geological Survey in 2008.

This omission of new data is extremely troubling and calls into question both the validity of BLM's allocation decisions and whether the BLM took the requisite hard look for purposes of NEPA. Despite its insistence that updated geological assessments were important for improved allocation decisions in the 2012 PEIS, the BLM instead demonstrates an almost total disregard for this new information. For example, the BLM relied on digital data provided by the BLM Utah State Office rather than data from USGS or UGS.[15] Oil shale data for the 25 foot thick, 25 gallon per ton resource standard used in the 2008 PEIS came primarily from older reports focusing on the southeastern part of the Uinta Basin. Newer USGS and UGS studies include complete data sets spanning the entire Uinta Basin.[16]

The DPEIS states that "(t)he BLM considered this new (USGS) information and has determined that while the new data should inform and update the 2012 PEIS effort, particularly with respect to information pertaining to the 2008 study area, the boundaries defining the in-place assessment do not represent the most geologically prospective areas of the Green River Formation located in the...Uinta...Basin...(T)he PEIS will not employ the USGS boundary to define the study area."[17] The BLM discusses at some length why it did not consider the increases found for estimated total in-place oil in the Piceance Basin USGS Oil Shale assessment,[18] but fails to justify why similar assessments for the Uinta and Green River Basins were not incorporated.

The BLM does not include reference citations in the text, map, or table identifying the geologically most prospective areas in Utah for oil shale;[19] however, UGS is certain the data described comes from preliminary information provided by the agency for the 2008 PEIS and does not reflect updated information developed by either UGS or the USGS. The DPEIS references Tabet (2007) as the source of oil shale and tar sand resource data for oil shale lands in

[15] Draft PEIS, Chapter 1, 1.2, pg. 1-10, footnote 4.
[16] Vanden Berg, 2008; UGS Special Study 128; USGS 2010b, *Oil Shale Resources of the Uinta Basin, Utah and Colorado*, National Oil and Gas Assessment Project, Digital Data Series DDS-69-BB.
[17] Draft PEIS, Chapter 2, 2.5.1, pg. 2-77.
[18] The BLM quoted the assessment as saying "much of this previously unassessed resource is of low grade and unlikely to be developed." *Id.*
[19] Draft PEIS, Chapter 2, 2.3, pp. 2-13 to 2-16.

Utah.[20] These references to information provided by a UGS senior geologist in 2007 confirms that the resource data used for the 2012 DPEIS came from information provided by the agency for the 2008 PEIS. This information, as even the BLM acknowledges, is out-of-date and been replaced by information from more recent UGS and USGS resource assessments.

It is disturbing that the BLM employed few people with geological and mining engineering backgrounds in the analysis of the most geologically prospective areas for the 2012 DPEIS.[21] It appears that the BLM chose to update the resource picture without the assistance of suitably trained personnel. The only geologist employed in the current effort evaluated paleontological resources, not OSTS resources. This demonstrates a biased reevaluation by BLM of the issues and impacts from OSTS leasing. It also violates the NEPA requirement that insures "environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA." (emphasis added) [22]

The Draft PEIS Fails to Adequately Analyze Oil Shale Technologies

The DPEIS relies heavily on outdated information regarding oil shale and tar sands development technologies and in doing so, fails to provide the kind of comprehensive information required by NEPA for proper decision making.

CEQ regulations are quite clear about the standards required under NEPA for EISs. According to Sec.1500.1 (b)

"...information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA."

Because an EIS is used to plan actions and make decisions and must be supported by evidence that the agency has made the necessary environmental analyses,[23] it must contain the most accurate, up-to-date information available. Based on our extensive discussions with oil shale and tar sands industries, the DPEIS is clearly deficient and shows little to no coordination with industry. This may be a product of the backgrounds of the DPEIS contributors, where there is no evidence of industry or development background.

The BLM admits that "some of the information on the environmental consequences of oil shale development...is based on past oil shale developments. For purpose of this analysis, in the absence of more specific information of the oil shale technologies to be implemented in the future and the environmental consequences of implementing those technologies, information derived from other types of development... was used."[24] (emphasis added).

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[20] *Id.*, 2.3.1, pg. 2-20, footnote 4: Appendix A references.
[21] Draft PEIS, Chapter 8.
[22] 40 CFR 1500.1.
[23] 40 CFR §1502.1.
[24] Draft PEIS, Chapter 4, pg. 4-1.

Consultation and coordination with industry by the BLM is critical to the effective and unbiased analysis of the environmental consequences as well the economic benefits of oil shale and tar sands development. Based upon the previous decisions of the BLM, companies have invested hundreds of millions of private capital in technology, permitting, construction, and processing of oil shale and tar sands. The willingness of the state and private landowners to encourage this development in Utah has produced a highly sophisticated, successful, privately funded and well-capitalized oil shale and tar-sands industry in the state.

The BLM qualifies its analysis of oil shale and tar sands technologies by stating that the information on these technologies is presented for the purposes of general understanding and doesn't define the range of possible technologies that might emerge in the coming years.[25] This reflects a lack of due diligence on the part of the BLM. There is information available on newer, cutting-edge technologies that have moved from the RD&D phase into commercial scale development. BLM's reliance on outdated or general descriptions of the technology and its environmental impacts when there is ample information available on the newest developments in the industry contravenes NEPA's implementation requirements for EISs.[26] Appendix A references six oil shale projects in Utah from the late 1960s-the mid 1980s and cites these projects as a "wealth of resource, engineering, and baseline environmental data that will be useful in future efforts to develop oil shale resources."[27] While past experience may be useful for the analysis of the impacts of oil shale technologies, it is also important to include analysis of the innovative technologies currently in use that seek to resolve some of the environmental concerns raised by these earlier projects. Relying on technological examples in any industry (e.g. computing for example) from years back simply does not meet the requirement of NEPA to consider the best information available.. This is true especially in the oil shale and tar sands industries present in Utah.

An examination of Chapters 4 and 5 of the PEIS, along with the accompanying references, shows that the BLM did little research on newer technologies and did not make personal contact or mention any coordination witha single representative from industry. This is troubling to the state, since the Preferred Alternative relies on proven success through RD&D projects before allocating additional lease lands. A willingness to communicate and work effectively with industry will be critical under any of the alternatives, but especially under an RD&D driven alternative.

For example, BLM's analysis of the EcoShale™ In-Capsule Technology developed by Red Leaf Resources was based solely on information derived from Red Leaf's website.[28] Employing a team of researchers devoted to addressing reasons to exclude lands from commercial development while limiting technology and industry research to an effective 'google search' demonstrates BLM's fundamental incapability to work with industry.

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[25] *Ibid.*

[26] 40 CFR §1502.2 (g) *"Environmental Impact Statements shall serve as the means of assessing the environmental impact of proposed agency actions, rather than justifying decisions already made."*

[27] DPEIS Appendix A, pg. A-21.

[28] *Ibid.*, A.5.3.7, pg. A-87.

A second example is the information regarding the development of Enefit's RD&D lease at the White River Mine. This DPEIS relies heavily on findings from a 2007 EA for OSEC's proposed development activities at the same site. The only update BLM provides for the purpose of its analysis is that Enefit will employ its own version of the proposed underground mining and aboveground retort technologies based on its Enefit280 plant under construction in Estonia.[29] BLM provided no comparative analysis between the Enefit280 process and the ATP retort process the agency evaluated for the purposes of the 2007 EA. It also fails to mention that the Enefit280 plant is possible only due to the commercial success of Enefit's parent company producing energy from oil shale since before 1950. Framing Enefit's successes and technology as "Enefit280 plant under construction" further shows BLM's bias and active efforts to portray the industry as nascent while in fact it has been functioning successfully and economically outside of the country. This demonstrates that the leading reason that oil shale and tar sands have not been proven commercially is due to the efforts and bias of BLM; not the lack of technology as BLM asserts.

The Utah Division of Oil, Gas and Mining (DOGM) recently granted Red Leaf a permit to begin commercial scale oil shale production in the Uintah Basin. Following a successful pilot test of its EcoShale technology, the company will commence oil shale operations on 1,500 acres in the Uintah Basin on state owned school trust lands. Enefit American Oil, a subsidiary of an Estonian energy company with 50 years of experience commercially producing energy from oil shale, acquired the Utah-based Oil Shale Exploration Company (OSEC) in March of 2011. Eesti Energia, the parent company of Enefit, recently announced it will conduct a commercial study of the application of its Enefit retort process to operations at the White River Mine.

These companies report that their new technology uses less water and result in fewer environmental impacts than the process technologies of the 1980s. For example, the EcoShale technology utilizes low temperatures for heating and does not require process water. The Enefit140 retort process, currently in use in its Estonian facilities and the predecessor to the Enefit280, uses no water, runs on organic waste, and emits significantly lower CO2 emissions.[30] While the BLM acknowledges that these two companies are planning commercial production in the Uintah Basin in the near future, BLM fails to examine these technologies in any detail or evaluate their assertions of reduced environmental impacts. The agency instead relies on assumptions based on old data.[31]

This omission is serious. According to regulations for the implementation of NEPA:

> *"If a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion."*[32]

BLM's failure to include any kind of meaningful consideration of current oil shale and tar sand technologies and their environmental impacts is a serious breach of its responsibility to provide thorough, unbiased analyses in its EISs. CEQ regulations are very clear that EISs shall

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[29] *Ibid*, A.5.3.34, pg. A-75.
[30] https://www.energia.ee/en/oil/oilandgas/enefit140
[31] *Ibid*, Chapter 4, 4.1, pg. 4-2.
[32] 40 CFR 1502.9(a).

serve as the means for assessing the environmental impact of proposed agency actions, rather than justifying decisions already made.

The state strongly supports the development of oil shale and tar sands resources and recognizes the significant contribution this development will provide Utah's economy. Utah contains some of the richest oil shale reserves in the world. Unconventional fuels such as oil shale and tar sands are an important component of Governor Gary Herbert's 10-year Strategic Energy Plan for the state.[33] Energy development attracts new jobs, capital investment, and economic development opportunities for the state.

Information gathered by the Utah Office of Energy Development (OED) bears this out. Enefit has invested over $100 million dollars to bring its commercially proven technology to Utah[34] and has indicated it will invest more if given the opportunity to develop resources on public lands. Questerre Energy Corporation recently signed a letter of intent to invest $40 million in Red Leaf and their EcoShale In-Capsule technology, citing the success of the Utah pilot project.[35] As recent as April 2012, the major French Oil Company Total entered into a $200 million Joint Venture with RedLeaf to further commercial scale operations.[36] In March of 2012, the Uintah Transportation Special Service District awarded a $9 million asphalt paving contract to surface the first 17 miles of a road to the Uintah-Grand County line with Plant Mixed Oil Sand Asphalt (PMOSA), a heated blend of Uintah county aggregate and tar sands. Additional paving contracts using PMOSA demonstrate a growing commercial demand for tar sands.

OED also performed an informal survey of companies who had either previously invested in oil shale and tar sands development or had indicated a strong interest in doing so in the future. Survey results showed that 99.7% of the investment dollars represented in the survey believed that the primary impediment to developing oil shale and tar sands was uncertainty surrounding access to BLM lands, ranking overwhelmingly higher than lack of technology, capital, or access to state or private lands. With over $190 million of recent (< 5 year) investment and over $930,000,000 of planned (5< year) investment represented in the survey, OED calculates that implementing the Preferred Alternative, with its RD&D emphasis and limited acreage available for leasing, would prevent approximately $3.26 billion dollars in investment in the state for oil shale and tar sands development.

Availability of Water
Supposition vs. Fact

The characterization of water resource use in the DPEIS study area lacks the clarity necessary to satisfy the requirements of NEPA, which stipulates that "statements shall be concise, clear, and to the point."[37] Broad statements and the confusing application of water use

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[33] Energy Initiatives and Imperatives: *Utah's 10-Year Stratgic Energy Plan*, pg. 14.

[34] https://www.energia.ee/-/doc/10187/pdf/concern/Interim_report_2011_Q3_eng.pdf

[35] "Red Leaf Resources Get Green Light for Oil Shale Project in Utah", April 5, 2012, http://www.centerwest.org/publications/oilshale/7new/?p=450

[36] http://www.marketwatch.com/story/red-leaf-resources-inc-total-ep-usa-oil-shale-llc-announce-a-joint-venture-for-oil-shale-production-project-2012-04-18, *Red Leaf Resources, Inc & Total E&P USA Oil Shale, LLC announce a joint venture for oil shale production project*, Marketwatch website accessed 5/1/2012.

[37] 40 CFR § 1502.1.

terms cloud and complicate the analysis. The state asserts BLM's data lacks the necessary confidence to properly evaluate the impact of oil shale and tar sands on water allocations under the Upper Colorado River Basin Compact, given the lack of clarity contained in the agency's descriptions of water availability and usage.

The BLM describes water use in the Colorado River Basin as "highly developed, allocated, and regulated."[38] This sentence is misleading. Although the statement is true for the lower-basin states, it misrepresents conditions along the main stem of the Green and Colorado Rivers in Utah. None of the Upper Basin States have developed all of their Colorado River Compact water, with the possible exception of New Mexico. Utah has yet to deplete or consume roughly 300,000 acre-feet of its approximately 1.37 million acre-feet of water under the Colorado River Compact, as evidenced by BLM's own table included in the DPEIS.[39]

The BLM should make it clear in its discussion of water allocation under the Compact that the 6 million acre feet of water available both physically and under the provisions of the Compact is the quantity of water the Upper Basin States may deplete or consume. [40]

While the BLM defines the terms "diversion" and "consumptive use" in the DPEIS, it does not define the term "demand." It appears the BLM uses the term synonymously with diversion, which is not correct. Since the BLM does not provide a definition of "demand," the use projections on two of the tables are misleading[41] and conclusions regarding supply and demand are faulty.[42]

The Utah Water Demand Table (3.4.1-3) shows the projected 2020 and 2050 demand will be greater than the 23% allocation of 6 million acre-feet available for the Upper Colorado River Basin under the compact.[43] Without a definition of supply or demand, this comparison is meaningless. The 6 million acre feet of water available for the upper basin states is not a limitation on diversion or demand, but rather a limitation on the allowable depletion or consumption. Statements regarding water use [44] make it appear that there is no water available to develop in the Upper Basin states. Utah has not fully used its allocation of the Colorado River Compact and, as the BLM indicates in its 2030 projections, even if consumptive uses are on the high end, Utah will still have a 268,425 acre-foot surplus for consumptive use.[45]

The BLM Uses Outdated Assumptions Regarding Water Usage for Oil Shale and Tar Sands Development

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[38] Draft PEIS Chapter 3, 3.4, pg. 3-61.
[39] *Ibid.* Table 3.4.1-3, pg. 3-67.
[40] *Ibid.* 3.4.1.1, pg. 3-61.
[41] *Ibid.*, Tables 3.4-1-2 and 3.4.1-3, pp. 3-67-3.72.
[42] *Ibid.* pp. 3-73, 3-74, 3-75.
[43] *Footnote "j", Ibid.*, pg. 3-70.
[44] *Ibid.* pg. 3-73.
[45] *Ibid.*, Table 3.4.1-2, pg. 3-67.

The BLM states that 'although a certain amount of water is calculated to be available in…Utah…, this does not imply that the water is readily or physically available for development."[46] Supporting statements include:

- Oil shale basins and STSAs are situated in areas much smaller than the Upper Colorado
- Hydrologic basin on which water availability was calculated
- Storage and capture infrastructure may not be available in oil shale basins and STSAs
- Developers would have to acquire water rights either through transfer or purchase, since most of the water has been claimed
- Water use would be regulated under a number of state and federal regulations, as well as instream flow requirements to protect endangered fish[47]

These broad statements would apply to most water use in the Upper Colorado Basin and should not be used as justification for wholesale dismissal of water availability for oil shale and tar sands development.

In its discussion of water use for oil shale development, the BLM bases its assumptions on outdated information.[48] Its assessment assumes 2.6 to 4.0 bbl of water per barrel of oil for surface mining with a surface retort and underground mines with surface retorts and 1 to 3 bbl of water for in situ projects. Current technology utilizes 1 to 1.5 barrels of water per barrel of oil. New technologies do not use water for the actual extraction of the oil from the shale but primarily for dust control.

Recently permitted oil shale operations in Utah use considerably less water than the BLM assumes for purposes of the PEIS. According to Red Leaf's permit "most water will be consumed for construction of the process capsules and for dust control. The EcoShale InCapsule process itself is a net producer of water."[49] Red Leaf's petroleum removal process extracts water from the oil shale. Removed as water vapor, condensed, recovered and then put to use in mining operations, this process water will supply approximately one third of the total project water demand. All water captured, recovered, or withdrawn for use on the project is to be used on site.[50] The DPEIS assumption of 1-3bbl water/bbl oil produced for a 30,000-50,000bbl/day in situ plant does not take into account the different water requirements for Red Leaf's mining technology.[51]

Enefit's retorting process itself does not require water, although water is needed for cooling, upgrading, power production, and dust control.[52] In considering the impacts to water resources from Enefit's White River Mine, the BLM references its 2007 EA for OSEC's proposed mining operations at the mine site.[53] Water requirements for the OSEC operations,

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[46] *Ibid.*, pp. 3-74 and 3-75.
[47] *Ibid.*, pg. 3-75
[48] Draft PEIS, Chapter 4, 4.5.1.2, pg. 4-33.
[49] Utah Division of Oil, Gas, and Mining. Red Leaf Large Mining Operation Application, Appendix K. Approved March 14, 2012.
[50] *Ibid.*
[51] Draft DPEIS, Chapter 4, Table 4.5.2-1, pg. 4-43.
[52] https://www.enefit.com/en/oil/projects/usa
[53] Draft PEIS, Appendix A, A.5.3.4.3, pg. A-79.

based on the use of an ATP retort, are likely not comparable to those proposed by Enefit and again shows that BLM has failed to cooperate and discuss these vital issues with industry. The state strongly suggests that BLM cooperates with industry and again asserts that the DPEIS is deficient without these efforts.

The anticipated decline in available Colorado River water is based in part on the development of water for oil shale and tar sands development.[54] This decline appears to be based on the water requirements of older technologies and should be revised accordingly.

The BLM appears to believe that water is only available through retiring agriculture water rights.[55] In Utah currently, there are approved water right applications totaling well in excess of 10,000 acre-feet of water for the express purpose of developing oil shale and tar sands.

The assumptions regarding likely water sources for tar sands development on Asphalt Ridge are flawed.[56] Water in the Green River, which flows past the southern tip of Asphalt Ridge, is available for use. Until recently, there was an approved application to divert water from the Green River for tars sands development at Asphalt Ridge. The application is held by the Uintah Water Conservancy District, which plans tar sands development as a future use for the application.

The DPEIS Does Not Fulfill the Requirements of a Commercial Leasing Program as Required by the Energy Policy Act of 2005

Section 369 of the Energy Policy Act of 2005 (EPACT) states "not later than 18 months after the date of enactment of this Act... the Secretary (of Interior) shall complete a programmatic environmental impact statement for a commercial leasing program for oil shale and tar sands resources on public lands, with emphasis on the most geologically prospective lands within each of the States of Colorado, Utah, and Wyoming."[57] Like the 2008 PEIS before it, the 2012 Oil Shale Tar Sands PEIS seeks to simply identify lands "available for application for leasing" rather than completing an analysis that would make lands available for commercial leasing. The DPEIS, contrary to the intent of Congress in EPACT, does not actually designate lands available for commercial leasing or establish the necessary guidelines or regulations for a commercial oil shale and tar sands leasing program by the BLM. The Preferred Alternative, in fact, takes a step backwards, constraining commercial leasing by:

- excluding large swaths of geologically prospective lands from application for leasing;
- demanding unnecessary, burdensome NEPA analyses that go beyond those required for conventional oil and gas and surface mining leasing programs; and
- predicating commercial leasing on the successful application of oil shale technology through an RD&D leasing program.

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[54] Draft PEIS, Chapter 4, 4.5.2.2, pg. 4-48.
[55] Draft PEIS, Chapter 4, pg 4-34-4.35; Chapter 5, 5.5.1.2, pg 5-27..
[56] Draft PEIS, Chapter 5, 5.5.2.2.1, pg 5-37.
[57] Public Law 109-58, "Oil Shale, Tar Sands, and Other Strategic and Unconventional Fuels Act of 2005." Section 369 (d)

Geologically Prospective Lands Excluded From Application For Leasing

The Preferred Alternative removes geologically prospective lands due to perceived conflicts with sage grouse core or priority habitat and lands with wilderness characteristics (LWCs). While the Settlement Agreement ("Agreement") [58] between the BLM and environmental plaintiffs that resulted in the revision of the 2008 PEIS ROD required the BLM to analyze the environmental effects of an alternative that excluded these lands from oil shale and tar sands leasing, the Agreement did NOT require the BLM to select this alternative. As discussed above, BLM's analysis of these two factors is replete with errors in fact and policy. In fact, in light of the requirements of EPACT, the Preferred Alternative nullifies the intent of Congress to establish a commercial leasing program.

Unnecessary, Burdensome NEPA Analyses That Go Beyond Those Required For Conventional Oil And Gas And Surface Mining Leasing Programs

The BLM treats oil shale and tar sands leasing differently than oil and gas leasing and coal leasing by requiring additional levels of analysis before commencing commercial leasing. The agency states "it anticipates, to the best of its knowledge, that the surface disturbing activities involved with other types of mineral development are comparable to those that may result from oil shale and tar sands development."[59] It also says that it anticipates that oil shale development will proceed in a three-step decision-making process similar to that used for federal on shore oil and gas.[60] Then it turns around and says that due to the experimental nature of oil shale and tar sands technologies, the BLM believes the stages of NEPA compliance will be different from oil and gas. It goes on to explain that "(i)f and when applications to lease are received and accepted, the BLM will conduct additional required analyses, including consideration of direct, indirect, and cumulative effects, reasonable alternatives, and possible mitigation measures, as well as assessment of level of development that may be anticipated. (Based on this analysis of future lease applications), the BLM will establish general lease stipulations and best management practices" for oil shale and tar sands leasing and development.[61]

These extra levels of environmental analyses are unnecessary and place an undue burden on companies wishing to develop oil shale and tar sands resources. The proposed process is so cumbersome and fraught with uncertainty that few companies could afford to secure investment and dedicate capital resources to development efforts, especially given the added possibility of additional delays due to protests or legal challenges. This lengthy process defeats the intent of EPACT to construct a commercial leasing program, a program originally scheduled to be in place by 2011.

There are adequate federal and state regulations to deal with the impacts of oil shale and tar sands operation that protect water quality, air quality, and other resource values. Oil shale and tar sand developments involve well-defined, basic extraction, processing, and upgrading

[58] Civil Action No. 09-cv-00085-JLK, February 15, 2011.
[59] Draft PEIS, Chapter 4, pg. 4-1.
[60] . Draft PEIS, Executive Summary, pg. ES-5.
[61] *Id.*

techniques that have been in use in Australia, Brazil, Canada, China. Estonia, and Ireland. Oil shale and tar sands enjoy commercial success in Canada and Estonia and have been produced there successfully for many years. Similar extraction and production technologies have undergone RD&D testing in the United States since the 1960s. The impacts from developing these resources should not require further BLM analysis or research to understand the environmental impacts of oil shale and tar sands before leasing can take place.

Oil shale and tar sand leasing and associated development activities have occurred on Utah state lands for many years. These operations have proceeded in a manner that provides adequate protection of the environment under state regulatory programs sanctioned by the Office of Surface Mining (OSM) and the Environmental Protection Agency (EPA). The BLM gives no reason why similar activities, safeguarded by the same level of environmental protection, could not be carried out on federal lands absent further NEPA or BLM analysis. The BLM correctly states that it would have ample opportunities to assess the impacts of OSTS development plans with further "NEPA analysis and other appropriate review" "before approval of a lease and subsequent plan of development on a lease."[62] More RD&D and NEPA analysis is not needed now or before BLM proceeds to a commercial OSTS leasing program.

Commercial Leasing Predicated On the Successful Application Of Oil Shale Technology Through An RD&D Leasing Program

The BLM declares in the Preferred Alternative that the agency "would like to maintain focus on RD&D projects."[63] This is not the mandate of EPACT, which was to proceed to commercial leasing. Congress did not ask the BLM to determine whether it wished to have commercial leasing or not. As was stated before, a number of companies have initiated pilot projects on state and private lands in Utah for years. One company, Red Leaf, is confident that its technology will lead to oil shale production on a commercial scale. It requested and received a permit from the Utah Division of Oil, Gas, and Mining (UDOGM) to proceed with commercial operations. The justification for seeking more RD& D data is not valid in the case of oil shale companies who might seek federal leases in Utah.

BLM's RD&D Leasing Program

The BLM declares in the Preferred Alternative that the agency "would like to maintain focus on RD&D projects."[64] The state finds this unacceptable, as the previous RD&D Leasing Program was not only excessively burdensome, but not economically attractive and, as a result, effectively killed interest in development of oil shale and oil sands on BLM land. As an example, the first round of RD&D leases offered more than 5,000 acres for commercial development if a technology was deemed 'worthy' by BLM. The second round decreased the amount 'awarded' to RD&D lease applicants to less than 700 acres, as well as increased the administrative oversight and bureaucratic burden. Quite simply, 700 acres is not enough area for a successful commercial

[62] Draft PEIS, Chapter1, pg. 1-1.
[63] Draft PEIS, Executive Summary, pg. ES-9.
[64] Draft PEIS, Executive Summary, pg. ES-9.

project, as evidenced by the examples throughout these comment. In addition, BLM placed approximately 50% of Enefit's preferential lease area as 'off-limits' to development despite having identified this as an area which should be awarded to the RD&D lease holder.

This is a clear example of the disregard for the realities faced by industry and shows that BLM is not truly interested in understanding the requirements of a successful oil shale industry. A simple coordination with industry during the DPEIS process would have borne this out, but BLM showed no effort in this regard. The result is massive regulatory uncertainty that shadows the industry and prevents successful economic development. It is further evidence that the reason that there is less commercial success in the United States is not due to lack of technology, as asserted in the DPEIS; instead it is due to the regulatory uncertainty created by efforts like this DPEIS.

BLM's Deal With Plaintiffs In The Settlement Agreement Is At Variance With The Requirements Of EPACT

The BLM in many ways abrogated its responsibilities under EPACT when it signed the Settlement Agreement. The Agreement prohibited the BLM from issuing a call for expression of leasing interest for oil shale or offer lands for competitive tar sands leasing or expressions of interest in tar sands leasing prior to January 15, 2013,[65] well after the December 2012 deadline for issuance of an ROD. This defeated the stated purpose behind the original 2008 PEIS for establishing a commercial leasing program. The Agreement effectively precluded consideration of areas of interest to industry for the purposes of the 2012 PEIS while at the same time giving disproportionate weight to "nominations" of areas precluded from oil shale and tar sands leasing by environmental interests. This turns the intent of EPACT on its head.

The labyrinthine process created in this DPEIS makes it nearly impossible for companies to develop oil shale resources on public lands. How can interested parties make applications for commercial leasing of oil shale in the absence of a commercial leasing program? If BLM delays further oil shale leasing analyses until companies nominate lands for leasing and BLM has no mechanism to allow companies to nominate lands for leasing, it is difficult to see how there can be commercial level oil shale leasing.

This is troubling for a number of reasons. NEPA requires agencies to assess the direct and indirect effects of a proposed action.[66] It also requires analysis of the cumulative impacts of a proposed action.[67] The BLM proposes to complete the analyses for areas nominated for commercial OSTS leasing after the ROD. Since this information is critical to an informed decision on the allocation of lands available for leasing and should be considered in the DPEIS, the BLM effectively signed away its statutory responsibility to properly analyze a major federal action that required an EIS under NEPA when it entered into the Settlement Agreement.[68]

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[65] Civil Action No. 09-cv-00085-JLK, 12, February 15, 2011.
[66] 40 CFR 1508.8.
[67] 40 CFR 1508.7
[68] See 40 CFR 1508.18 (b) (3) as it applies to adoption of a program to implement a specific statutory program, specifically EPACT.

In contrast, the BLM incorporates information related to lands with wilderness characteristics inventoried over five years ago. It proposes to include priority areas for sage grouse in its lands for exclusion from leasing with no supporting evidence for the selection of these core areas. Yet it fails to consider current evidence of interest in lease areas; in fact, it prevents the consideration of this interest. The level of interest in oil shale and tar sands lease areas has a direct and indirect effect on oil shale development. Denial of consideration of industry interest has cumulative impacts both on the development oil shale and tar sands technologies as well as the implementation of a commercial oil shale tar sands leasing program.

The Agreement did not require the BLM to predicate its leasing program on nominations of lands for leasing, nor did it prevent the BLM from establishing a commercial leasing program subsequent to the January 2013 date. Its selection of the Preferred Alternative indicates that the BLM did not seriously consider other options.

By entering into an Agreement that effectively foreclosed the opportunity for industry to express an interest in prospective areas or nominate appropriate areas for leasing prior to a ROD on the FPEIS and creating a situation in which the agency claimed it could not even consider such areas for the purposes of analysis in the DPEIS, the BLM :

- Violates the express provisions of EPACT to establish a commercial leasing program for oil shale and tar sands; and
- Violates NEPA by segmenting issues to a degree that it is impossible for the agency to take the requisite hard look at the environmental impacts of a commercial leasing program.

Segmentation of Issues Violates NEPA and Contravenes Intent of EPACT

The BLM cannot properly analyze the impacts from oil shale and tar sands leasing because the agency has failed to:

- consider expressions of interest in oil shale and tar sands areas
- establish royalties, fees, rentals, bonus, and other payments for leases
- consider the support and interest in Utah for the development of oil shale and tar sands resources
- establish a program to facilitate land exchanges to consolidate land ownership and mineral interests into manageable areas.[69]

These actions are not only required by EPACT, they are necessary elements of a commercial leasing program. The 2008 PEIS provided the environmental analysis required by EPACT for a commercial leasing program, with the assumption that within a carefully prescribed time period the other critical components of the program would be in place. Four years later, these critical pieces remain in a state of flux.

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[69] Public Law 109-58, "Oil Shale, Tar Sands, and Other Strategic and Unconventional Fuels Act of 2005," Section 369 (c), (n), (o).

Consider expressions of interest in oil shale and tar sands areas

This was discussed at length earlier.

Establish royalties, fees, rentals, bonus, and other payments for leases

A recent oil shale rulemaking agreement[70] allows the BLM to change royalty rates for oil shale and tar sands leases, with the notice of proposed rulemaking (NPR) due out after the DPEIS comment period closes. The BLM states that "determining commercial royalty rates"[71] is outside the scope of the congressional requirements of EPACT for the BLM's programmatic analysis for a commercial OSTS leasing program. By removing and replacing the current royalty rate and creating even greater uncertainty for industry, the BLM, as it did with the Settlement Agreement, chose to further erode the formation of a commercial oil shale and gas leasing program.

Consider the support and interest in Utah for the development of oil shale and tar sands resources

The BLM acknowledges that state interest in leasing is relevant, stating "it has been suggested by one of the cooperating agencies, and seconded by others, that BLM develop an alternative that would allow for larger scale leasing and development in Utah and Wyoming where the majority of the cooperators support a program that makes more federal oil shale and tar sands resources available for application for future leasing, while limiting development in Colorado, where the majority of cooperators favor a more cautious approach to leasing and development."[72] Governor Herbert has made it quite clear that Utah favors this approach.[73] However, The BLM dramatically reduced the acreage of lands allocated as available for leasing in Utah in the Preferred Alternative in apparent conflict with the high interest demonstrated by the state for increasing oil shale and tar sands development.

Establish a program to facilitate land exchanges to consolidate land ownership and mineral interests into manageable areas

The BLM admits it has no plans in place for land exchanges. The DPEIS contains no discussion of the ways BLM might facilitate such exchanges, either through requests for nominations for lands to exchange, determination of which federal lands are available for exchange, extra staff and budgets to identify and expedite proposed exchange opportunities, or streamlined NEPA and land resource appraisals to foster quicker exchanges. The DPEIS simply avoids the subject by claiming that "the possible locations for such future exchanges are unknown at this time."[74] Deferring or avoiding the identification of lands available for future exchange does nothing to move the BLM forward in facilitating or giving priority to land exchanges as required by EPACT.

The 2012 DPEIS was an ideal opportunity to remedy the lack of coordinated consideration of the cumulative impacts of these components on a commercial leasing program. Instead, the DPEIS segments these elements, removing them from even initial consideration, and

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[70] Civil Action No.-09-cv-00091-JLK

[71] Draft PEIS, Chapter 1, pg. 1-13.

[72] Draft PEIS, 2.4.4, pg. 2-76.

[73] Utah Energy Initiative: A 10 Year Strategic Energy Plan, Pg. 7.

[74] Draft PEIS, Chapter 1, pg. 1-12.

cites the agency's self-imposed inability to weigh these essential factors as justification for scaling back the lands available for leasing even further than it did in the 2008 PEIS. By excluding these significant aspects of a commercial leasing program from analysis in the DPEIS, the BLM fails to properly examine the full range of impacts from oil shale and tar sands leasing as required by NEPA, and has improperly segmented the analysis of the proposal.

BLM Overstates the Amount of Land Truly Available for Leasing

BLM overstates the availability oil shale lands by failing to discuss the potential for conflicting known uses. Much of the land proposed for availability for oil shale leasing is already leased for oil and gas, and projects are planned to develop those resources. It is nearly impossible for both developments to occur on the same piece of land. The discussion in the DPEIS does not adequately reflect the true status of lands available for oil shale development because of existing proposals The BLM uses out-of-date (pre-2005) information and grossly underestimates levels of oil and gas drilling in the Book Cliffs area.[75] The DPEIS must be rewritten to discuss the conflict with oil and gas operations, discuss the minimal amount of lands available as a result for oil shale leasing in Utah in the next 20 years.

The DPEIS also needs to discuss making a suitable amount of lands available for oil shale and tar sands leasing in the face of the oil and gas development. As discussed above, the oil shale industry is ready to proceed, and the BLM must provide enough resource to allow this industry to flourish. Allowing this will reduce our reliance on foreign oil, create jobs and bring significant economic development to every state involved. The state suggests modifying the definition of the most geologically prospective oil shale lands in Utah to include resources to a depth of 3000 feet.

Conclusion

The State of Utah appreciates the opportunity to work with the BLM on the development of active oil shale and tar sands industries in Utah, and stands ready to rework the DPEIS in order to do so. Specifically, we request that the BLM prepare the analyses requested by the state and local governments in Utah, and issue a Supplemental Environmental Impact Statement which discloses these new analyses to public scrutiny under the provisions of NEPA. The state also urgently requests the BLM to immediately request further time to complete these analyses from the Court, for the reason that the tight time frame originally set out has proven too narrow to meet the provision of substantive federal law. The state offers to support the BLM in this request.

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[75] Utah Division of Oil, Gas, and Mining drilling statistics by county for Duchesne and Uintah Counties for the years 2008 through 2011 give an average annual rate of 264 oil wells in Duchesne County (Diamond Mountain area) and 88 oil wells and 410 gas wells in Uintah County (Book Cliffs area). Using these updated average annual drilling rate figures for 20 years, rather than the incorrect 15 year planning level presented in Table 6.1.6-5, provides estimates of 5280 oil wells in Duchesne County (versus BLM's 76 oil wells) and 1760 oil and 8200 gas wells in Uintah County (versus BLM's 62 oil and 143 gas wells) as the expected amount over a 20-year planning horizon. Attachment A1, Section 6, Current Crude Source, pg A-109, needs to be revised to reflect current information on oil production levels, which have increased significantly in the last few years. For example, Utah is currently producing at least 57 to 58,000 barrels per day compared to the 43,000 barrels per day depicted in Figure 8. The discussion of PADD 4 does not reflect the new pipeline connecting Salt Lake City, Utah to the Las Vegas, Nevada market

The State of Utah also respectfully formally informs BLM, pursuant to the terms of EPACT 2005, that it will not be bound by the artificial timeline set out in the Settlement Agreement providing that the amendments to the existing oil shale regulations will be offered for public comment on or about May 15, 2012, after the comment period on the DPEIS has closed. The BLM is required by EPACT 2005 to consider the views of the Governors of the states involved, and is required to consider the effects of the land allocation decisions and the regulatory structure simultaneously as part of those consultations. The land allocation decisions and the leasing and royalty structure are part and parcel of the total leasing program envisioned by EPACT 2005. The state will not allow the law which created these consultation requirements to be artificially segmented by actions of the BLM and non-governmental parties, no matter the forum employed by BLM to create this improper segmentation. The state will be offering the BLM substantive comment about the connection between the land allocation information in the DPEIS and the soon-to-be-announced new regulatory structure. The state will require the BLM to consider any such comments as part of the record in the final decision concerning the Record of Decision based upon the current DPEIS.

The State of Utah strongly supports the work done by the BLM which culminated in the 2008 Records of Decision, and will actively and vigorously oppose any amendments or other changes to those decisions. The state specifically requests the BLM to consider the other alternatives within the DPEIS in light of the rush to poor analysis occasioned by the ill-conceived timeline set out in the Settlement Agreement, and determine that more time is necessary for BLM to obtain sufficient information to make a reasoned decision. In light of the need for further information and analysis, and the need for a Supplemental EIS to provide this information to the public for review. Fundamentally, the state requests that BLM simply choose the No-action alternative, and affirm the earlier work.

Thank you for the opportunity to work with you to improve the land in Utah, and to provide for a healthy economy. Additional comment is attached as an Addendum and Technical Comments. Please feel free to contact myself for any further information that you may need.

Sincerely,

K Clarke by JH

Kathleen Clarke
Director

Addendum To State of Utah Comments

Environmental Permit Requirements

Air Quality

The state is heavily engaged in studies designed to identify potential adverse impacts on regional haze and winter ozone levels in the Uintah Basin. The state objects to the conclusory statements drawn from generalized information. The DPEIS indicates that PM2.5 and ozone could rise above acceptable levels in the Uintah Basin if oil shale and tar sands development begins on a commercial scale.

The DPEIS, however, contains some pro forma references to state and federal regulatory means for addressing air quality issues, particularly in the Uintah Basin, that lack the specificity required for informed decision-making. Annual emission inventory for criteria pollutants and VOCs for counties is ten years old76. UDAQ recommends updating the emissions to most current available inventory.

Utah Division of Air Quality urges the BLM to identify best management practices (BMPs) for the reduction of PM, NOx, and VOC emissions from oil shale and tar sands operations. The Division also requests that BLM consider the cooperative efforts currently underway statewide and regionally to tackle the challenges presented by wintertime ozone. The results of these studies and cooperative partnerships are important for BLM's decision-making process on the allocation of areas available for oil shale tar sands leasing and should be part of the DPEIS analysis.

Regulatory Mechanisms

A Memorandum of Understanding (MOU) signed by the Department of Agriculture, Department of the Interior, and the Environmental Protection Agency on June 23, 2011, committed the signatory agencies to a clearly defined, efficient approach to compliance with NEPA regarding air quality and air quality values (AQRVs) in connection with oil and gas development on federal lands. 77 The MOU established procedures for assessing impacts related to NAAQs and AQRVs. The DPEIS referenced the MOU for GHG emissions78 but failed to do the same for other criteria pollutants.

According to Section V.D. of the MOU79,

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[76] Draft PEIS, Chapter 3, 3.52, pp. 3-105-107.

[77] *Memorandum Of Understanding Among The U.S Department Of Agriculture, U S. Department Of The Interior, And U.S. Environmental Protection Agency, Regarding Air Quality Analyses And Mitigation For Federal Oil And Gas Decisions Through The National Environmental Policy Act Process.*

[78] Draft PEIS, Chapter 4, 4-6.1.1.1, pg. 4-57.

[79] *Memorandum of Understanding, pg. 9*

"...the Lead Agency (BLM) will complete and document supporting air quality and AQRVs analyses prior to (f)ederal oil and gas planning, leasing, or field development decisions." (emphasis added)

These air quality and AQRVs analyses should incorporate the most current data. The county annual emissions inventory data cited in the DPEIS is ten years old. The Utah 2008 Statewide Emission Inventory contains the latest data and is available on the UDAQ web site at: http://www.airquality.utah.gov/Planning/Emission-Inventory/2008_State/08_State_List.htm.

The state summary, last updated in November 2010, categorizes emissions for the six criteria pollutants by area source, non-road mobile, on-road mobile, point source, biogenics and wildfires: (http://www.deq.utah.gov/search_results.htm?cx=003215417047777185873%3Asg4mqgvgk-m&q=2008+emissions+inventory+county&cof=FORID%3A9.

The inventory includes detailed annual emissions from point sources in each county (http://www.airquality.utah.gov/Planning/Emission-Inventory/2008_State/2008_FormB_CountyDetails112210.pdf) as well as from area sources (http://www.airquality.utah.gov/Planning/Emission-Inventory/2008_State/2008_Area_revised113010.pdf).

UDAQ has pointed out this omission in previous comments. According to the MOU80, early in the NEPA process the lead agency will discuss with the agencies:

- information about the affected environment to include in the baseline assessment;
- methodology, assumptions, and scale of the analyses; and
- monitoring protocols and mitigation

The BLM has yet to include this important information in its air quality impact analysis. UDAQ requests the BLM update its data and utilize the 2008 emission inventory in its analysis for the DPEIS.

Monitored concentrations representative of the study area81 reference concentration levels for PM10, PM2.5, and SO_2 from monitors in surrounding states, specifically the Grand Junction CO Powell Station and Rock Springs, WY station. Data from these monitors, located at some distance from oil shale/tar sands resources in Utah, do not provide the necessary specificity for an accurate accounting of emission levels in the Uintah Basin. UDAQ, through its 2012 Winter Ozone Study, is collecting air quality data from 20 fixed, distributed monitoring stations in the Basin and two air quality "super sites" in Roosevelt and Horsepool. Three permanent monitors in Fruitland, Roosevelt, and Vernal supply regional air quality information. Data from these sites should be considered in any analysis of air quality in the study area.

About 75% of all PM2.5 found on UDAQ's monitoring filters is created by secondary particulate formation, which occurs when precursor emissions, usually NOx, SOx, and VOC,

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[80] *Ibid*

[81] Draft PEIS, Chapter 3, Table 3.5.3-2, pp. 3-112-113.

react in the atmosphere to form PM2.5. Oil and gas operations emit precursor gases that contribute to the formation of PM2.5 and oil shale development would likely do the same.

UDAQ recommends the BLM utilize the data from the aforementioned monitoring stations located in the Basin, incorporate this data into the FPEIS, and consider it in its Record of Decision. Any impact assessment for air quality from oil shale and tar sands development should contain the available emissions data from the Uintah Basin 2012 Ozone Study (see below). The preliminary results from this study, scheduled for release in July, will provide a more comprehensive picture of air quality conditions in the Basin. Given the challenges facing the Basin with ozone and PM2.5, the BLM should utilize the most up-to-date air quality information to make informed decisions on oil shale lease allocation decisions.

In addition, UDAQ requests the BLM reference the MOU Appendix "Modeling Approaches to Evaluate Air Quality for NEPA Decisions Regarding Federal Oil and Gas" in support of the requirements of Section V.D. The Reusable Modeling Framework (RMF) contained in the Appendix recommends that

> *"(f)or future emissions, projections should be made from the base year to 10-15 years forward to examine the potential for maximum growth in the planning area."*

Emissions projections will apprise the BLM of potential air quality issues associated with commercial scale oil shale development and should be part of the air quality analyses for lease allocation decision-making.

Best Management Practices

Normally, the state uses the New Source Review (NSR) program to regulate oil and gas emissions, with sources subject to Best Available Control Technology (BACT) review, modeling, and public comment before receiving a permit. To qualify for NSR, sources must meet a minimum threshold of emissions—5 tons per year of any criteria pollutant, less than 500 pounds per year of any single hazardous air pollutant, or less than 2,000 pounds per year of combined hazardous air pollutants. If the source emits less than the threshold they fall outside of NSR regulations (de minimis emissions).

In the Basin, many of the oil and gas emission sources, including wellheads and tanks, do not meet the NSR threshold and are not regulated.82 RD&D oil shale projects will probably also not meet this NSR threshold. UDAQ and its partners in the Basin are working with stakeholders to determine the feasibility of other regulatory measures for sources that fall outside of NSR to establish better pollution controls for smaller sources.

Emissions that fall within this de minimis exemption could include fugitive dust from mine operations, products of combustion including SOx, NOx, CO, CO2, and VOC from oil processing and handling equipment.

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[82] UAC R307-413-2.

Proposed National Environmental Standards for Hazardous Air Pollutants or NESHAPS regulations on oil and gas sources83 could significantly lower emissions, particularly from VOC sources. These VOC reduction methods include the use of low bleed pneumatic controllers, wet seals on centrifugal compressors, rod packing replacement for reciprocating compressors, and the use of vapor recovery units on storage tanks. Use of these controls could prove crucial to protecting Basin air quality while allowing for resource development.

We have included suggested oil shale development BMPs for fugitive dust, VOCs, and combustion engines These BMPs include management practices for emissions from current oil shale development projects. The BMPs cited do not represent the full complement available for emissions reduction.

Fugitive Dust

Blasting

- Stabilize surface soils where drills, support equipment, and vehicles will operate
- Pre-water and maintain surface soils in a stabilized condition
- Apply and maintain a chemical stabilizer on surface soils
- Stabilize soil during blast preparation activities
- Limit the blast footprint to no larger than what can be practically stabilized immediately following the blast
- Maintain surface rock and vegetation where possible to reduce exposure of disturbed soil to wind
- Stabilize soil after blasting
- Water disturbed soils to form crust immediately following blast and safety clearance

Clearing

- Stabilize surface soils where support equipment and vehicles will operate
- Pre-water and maintain surface soils in a stabilized condition or,
- Apply and maintain a chemical stabilizer on surface soils
- Stabilize disturbed soil immediately after clearing and grubbing activities
- Water disturbed soils to form crust, or
- Apply and maintain a chemical stabilizer on disturbed soils to form crust.
- Stabilize slopes at completion of activity
- Stabilize sloping surfaces using soil binders until vegetation or groundcover can effectively stabilize the slope
- Apply water and maintain sloping surfaces/wind breaks in crusted conditions

Additional Ongoing Measures

- Water unpaved roads periodically or apply chemical stabilizers
- Remove dust-forming debris from roads promptly and scrape and compact unpaved roads frequently to stabilize the road surface
- Restrict the speed of vehicles in and around the mining operation
- Revegetate, mulch, or otherwise stabilize the surface of all areas adjoining roads that are a source of fugitive dust

[83] 76 FR 52738, Tuesday August 23, 2011.

- Restrict the travel of vehicles on other than established roads
- Enclose, cover, water, or otherwise treat loaded haul trucks to minimize loss of material to wind and spillage
- Substitute conveyor systems for haul trucks and cover conveyor systems when conveyed loads are subject to wind erosion
- Minimize the area of disturbed land
- Revegetate lands promptly
- Plant special windbreak vegetation at critical points in the permit area
- Control dust using water sprays, hoods, dust collectors or other controls
- Reduce the period of time between initially disturbing the soil and revegetating or other surface stabilization
- Restrict fugitive dust at spoil transfer and loading points
- Control dust from shale storage piles through use of enclosures, covers, or stabilization

Combustion Engines

Require the following emission standards for stationary internal combustion engines:

- 2 g/bhp-hr of NOx for engines less than 300 horsepower
- 1 g/bhp-hr of NOx for engines over 300 horsepower.

Control emissions from engines utilizing Best Available Control Technology (BACT) such as lean-burn technology, catalysts, air/fuel ratio controllers or other technologies

Schedule proper maintenance and upkeep of vehicles to ensure optimal functioning of engines

Volatile Organic Compounds

- Use vapor control systems on tank breathing vents, with vapors routed to condensers and/or combustion for tanks larger than a certain capacity84 is if the material has a true vapor pressure greater than 5.2 kPa. This is equal to 5.2 bar, 0.05 atmospheres, or 0.76 psig.
- Conduct regular leak detection using a VOC detection device and repair all process connections in VOC service
- Ensure regular maintenance of tanks, roof seals, hatch seals, and tank loading process connections
- Replace safety relief valves less than 48 hours after use
- Operate thief hatches in the locked position at all times when the tank itself is not being actively maintained
- Discourage the use of surface evaporation impoundments to receive produced wastewater
- Use pneumatic controllers with a no bleed or low bleed design

[84] 40 CFR 60 Subpart Kb

Studies and Partnerships

UDAQ is currently involved in several studies to address the problem of wintertime ozone in the Uintah Basin. Stakeholders from the oil and gas industry, federal land management agencies (including the BLM), several western states, and the EPA have joined forces to identify the causes of winter ozone and formulate mitigation strategies.

In 2009 and 2010, monitors showed that concentrations of both PM2.5 and ozone were at or near the current state and national standards. The EPA and the Ute indian Tribe have four monitoring stations in the Uintah Basin: Myton, White Rocks, Ouray, and Red Wash. In the winter of 2010, ozone levels reached a high 8-hour value of 139 ppm during inversion conditions, nearly twice the national health standard. UDAQ wintering monitoring studies for 2007, 2008, and 2009 have shown that , under inversion conditions, PM2.5 concentrations are at or above the standard and can be as high as those seen along the Wasatch Front. Due to low snow cover this winter, in 2012 ozone levels did not exceed these standards. However, UDAQ anticipates that under normal snow cover conditions in the Basin, ozone levels will rise above this standard during wintertime inversions.

The Uintah Basin 2012 Winter Ozone Study was a comprehensive study of the atmospheric chemistry and precursor gases that form wintertime ozone in the Basin. The study was by far the largest and most complex air quality study ever conducted in Utah. The nearly $3 million effort was funded by a number of agencies, including the Uintah Basin Impact Mitigation Special Service District, Western Energy Alliance, BLM's Utah Office, and EPA Region 8. Cooperative research work was undertaken by atmospheric research partners from USU, NOAA's Chemical Sciences and Global Monitoring Divisions, University of Colorado's Institute of Arctic and Alpine Research, DAQ, EPA, BLM, and local oil and gas producing members of the Western Energy Alliance.

Study components included:

- Basin-wide ozone and precursor measurements to determine spatial extent of the problem.
- Long-term monitoring of ozone and key precursors at two "super sites"—Roosevelt and Horse Pool—to provide baseline trend information against which energy production increases and mitigation work can be evaluated.
- Intensive atmospheric chemistry studies to understand the chemical pathways and determine limiting formation precursors.
- Development of a complete, detailed inventory of emissions sources in the Basin, including information on location, operation, and pollutants emitted.

Preliminary results and conclusions are scheduled for release in July 2012. The goal of the study is to develop a conceptual model of wintertime ozone formation in the basin and identify appropriate and effective air pollution mitigation strategies. While the lack of snow this winter hindered efforts to analyze the photochemical reaction of sunlight on snow that seems to leads to ozone production, the emissions inventory component of the study was still important. The emissions inventory identified source emitters, emission rates, and emissions characteristics.

Source specific measurements located areas of high concentrations for precursor gases. This data will not only aid in identifying the location, level, and spatial representation of ozone and its precursors in the Basin, but will also assist in the development of mitigation measures and strategies for emissions reductions in areas where high levels of ozone have been detected.

Utah, Colorado, and Wyoming, the EPA, the BLM, and the U.S. Forest Service are participants in a pilot project called the Three-State Study. The project will provide a regional assessment of air quality conditions by focusing on the impacts from oil and gas development. Leasing allocation decisions in the DPEIS for oil shale and tar sands will be located in these three states and the findings from this project on air quality issues in the Uintah Basin will have bearing on oil shale development in the area.

Specifically, the pilot project focuses on the flowing activities:

- Expanding air quality monitoring to establish baseline conditions, track trends, and evaluate model performance;
- Creating a data warehouse to store, manage, and share data among state and federal agencies, industry, and their contractors to support modeling of air pollutants; and
- Performing regional scale air quality modeling of current and projected conditions.

UDAQ has also established an Oil and Gas Air Quality Partnership to evaluate the impacts of oil and gas development on air quality and determine the best approaches for managing the Uintah Basin air shed. UDAQ will include oil shale development in this effort. Representatives from the following agencies are involved in the partnership:

Anadarko Petroleum
Bill Barrett Corporation
Bureau of Land Management
Duchesne County Commission
ECO Resources
Energy Dynamics Lab
Environmental Protection Agency
GASCO
McVehil Associates
Newfield Exploration
QEP
Questar
Red Leaf Resources
Rocky Mountain Power
SITLA
Tri-County Health Department
Uintah County Commission
Uintah Impact Mitigation SSD
Utah Cooperatives
Utah Department of Environmental Quality
Utah Division of Air Quality
Utah Governor's Office
Utah Petroleum Association
Ute Energy
Western Energy Alliance

These collaborative efforts demonstrate the willingness of parties involved in resource development in the Basin to work cooperatively in search of solutions. These partnerships and the resulting development of air quality mitigation strategies will have a direct bearing on the resource use decisions contained in the DPEIS and should be given thorough consideration.

Water Quality

Surface Water Quality

In Utah, oil shale reserves are located primarily in the Green River Formation within the Colorado River drainage. Surface waters in the Uintah Basin are known for high salinity. Several rivers located in the area are listed on Utah's 303(d) list of impaired water bodies for high salinity (total dissolved solids, or TDS) at levels that do not protect for agricultural uses.

When pollutants impair the use of water a study is required to determine how to reduce them and restore water quality. This study is known as a Total Maximum Daily Load (TMDL). A TMDL establishes the maximum amount of a pollutant allowed in the water while maintaining all of its designated beneficial uses. Several water quality studies have been conducted in the Colorado drainage that address the reduction of pollutants like salinity and the restoration of water quality. A full list of approved TMDL's for this area of Utah is located online at or by request from the Division of Water Quality.

The development of oil shale and tar sands as described in the DPEIS will have impacts on the Bitter Creek and Willow Creek watersheds, which will have to be addressed. Willow Creek is on the 2010 Utah 303(d) list of Impaired Waters for biological degradation based upon macro invertebrate data. Bitter Creek frequently exceeds numeric water quality standards for both TDS (>1,200 mg/l) and boron (>750 ug/l). Currently, the main source of TDS and boron in the Uintah Basin is from the erosion of weathered rock. The BLM should consider and, wherever possible, control for actions that could potentially increase either TDS or boron concentrations in the surrounding surface waters.

Oil shale development can potentially cause impacts to surface water quality through:

- Erosion;
- Withdrawal of water for operations; and
- Discharge of water used in operations

Ground disturbance activities (erosion) can degrade surface water through drainage from prepared sites, which can contribute sediment, salts, and possibly chemicals and oil shale products into receiving streams. Typically, DWQ minimizes the degradation to surface water from ground disturbance activities through stormwater permits. However, mining activities are exempt from this requirement unless the water comes into direct contact with tailings. The BLM should evaluate the potential for water-tailings contact. In the event a permit is not required for oil shale projects, DWQ recommends the development of a detailed plan that minimizes stormwater influence on surface waters and a monitoring program that measures the effectiveness of mitigation measures. A voluntary mitigation plan would demonstrate a commitment by project developers to sustainable development and would provide necessary data for future expansions.

Withdrawal of groundwater during mining operations can potentially affect surface water quality. Significant decreases in groundwater aquifers can result in a corresponding decrease in

inputs to streams or lakes. Such decreases would likely increase stream temperature and Dissolved Oxygen (DO), which could have damaging effects on fish and other wildlife.

It is frequently difficult or impossible to contain all of the groundwater withdrawn for mining operations, which necessitates a Utah Point Source Discharge Elimination System (UPDES) permit.

Groundwater Permits

Groundwater conditions in the southern Uintah Basin are poorly known because the area has not been exploited for groundwater historically and the predominance of fine-grained sedimentary rocks in the area is not favorable to containing groundwater in aquifers. Aquifers controlled by the stratigraphy are present, mainly in the subsurface. The Douglas Creek and Bird's Nest aquifers are good examples of these types of aquifers.

These aquifers will become increasingly important as the area is developed for oil shale and tar sands operations. Isolated aquifers and zones of saturation such as PR Spring may be locally important sources of water. Oil shale and tar sands operators should, as part of their mine development activities, prepare an inventory of springs and seeps near their proposed operation and note occurrences of groundwater in exploratory drill holes and water wells. Operators should take samples from these sources to determine background groundwater quality and class.

When ongoing monitoring or other reporting is necessary to ensure groundwater protection, the permittee and DWQ will develop and mutually agree upon permit conditions. A draft version of the permit will be made available to the public for a 30-day comment period, and after resolution of concerns raised during this comment permit, a final permit will be issued.

Groundwater Discharge Permits

The Utah Ground Water Quality Protection Rules (UAC R317-6) allow DWQ to protect Utah's groundwater resources by issuing ground water discharge permits. The rules require facilities that have the potential to cause a discharge of pollutants to groundwater to apply for a ground water discharge permit. These facilities include mining and milling operations with waste management units such as tailings impoundments and waste storage piles. This requirement ensures that oil shale and tar sands facilities that have the potential to impact groundwater resources are regulated by the state to minimize or prevent degradation of groundwater quality.

Groundwater discharge permits require site-specific characterization of the proposed facility including depth to ground water, hydraulic gradient, ground water flow direction, and pre-operational background ground water quality.

The two primary components of a groundwater discharge permit are best available technology and groundwater monitoring. Best available technology minimizes the discharge of contaminants from the waste source by applying control and containment technologies such as liners, leak detection systems, leak collection systems, and pump-back systems. Groundwater

quality monitoring in compliance wells measures the actual effect of the facility operations on groundwater quality. The rules utilize federal drinking water maximum contaminant levels as groundwater quality standards. Permit-specific protection levels are percentages of the standards based on the site- or well-specific Groundwater Class (i.e., the better the ground water quality, the more stringent the protection level). If practical, based on depth to groundwater, compliance monitoring wells are used to provide an early warning of contamination. This allows time to implement corrective actions well before beneficial uses are adversely affected. Permit conditions can also address the discharge of subsurface water affected by a permitted facility that may become a nonpoint source of pollutants to surface water.

In some cases, after review of the material submitted in a groundwater discharge permit application, DWQ may conclude that the project qualifies for permit-by-rule status, if it has *de minimus* effect on water quality or if other regulatory programs insure protection of water resources.

Technical Comments

Preamble, Page xxiii, line 15:

Insert "SITLA" as an acronym for "School and Institutional Trust Lands Administration (Utah)"

ES. 6.3, page ES-6, lines 28-29:

Core or priority sage grouse habitat, as defined by such guidance as the BLM or DOI may issue" has not been determined. DOI and BLM have committed to defer to state-level determinations of what constitutes such habitat. These processes are ongoing. As more fully set forth in the body of these comments: (1) the State and its constituent agencies cannot adequately comment on the proposed alternatives until the extent of such habitat is determined; and (2) the PEIS appears to be based on maps of such habitat that have not been themselves released for public comment or reviewed under NEPA.

Chapter 1, Page 1-13, lines 32-37:

It is erroneous to exclude oil shale regulations and national policy from the scope of the PEIS. BLM is obligated to follow the law in its analysis. EPACT 2005 explicitly makes development of oil shale resources a national policy priority. The PEIS needs to include a detailed analysis of the relationship between each alternative and national policy as expressed in EPACT. Similarly, determination of commercial royalty rates should not be excluded from the scope of the PEIS. Depending on the level at which such rates are set, the range of foreseeable development of oil shale resources will vary greatly. The analysis of each alternative should include analysis of development scenarios under various royalty rates, or else be delayed until royalty rates are determined, and then analyzed.

Chapter 1, page 1-20, ll. 20-23:

The PEIS states that BLM has not received any new information since the 2008 OST PEIS and ROD concerning the environmental consequences of commercial oil shale development. There is a wealth of public information that is available and should be considered. These include multiple reports prepared on behalf of the U.S. Department of Energy by the University of Utah's Institute for Clean and Secure Energy on environmental, resource and socioeconomic consequences of unconventional fuel development in the subject area, prepared in response to Section 369 of EPACT. Significant information is also available with respect to development of oil shale and tar sands on state trust lands in Utah, notably in the form of public files for mine permitting on file with the Utah Division of Oil, Gas and Mining and the Utah Division of Water Quality. The DPEIS must be revised to take into account each of these sources of information.

Chapter 2, Page 2-13, ll. 10-24.:

As noted in the body of the state's letter, the PEIS should confirm that just because BLM lands are withheld from competitive leasing does not disqualify the lands from conveyance to the State by land exchange in accordance with Section 369(n) of EPACT, other exchange authority, or state indemnity selection.

This section of the PEIS should also be reworded to discuss how BLM will follow Congress' mandatory directive in Section 369(n) of EPACT that it will give priority to land exchanges. As currently draft, the PEIS notes the directive, and then devotes most discussion to why BLM will have problems with doing so. The PEIS should reflect that by law such exchanges are to be a priority. The PEIS should also note the environmental benefits of land exchanges, including protection of natural values and other resources on state trust lands through conveyance to the United States.

This section of the PEIS also needs to be supplemented to reflect legal alternatives to an appraisal process in concluding land exchanges. Existing BLM land exchange regulations state:

> *In the absence of current market information reliably supporting value, the authorized officer may use other acceptable and commonly recognized methods to determine market value: 43 C.F.R. 2201.3-2(c).*

This language has been used as the basis for multiple oil shale land exchanges between BLM and Utah on the basis of ton-for-ton conveyance of oil shale, adjusted for energy content, without necessity of appraisal. Similarly, the Utah Recreation Land Exchange Act of 2009, Pub. L. 111-53, contains language for transfer of federal oil shale land to the State without appraisal, based on BLM reserving an interest in future oil shale production from the lands equal to 50% of bonuses and rentals, and BLM's royalty share, less preexisting mineral revenue sharing obligations to the State. See H. Rep. 111-79 at 6-7 (analysis of section 3(f)). Proposed

legislation now pending in Congress as H.R. 4027 contains similar language with respect to mineral valuation. The PEIS should recognize these authorities.

Chapter 4: Effects of Oil Shale Technologies
Table 4.1.1-1 Assumptions Associated with a Surface Mine with Surface Retort, page 4-3.

This table needs further explanation of the data presented to improve clarity. For example, the "(f)ootprint of development area (acres)" for Wyoming and Utah should give a number based on a time frame (per/yr) as is done with "water use," rather than the vague footnote explanation that it is the disturbance at any given time. The factor listed for "surface disturbance" is a larger number of acres than one could assume is the cumulative life of mine disturbance and it would be helpful to have the number in the table labeled as cumulative rather than having the reader refer to the footnote for extra clarification. The "wastewater" factor is provided on a gal/ton basis, but the table does not contain any data on the annual or cumulative number of tons produced. Such data would make this number meaningful in relation to the other factors provided. The wastewater factor should be in gallons per year, or ac-ft /yr, or gallons per barrel of oil produced in order to be meaningful. The "total employment" factor is not the sum of the direct and indirect employment factors and there is no explanation of how the BLM derived total employment from direct and indirect sources.

Table 4.1.2-1 Assumptions Associated with an Underground Mine with Surface Retort, page 4-8.

This table suffers from the same lack of clarity in data presented as mentioned for Table 4.1.1-1.

Table 4.1.3-1 Assumptions Associated with an In Situ Retort Project, page 4-11

This table suffers from the same lack of clarity in the data presented as mention for Table 4.1.1-1.

4.1.6 Expansion of Electricity-Generating Capacity, page 4-13

This section mainly refers to the high electricity need for in situ projects proposed for Colorado, and does not differentiate that from the lower power need for the mine and retort technologies proposed in Utah. Specifically, this section does not reflect that ENEFIT and Red Leaf assertion that their operation will supply nearly all their own project energy needs from the retorting process. In addition, the first paragraph incorrectly states that definitive information about the power requirements of commercial oil shale development is not available. This is not the case with the ENEFIT technology. BLM's analysis is faulty because it does not include specific information about ENEFIT and Red Leaf technologies, which are both poised for commercial development in Utah.

4.2.1.2 Acquisition, Conversion, or Transfer of Water Rights, page 4-19

This section only discusses water rights in Colorado, not in Utah or Wyoming. The ENEFIT project acquisition included water rights. The DPEIS needs a more complete and balanced discussion about water rights for all three states.

4.5 Water Resources, starting page 4-31

The discussion in this section and various subsections tends to use relative terms like "large" and "small" without defining what is meant quantitatively by such terms. For example, on page 4-33 under Water Use, on line 41, the PEIS states that "A large amount of water is required during the operations phase." Subsequent sentences give actual numerical ranges of water use, but nowhere is the term "large" actually defined. Likewise, on page 4-39, the last sentence EIS states that "(a) relatively large water-quality impact is expected in areas where population growth is large and the receiving water is small." The PEIS should define such relative terms in quantitative terms.

4.9.1.4.2 Power Generation Facilities, page 4-152

This section relies on outdated information that anticipates new power generation coming from coal-fired power plants. Pending carbon management legislation and a surge of new domestic natural gas supplies means new power plants in Utah would likely be gas-fired. This assumption of coal-fired power generation and any associated analysis incorporating this assumption is out-of-date for the present market situations. BLM needs to revise the DPEIS to reflect the current market situation for new power generation plants.

4.15 Health and Safety, page 4-199, Table 4.15.2

At the beginning of Chapter 4, the BLM revised the size of mining and surface retort and in situ oil shale projects downward, but this table utilizes the 2008 scenario of a 1,000,000 bbl/day oil shale industry. This table needs to have the size of the industry's health effects reduced to match the reduced size of the oil shale operations as provided earlier in Chapter 4. This would probably drop the overall industry to 14 facilities, with a production level below 500,000 bbl/day. The accompanying text and footnote also appear to be inconsistent and provide an overestimation of the number of oil shale workers compared to the total employee numbers given in Table 4.1.1-1, 4.1.2-1, and 4.1.3-1

Table 6.1.6-5, Projected Levels of Major Activities for Seven Planning Areas

This table presents faulty analysis of the level of OSTS developments on nonfederal lands in Utah by simply using the phrase "potential unknown" to gloss over known development activities, particularly those in the Book Cliffs area that are mentioned in Appendix B of the PEIS.

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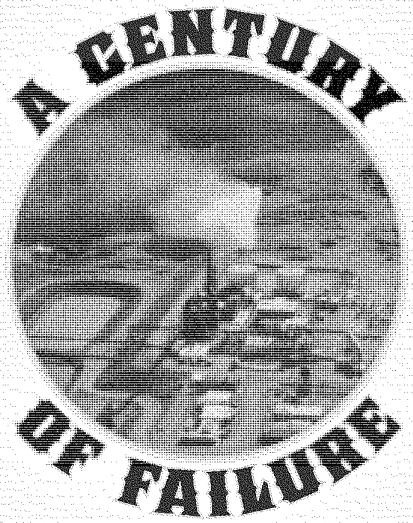
OIL SHALE: A CENTURY OF FAILURE REPORT BY CHECKS AND BALANCES PROJECT, APRIL 2012

OIL SHALE:



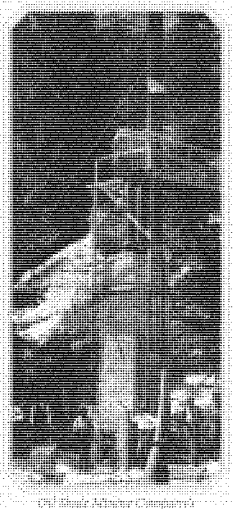
A look at a century of failed attempts at oil shale development in the West

a report by

THE CHECKS AND BALANCES PROJECT

April 2012

FOR NEARLY 100 YEARS, THE OIL INDUSTRY HAS TRIED TO MELT ROCK-SOLID FORMATIONS IN COLORADO, UTAH AND WYOMING AND TURN IT INTO OIL.



first retort, Mesa County, Colorado, 1918

Since 1917, when a government official persuaded a Nevada parole board to release a prisoner so the inmate could develop his oil shale extraction idea, experts, insiders, executives and the federal government have dumped billions into efforts to tap oil shale, leaving nothing but failed projects behind. The oil industry has had plenty of help. The federal government crafted oil shale policies that have effectively transferred thousands of acres of public land to oil companies and have created a leasing structure that could potentially transfer billions of dollars of public wealth to the oil companies. Never before have we given this much to an industry that has yet to show commercial success.

Not one single oil shale project since the first attempts in the late 1920s has ever produced commercial fuel from shale rocks. In fact, one of the few direct results of the federal support has been premature oil shale booms that have ultimately busted.

For all the efforts the American taxpayers have made toward developing oil shale for the oil industry, every effort to sustain commercial production of the resource in the last century has failed.

1916
The New York Times reports that oil shale "will yield gasoline supply"

1917
A.H. Crane released from prison to use his oil shale development technique

1920s
The U.S. Bureau of Mines opens, then abandons oil shale site in Colorado

BLACK SUNDAY

Late Saturday, May 1, 1982, thousands of people worked at the Colony Oil Shale project on the Western Slope of Colorado. Another 7,500 support workers helped with the effort to melt mined rocks to produce synthetic oil.[1] By the next morning, all of that changed.

Amid falling oil prices and rising costs, Exxon announced early Sunday morning, May 2, 1982, that it would abandon its involvement in the Colony project near Parachute in northwest Colorado. Suddenly, about 2,200 employees and thousands of others who had moved to the state to support a burgeoning oil shale industry were out of a job.

Many workers, unaware of Exxon's announcement Sunday morning, found locked gates when they went to work Monday. Others found out about their pink slips from the evening news.

Today, local residents remember the day as "Black Sunday."

> "...Right then the news came on and we saw it on television. Then our next-door neighbor and his wife came over—they just rang the doorbell and they say said, 'We've been trying to get in touch with you all day. Have you heard?' I said, 'We just did.' His wife was crying, I was crying. We all just sat on the steps and we talked. It was like we were at a funeral."[2]
>
> - An employee at Exxon's Grand Junction office

The resentment over Exxon's decision was palpable among local residents and those who traveled thousands of miles for an oil shale job. Some created bumper stickers saying, "Jesus came to Parachute but Exxon laid him off."[3] Graffiti appeared in local bars, with markings saying "Exxon: The Sign of the Double Cross" and "Welcome to Colorado's Newest Ghost Town. Compliments of Exxon."[4]

Exxon's decision shattered local communities and sent thousands of people away. Within four days of Exxon's decision, all rental trucks within 90 miles of Parachute were leased.[5] Within one week, 1,000 residents had left Parachute and Garfield County.[6] From 1983 to 1985, 24,000 people left Garfield and Mesa Counties.[7]

Major oil corporations would soon follow Exxon's example, which ultimately cost western Colorado $85 million in annual payroll, and abandoned their oil shale projects.[8] Thousands more were laid off, leading to a regional economic malaise that lasted for years.

1940s
The U.S. Synthetic Fuels Act authorizes taxpayer money for oil shale experiments

1945
The Bureau of Mines returns to the Colorado site

1946
The Associated Press reports that oil shale will "furnish fuel"

1948
The Bureau of Mines again researches at the Colorado site

JUST TAKE A LOOK AT THESE HEADLINES FROM MAJOR AMERICAN PUBLICATIONS THROUGHOUT THE PAST 100 YEARS:

Shale Will Yield Gasoline Supply
April 30, 1916, New York Times

Oil Shale to Furnish Fuel
October 17, 1946, The Associated Press

First Oil Output From Shale Lands in West Due in '70
April 27, 1966, New York Times

Shale Oil is Coming of Age
November 6, 1981, New York Times

And the optimism for oil shale is here again, especially amid rising oil prices.

Yet oil companies that obtained research oil shale leases atop rich deposits in northwest Colorado still say it might be another decade before commercial oil shale production ever begins, echoing those headlines from the past 100 years.

1950s
Union Oil operates oil shale plant for three years

1956
Additional work is conducted at the BLM Colorado site, with little oil ever produced

1963
As a joint venture among four companies, the Colony oil shale project is launched in Colorado

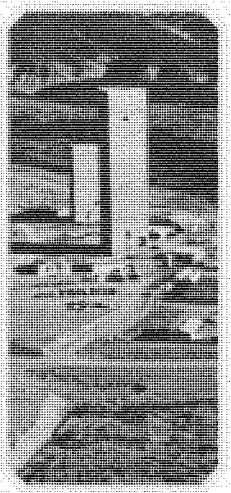
In 1917, A.H. Crane – a prisoner serving time for burglary in a Nevada state prison – received a pardon after the warden reported Crane's claim to the federal government.[9] A federal expert testified at the state's parole board that "Crane's method for extracting oil from shale will be of almost incalculable value to the government."[10]

In the late 1920s, the Bureau of Mines spent taxpayer money at a research site in western Colorado.[11] They abandoned those efforts when new oil supplies were found in the United States.[12]

The Bureau of Mines continued research in 1945[13] **and** 1948,[14] and conducted additional work in 1956.[15] Despite promises that commercial oil shale production was near, government-sponsored research in western Colorado would end in the 1950s with little oil produced. Eventually, the Bureau of Land Management in 2008 approved a $15.4 million contract to clean up the government's contaminated oil shale research site in western Colorado.[16]

In the 1940s, Congress passed the U.S. Synthetic Fuels Act, which authorized taxpayer money to be spent on oil shale experiments at a research station near Rifle, Colo.[17] About $18 million – nearly $220 million today –was spent on oil shale research between 1949 and 1955.[18] The research at the site ultimately failed to sustain a commercial oil shale industry despite numerous promises that it would (see these articles from Time and the Wall Street Journal).

Union Oil's first oil shale project, Colorado: In the 1950s, Union Oil Company of California operated an oil shale plant for three



Prototype Colorado oil shale mine in *November 1979*

1968
The Atomic Energy Commission plans "Project Bronco" but the project never happens

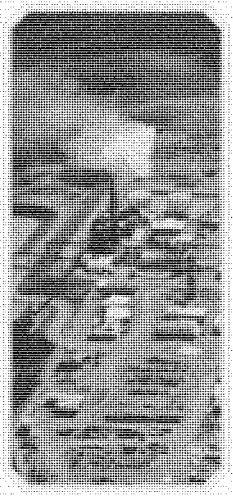
1966
The New York Times reports that the first fuel from shale rocks will come in just four years

1970s
The DOE contracts with Paraho Development Co. to produce oil from shale rocks; the company never builds a facility

1974
Gulf Oil Co. and Standard Oil Co. acquire a federal lease in CO

years, according to a Bureau of Land Management (BLM) analysis of previous oil shale projects.[19] However, commercial production of oil was never sustained.

Project Bronco, Colorado: In 1966, the Atomic Energy Commission proposed detonating a 50-kiloton weapon in western Colorado to recover oil from shale – a plan known as "Project Bronco."[20] The detonation button was never pushed.



Prototype C-a oil shale lease in CO, August 1981

The Colony Oil Shale project, Colorado: Exxon famously closed this Colorado project in 1982 (see "Black Sunday" sidebar, page 3), but it actually began in 1963 as a joint venture among four companies.[21] In 1981, Exxon's partner received a $1.1 billion loan guarantee[22] for its costs in the project.

Paraho-Ute, Colorado: The Paraho Development Corp., which tested oil shale extraction techniques in Colorado, acquired leases along the White River near the Colorado-Utah border.[23] The firm's research in Colorado during the 1970s spurred the DOE to agree to a contract with the firm for it to produce 100,000 barrels of oil.[24] However, the company never built any oil shale extraction facilities on its Utah properties.[25]

Prototype C-a oil shale lease, Colorado: Gulf Oil Company and Standard Oil Company acquired a 5,120-acre federal "prototype" oil shale lease in 1974 and built facilities to burn oil shale rock and produce oil. [26] They were "prematurely flooded in 1984 because of pump failure and the company was unable to resume operations."

1974
Three companies partner to acquire a federal lease in UT

1977-81
TOSCO acquires 29 state leases in UT; project is cancelled

1980
Magic Circle acquires UT state leases; no mine or construction ever takes place

1981
The New York Times reports that oil shale "is coming of age"

1981
Chevron and Conoco begin work on Clear Creek project in CO

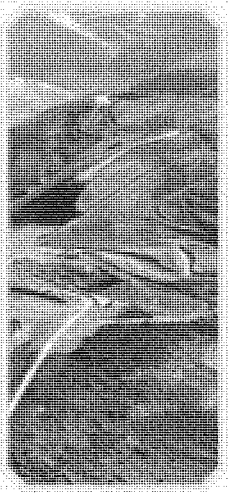
Prototype C-b oil shale lease, Colorado: Four companies acquired this federal "prototype" oil shale lease in the 1970s, but it was suspended in 1987 and pumping on the production on the lease was stopped in 1991.[27] No oil was ever produced from this lease.[28]

Prototype U-a, U-b leases, Utah: In the 1970s, three companies partnered to secure a 5,120-acre federal "prototype" oil shale lease in Utah, along with an adjacent 5,120-acre lease.[29] While several tons of oil shale were extracted to test mining conditions and technology, projects on the leases were abandoned in the mid-1980s.[30]

TOSCO Development Corporation, Utah: The company acquired 29 state leases in Utah to tap oil shale and performed initial development work on them from 1977 to 1981. However, TOSCO then abandoned the project before final permitting and construction began.

Magic Circle Energy Company, Utah: Magic Circle acquired about 76,000 acres of state Utah leases in 1980 and would later spend $1 million to perform tests and feasibility studies for potential oil shale extraction.[31] No mine or plant construction took place on the leases.[32]

Chevron Shale Oil Company work, Colorado: In 1981, Chevron and Conoco Shale oil began work on their Clear Creek project, located on a private 25,000-acre site north of De Beque. Construction at the site was halted in 1984.[33]



Colony plant site, Garfield County, Colorado, 1981

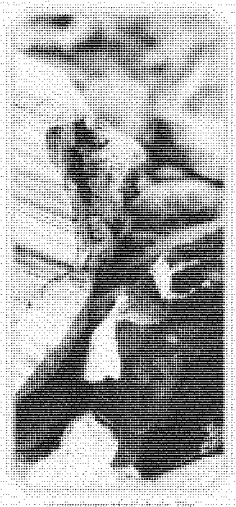
1982
Black Sunday – The Colony oil shale project in CO suddenly closes, causing economic devastation across the region

1984
Chevron and Conoco halt construction on project in CO

MID-1980s
The federal lease in UT is returned by the three partner companies

Union Oil's Parachute Creek project, Colorado: Union Oil Company of California (later Unocal) constructed the first phase of an oil shale project in 1980.[34] In 1981, it received a $400 million price guarantee that fixed the price of oil at its shale project.[35] Unocal called it quits in 1991.[36] Even when annual production peaked at 1.5 million barrels, Unocal lost $7 million.[37]

In February 2012, Chevron abandoned its lease for oil shale resources in Western Colorado and became the latest in a growing list of companies unable to turn a profit by melting so-called oil shale rocks into fuel.[38]



darker the color the higher the shale oil content.

ENDNOTES

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2. Ibid., 160
3. Ibid., 168
4. Ibid., 167
5. Ibid., 157
6. Ibid., 157
7. Center of the American West, http://bit.ly/K6TOLb
8. Andrew Gulliford, Boomtown Blues: Colorado Oil Shale, 1885-1985, (Niwot, CO: University of Colorado Press, 1989), 157.
9. "Extracts from Shale," New York Times, Aug. 29, 1917. http://bit.ly/r5Suzj
10. Ibid.
11. A.H. Ulm, "New Oil Sources Lie in Shale Mountains," New York Times, June 14, 1925. http://bit.ly/1Shin5r
12. Patty Limerick and Jason L. Hanson, "The First Bust," What Every Westerner Should Know About Oil Shale, 2008 http://bit.ly/Jj6yi0
13. "Drilling for Oil Is Begun In Colorado Shale Area," Wall Street Journal, Oct. 15, 1945, http://bit.ly/nYa28T
14. "Navy, Private Firms Seek Oil-Bearing Shale In Western Colorado," Wall Street Journal, July 19, 1948, http://bit.ly/oRThgF
15. Clare M. Cotton, "Commercial Extraction Of Oil From Shale Held Close at Hand," Wall Street Journal, September 5, 1956, accessed October 23, 2011, http://bit.ly/pArz5p

1991
After millions in subsidies and a decade invested, Unocal calls it quits

2012
Chevron abandons its lease in CO

16. Bureau of Land Management, "BLM awards Anvil Points Clean-up Contract," news release, July 29, 2008, accessed October 23, 2011, http://www.blm.gov/co/st/en/BLM_Information/newsroom/2008/blm_news_release.html
17. Congressional Research Service. Oil Shale: History, Incentives, and Policy. (April 13, 2006): 8, http://bit.ly/4B1r0d
18. Ibid., 8.
19. Bureau of Land Management, "2012 Oil Shale and Tar Sands Draft Programmatic EIS. Appendix: Oil Shale Development Background and Technology Review." January 2012. http://bit.ly/HWfqzP
20. "CER Geonuclear, 18 Others Propose Plan For Shale-Oil Recovery by Nuclear Blast," Wall Street Journal, October 26, 1967. http://on.wsj.com/15uWa6
21. Bureau of Land Management, "2012 Oil Shale and Tar Sands Draft Programmatic EIS. Appendix: Oil Shale Development Background and Technology Review." A-16.
22. "Reagan Opens Energy Unit," Associated Press. February 10, 1982. http://nyti.ms/J5GaxM
23. Bureau of Land Management, "2012 Oil Shale and Tar Sands Draft Programmatic EIS. Appendix: Oil Shale Development Background and Technology Review." http://bit.ly/HWfqzP
24. Ibid. A-20
25. Ibid. A-20
26. Ibid. A-16
27. Ibid. A-14.
28. Ibid. A-15.
29. Ibid. A-21
30. Ibid. A-22
31. Ibid. A-20.
32. Ibid. A-20.
33. Ibid. A-19.
34. Ibid. A-15.
35. "Reagan Opens Energy Unit," Associated Press. February 10, 1982. http://nyti.ms/J5GaxM
36. Bureau of Land Management, "2012 Oil Shale and Tar Sands Draft Programmatic EIS. Appendix: Oil Shale Development Background and Technology Review." A-16.
37. "Unocal to Close the Nation's Last Shale Oil Project," Los Angeles Times, March 27, 1991. http://lat.ms/13pGQE
38. Troy Hooper, "Chevron Giving Up Oil Shale Research in Western Colorado to Focus on Other Projects," Colorado Independent. February 29, 2012. http://bit.ly/wRR64f

All photos courtesy of the United States Geological Survey and the Bureau of Land Management.

Not Ready For Prime Time

Prepared by the Checks and Balances Project

Oil shale is not ready for prime time, but don't just take our word for it ...

Despite what gets said by oil industry lobbyists in a staged hearing or by politicians out on the campaign trail, the oil shale industry itself and energy experts have gone on record that a commercial scale oil shale industry is nowhere near a reality.

Shell Oil, corporate website, accessed April 24, 2012 - "A commercial [oil shale] decision would be middle of the next decade and possibly later depending on the sequence and outcome of research activities."

Jeremy Boak, director, Center for Oil Shale Technology and Research, Colorado School of Mines, E&E News, November 18, 2011 – "It isn't obvious to me yet that we need to be putting a bunch of commercial leases out there because no one has a commercial process yet... I don't see anybody eager to go out and lease land now when they're still running experiments."

Gene Whitney, Ph.D., manager, energy research, Congressional Research Service, House Natural Resources Committee oversight hearing, March 17, 2011 – "We did not do a technically recoverable [oil shale] resource estimate because there isn't one technology yet that is proven."

Memo by ExxonMobil, Colorado Springs Gazette, November 23, 2011 – "Many years of research and development will be required to demonstrate the technical, environmental, and economic feasibility of (oil shale) technology."

Tom Yelverton, ExxonMobil, Grand Junction Daily Sentinel, November 11, 2010 – "At best, commercial production is a decade away and most likely more."

Patrick McGinn, ExxonMobil, Colorado Independent, October 15, 2010 – "We plan to evaluate our in situ technology called Electrofrac thoroughly over several years before making any decisions on commercial projects."

Glenn Vawter, director, National Oil Shale Association, Glenwood Springs Post Independent, March 31, 2008 – "The short answer is that I don't think we will see anyone embark on a commercial project for well into the next decade."

Tracy Boyd, Shell Oil, Glenwood Springs Post Independent, November 11, 2008 – "In fact, it could take up to 10 to 12 years of additional research, environmental analysis and permitting before a company could develop a federal oil shale lease."

STATE OF COLORADO)
)ss.
COUNTY OF GARFIELD)

At a regular meeting of the Board of County Commissioners for Garfield County, Colorado, held at the County Administration Building in Glenwood Springs on _____, the ____ day of _____, 20___, there were present:

Tom Jankovsky_____, Commissioner
Mike Samson_____, Commissioner
John Martin_____, Commissioner Chairman
Jean Alberico_____, Clerk to the Board

when the following proceedings, among others were had and done, to-wit:

RESOLUTION NO. 12-____

RESOLUTION OPPOSING THE BLM'S OIL SHALE AND TAR SANDS PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT, BLM PROJECT # WO-300-1310-PP-OSHL (HEREAFTER 2011 OSTS PEIS) FOR LANDS ADMINISTERED BY THE BLM IN COLORADO, UTAH AND WYOMING

WHEREAS, the Board of County Commissioners of Garfield County, State of Colorado ("BOCC") is a legal and political subdivision of the State of Colorado for which the BOCC is authorized to act; and

WHEREAS, this Resolution is adopted in open meeting after due opportunity for public comment, by the Board of Commissioners of Garfield County, in order to redress the many violations of law, regulation, and policy by the BLM with respect to the BLM's 2012 OSTS PEIS; and

BACKGROUND

As background to this Resolution, the BOCC recites the following grievances:

WHEREAS, on April 14, 2011, the BLM caused to be published in the Federal Register, Volume 76, No 72/Thursday, April 14, 2011, pages 21003-21005, a notice of intent to prepare the above-referenced 2012 OSTS PEIS; and

WHEREAS, the preliminary purpose and need statement in the notice of intent, states the PEIS will analyze removing from oil shale and tar sands leasing "All areas that the BLM has identified or may identify as a result of inventories conducted during this planning process, as lands containing wilderness characteristics[.]" *Id.*, at page 21004; and

WHEREAS, the notice of intent further states at page 21004:

> Lands that the BLM identifies as having wilderness characteristics will be considered during this planning initiative, as described above, and consistent with Secretarial Order No. 3310, dated Dec. 22, 2010, and BLM Manuals 6301 and 6302. Future leasing of lands determined by the BLM to have wilderness characteristics, if compatible with the allocation decisions stemming from this initiative, will subsequently be assessed in accordance with BLM Manual 6303, as appropriate (i.e., where the BLM has not determined, consistent with BLM Manual 6302, whether the lands with wilderness characteristics at issue should receive a wild lands designation, BLM Manual 6303 will apply); and

WHEREAS, this language documents the BLM's intent to implement, administer and/or enforce Secretarial Order 3310 and one or more of the BLM guidance manuals promulgated under Order 3310; and

WHEREAS, any attempt by the BLM to implement, administer and/or enforce Secretarial Order 3310, including any effort by the BLM to proceed further on the above-referenced Programmatic EIS, violates the spending moratorium of Section 1769 of the April 21, 2011 Congressional Continuing Resolution to Fund Fiscal Year 2011 through September 30, 2011, which states:

> For the fiscal year ending September 30, 2011, none of the funds made available by this division or any other Act may be used to implement, administer, or enforce Secretarial Order No. 3310 issued by the Secretary of the Interior on December 22, 2010; and

WHEREAS, this spending moratorium has been carried forward in all subsequent Congressional spending resolutions up to and including the current spending resolution; and

WHEREAS, the 2012 OSTS PEIS, is an admitted attempt by the BLM to implement, administer and/or enforce Secretarial Order 3310 and its policies and objectives, all in violation of the Spending Moratorium of the 2011 Continuing Resolution; and

WHEREAS, the 2008 Oil Shale and Tar Sands Programmatic EIS (2008 OSTS PEIS) was required under Section 369 (d) (1) of the Energy Policy Act of 2005 and was prepared in cooperation with 14 federal, state, and local governmental organizations; and

WHEREAS, the 2008 OSTS PEIS was 3 years in the making, and it honored the input of a task force of Governors and other stakeholders as per requirement of the 2005 Energy Policy Act; and

WHEREAS, the Record of Decision (ROD) for the 2008 OSTS PEIS amended 10 land use plans in Colorado, Utah, and Wyoming to make approximately 2 million acres of public lands available for potential leasing and development of oil shale and approximately 430,000

acres available for tar sands leasing. Together with the regulations published in 2006 and 2008 for oil shale and tar sands resources, the 2008 OSTS PEIS and subsequent land use amendments constituted a reasonable and rational establishment of an oil shale and tar sands program as mandated in the Energy Policy Act of 2005; and

WHEREAS, the oil shale and tar sands program to which the 2008 OSTS PEIS and related regulations gave birth was a reasonable response to the fact that oil shale and tar sands resources in the Green River Formation located in northeastern Utah, northwestern Colorado and southwestern Wyoming may reach 8 trillion barrels of oil; and

WHEREAS, the preferred alternative in the draft 2012 OSTS PEIS drastically shrinks, diminishes and in many areas outright reverses virtually all of the lands made available for Oil Shale and Tar Sands development in 2008, and does so using the same data and science; and

WHEREAS, such a drastic reversal in lands available for Oil Shale and Tar Sands development between the 2008 PEIS and the 2012 preferred alternative, violates regulatory ran Task Force requirements of certainty for industry and investors; and

WHEREAS such a drastic reversal of lands available for Oil Shale and Tar Sands development in 2008, constitutes a de facto, piece-meal revision of previous BLM Resource Management Plans, in violation of the Section 202 Planning Process under FLPMA; and

WHEREAS, the preferred alternative in the draft 2012 OSTS PEIS entirely ignores the input of the task force and stakeholders which the 2005 Energy Policy Act directed the BLM to honor and follow; and moreover the draft 2012 OSTS PEIS may well violate various memoranda of understanding (MOUs) with counties which require the BLM to publish the written input of cooperators who disagree with the preferred alternative; and

WHEREAS the draft 2012 OSTS PEIS preferred alternative significantly restricts the acreage allotted in the 2008 PEIS for research and development leasing; and

WHEREAS the draft 2012 OSTS PEIS preferred alternative threatens to arbitrarily undermine the process and the work utilized in creation of the 2008 OSTS PEIS, and essentially dismantle a reasonable and rational oil shale and tar sands program in violation of Section 369 of the 2005 Energy Policy Act; and

WHEREAS, the 2012 OSTS PEIS preferred alternative is the creature of a friendly lawsuit settlement agreement between the BLM and ideological opponents to oil shale development, and is therefore entirely pre-determined and pre-decisional in violation of NEPA, with no apparent rationale for revising the acreages approved in 2008; and

WHEREAS, the BLM has settled on a preferred alternative in the 2012 OSTS PEIS admittedly without having first analyzed its impacts; BLM should be required to withdraw the preferred status of the alternative until it has performed this analysis; and

WHEREAS, the acreage approved for Oil Shale and Tar Sands development in the draft 2012 OSTS PEIS preferred alternative bears no rational relationship to the stated purpose and need; and

WHEREAS, the Department of Energy has basically abdicated the responsibility Congress placed upon it to defend and uphold a viable oil shale energy program in America, leaving it instead to the BLM encumbered by a host of anti-oil shale pro-wilderness groups steering BLM's every move; and

WHEREAS, the alternative adopted in the ROD of the 2008 OSTS PEIS is now the No Action Alternative of the draft 2012 OSTS PEIS; and

WHEREAS, the 2008 OSTS PEIS chosen alternative is consistent with the multiple use, sustained yield of the Federal Land Policy Management Act (FLPMA); and

WHEREAS, the 2008 OSTS PEIS chosen alternative is consistent with county general plans and policies which call for responsible development of available energy resources; and

WHEREAS, the development and production of oil from oil shale has been proven beyond a doubt to be technologically and economically feasible; and

WHEREAS, this same technology to extract oil from the oil shale rock is not only economically feasible, but it requires little to no consumption of water, contrary to the myths which falsely claim that oil shale extraction requires large consumption of water resources; and

WHERAS, the energy captured in the extract of oil from shale (natural gas capture, etc.,) more than makes up for energy consumed in that extraction process, thus dispelling the myth that the oil shale extraction process consumes more energy than it produces; and

WHEREAS, the rising price of gasoline, coupled with ever increasing loss of good paying jobs due to the Administration's policies against energy development on western public lands, result in increasing hardships for families and the local economy, to the point where some fear the window of opportunity is about to close for a civil, lawful and orderly response as citizens feel more and more pressured and desperate financially; and

WHEREAS, the 2012 OSTS PEIS improperly limits technology testing to strictly in situ efforts and does not allow for development of other technologies; and

WHEREAS, the BLM has left insufficient time for the public and cooperators to meaningfully comment on the public draft 2012 OSTS PEIS by the present comment deadline of May 4, 2012, because a highly relevant commercial oil shale BLM regulation is not due to be published until May 15, 2012 and the public should have the right to view that regulation first and then submit comments on the draft 2012 OSTS PEIS in light of that regulation; and

WHEREAS, the same problems with lack of consistency with local plans and policies and failure to honor the input of cooperators and all stakeholders, also besets many public lands EIS projects, in addition to the 2012 OSTS PEIS. The cooperators from Utah and Wyoming have already unanimously requested for the No-Action alternative in the draft 2012 OSTS PEIS become the preferred alternative.

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF GARFIELD COUNTY, STATE OF COLORADO AS FOLLOWS:

1. Garfield County declares the BLM's continuing to administer and carry out the 2012 OSTS PEIS to be an open contempt and flaunting of the Congressional Spending Moratorium first imposed in the 2011 Continuing Resolution and carried forward in all subsequent Congressional spending resolutions up to and including the present.

2. Garfield County calls upon the BLM to cease all further activities with respect to administering and carrying out the 2012 OSTS PEIS, because doing so constitutes an open Contempt and violation of the Congressional Spending Moratorium against implementing, administering and/or enforcing Secretarial Order 3310, which Spending Moratorium was first imposed in the 2011 Continuing Resolution and carried forward in all subsequent Congressional spending resolutions up to and including the present.

3. Garfield County calls upon the BLM to immediately cease and desist all activities related to the above-referenced 2012 OSTS PEIS and immediately publish a revised notice in the Federal Register signifying its cessation of all work on the Programmatic EIS in obedience to the above- quoted Spending Moratorium. Otherwise, the BLM would be in contempt of Congress.

4. Should BLM continue to go forward with the 2012 OSTS PEIS regardless of these grievances, the only legally, viable alternative would be if the BLM adopted the No-Action Alternative, which is identical to the Alternative chosen in the ROD of the 2008 OSTS PEIS.

5. The BLM should extend the May 4, 2012 deadline for public comment on the draft 2012 OSTS PEIS at least 30 days after publication of the expected oil shale regulation due to be published on or around May 15, 2012.

6. The BLM should honor the input of cooperators, particularly if they are local governments, as required by Section 202(c)(9) of FLPMA, in all matters, not just with respect to the 2012 OSTS PEIS.

DATED this ____ day of _____, 20___.

ATTEST:

BOARD OF COUNTY COMMISSIONERS OF GARFIELD COUNTY, STATE OF COLORADO

_____
Clerk to the Board

By: _____
Chairperson

Upon motion duly made and seconded the foregoing Resolution was adopted by the following vote:

Tom Jankovsky Aye
Mike Samson Aye
John Martin Aye
Commissioners

STATE OF COLORADO)
) ss.
COUNTY OF GARFIELD)

I, Jean Alberico, County Clerk and ex-officio Clerk of the Board of County Commissioners in and for the County and State aforesaid do hereby certify that the annexed and foregoing Resolution is truly copied from the Records of the Proceedings of the Board of County Commissioners for said Garfield County, now in my office.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of said County, at Glenwood Springs, this ___ day of _____, A.D. 20__.

County Clerk and ex-officio Clerk of
the Board of County Commissioners

_____

MCM 2012-034

RESOLUTION OF MESA COUNTY STATE OF COLORADO

OPPOSING THE BLM'S 2012 OIL SHALE AND TAR SANDS PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT, BLM PROJECT # WO-300-1310-PP-OSHL (HEREAFTER 2011 OSTS PEIS) FOR LANDS ADMINISTERED BY THE BLM IN COLORADO, UTAH, AND WYOMING,

This Resolution is adopted in open meeting after due opportunity for public comment, by the Board of Commissioners of Mesa County, in order to redress the many violations of law, regulation, and policy by the BLM with respect to the BLM's 2012 OSTS PEIS.

BACKGROUND

As background to this Resolution, Mesa County recites the following grievances:

WHEREAS, On April 14, 2011, the BLM caused to be published in the Federal Register, Volume 76, No 72/Thursday, April 14, 2011, pages 21003-21005, a notice of intent to prepare the above-referenced 2012 OSTS PEIS; and

WHEREAS, the preliminary purpose and need statement in the notice of intent, states the PEIS will analyze removing from oil shale and tar sands leasing "All areas that the BLM has identified or may identify as a result of inventories conducted during this planning process, as lands containing wilderness characteristics[.]" *Id.*, at page 21004; and

WHEREAS, the notice of intent further states at page 21004:

> Lands that the BLM identifies as having wilderness characteristics will be considered during this planning initiative, as described above, and consistent with Secretarial Order No. 3310, dated Dec. 22, 2010, and BLM Manuals 6301 and 6302. Future leasing of lands determined by the BLM to have wilderness characteristics, if compatible with the allocation decisions stemming from this initiative, will subsequently be assessed in accordance with BLM Manual 6303, as appropriate (i.e., where the BLM has not determined, consistent with BLM Manual 6302, whether the lands with wilderness characteristics at issue should be receive a wild lands designation, BLM Manual 6303 will apply); and

WHEREAS, this language documents the BLM's intent to implement, administer and/or enforce Secretarial Order 3310 and one or more of the BLM guidance manuals promulgated under Order 3310; and

WHEREAS, any attempt by the BLM to implement, administer and/or enforce Secretarial Order 3310, including any effort by the BLM to proceed further on the above-referenced Programmatic

EIS, violates the spending moratorium of Section 1769 of the April 21, 2011 Congressional Continuing Resolution to Fund Fiscal Year 2011 through September 30, 2011, which states:

> For the fiscal year ending September 30, 2011, none of the funds made available by this division or any other Act may be used to implement, administer, or enforce Secretarial Order No. 3310 issued by the Secretary of the Interior on December 22, 2010; and

WHEREAS, this spending moratorium has been carried forward in all subsequent Congressional spending resolutions up to and including the current spending resolution; and

WHEREAS, the 2012 OSTS PEIS, is an admitted attempt by the BLM to implement, administer and/or enforce Secretarial Order 3310 and its policies and objectives, all in violation of the Spending Moratorium of the 2011 Continuing Resolution; and

WHEREAS, the 2008 Oil Shale and Tar Sands Programmatic EIS (2008 OSTS PEIS) was required under Section 369 (d) (1) of the Energy Policy Act of 2005 and was prepared in cooperation with 14 federal, state, and local governmental organizations; and

WHEREAS the 2008 OSTS PEIS was 3 years in the making, and it honored the input of a task force of Governors and other stakeholders as per requirement of the 2005 Energy Policy Act; and

WHEREAS, the Record of Decision (ROD) for the 2008 OSTS PEIS amended 10 land use plans in Colorado, Utah, and Wyoming to make approximately 2 million acres of public lands available for potential leasing and development of oil shale and approximately 430,000 acres available for tar sands leasing. Together with the regulations published in 2006 and 2008 for oil shale and tar sands resources, the 2008 OSTS PEIS and subsequent land use amendments constituted a reasonable and rational establishment of an oil shale and tar sands program as mandated in the Energy Policy Act of 2005; and

WHEREAS, the oil shale and tar sands program to which the 2008 OSTS PEIS and related regulations gave birth, was a reasonable response to the fact that oil shale and tar sands resources in the Green River Formation located in northeastern Utah, northwestern Colorado, and southwestern Wyoming may reach 4 trillion barrels of oil; and

WHEREAS, the preferred alternative in the draft 2012 OSTS PEIS drastically shrinks, diminishes and in many areas outright reverses virtually all of the lands made available for Oil Shale and Tar Sands development in 2008, and does so using the same data and science; and

WHEREAS, such a drastic reversal in lands available for Oil Shale and Tar Sands development between the 2008 PEIS and the 2012 preferred alternative, violates regulatory ran Task Force requirements of certainty for industry and investors; and

WHEREAS such a drastic reversal of lands available for Oil Shale and Tar Sands development in 2008, constitutes a de facto, piece-meal revision of previous BLM Resource Management Plans, in violation of the Section 202 Planning Process under FLPMA; and

WHEREAS, the preferred alternative in the draft 2012 OSTS PEIS entirely ignores the input of the task force and stakeholders which the 2005 Energy Policy Act directed the BLM to honor and follow; and moreover the draft 2012 OSTS PEIS may well violate various memoranda of understanding (MOUs) with counties which require the BLM to publish the written input of cooperators who disagree with the preferred alternative; and

WHEREAS the draft 2012 OSTS PEIS preferred alternative significantly restricts the acreage allotted in the 2008 PEIS for research and development leasing; and

WHEREAS the draft 2012 OSTS PEIS preferred alternative threatens to arbitrarily undermine the process and the work utilized in creation of the 2008 OSTS PEIS, and essentially dismantle a reasonable and rational oil shale and tar sands program in violation of Section 369 of the 2005 Energy Policy Act; and

WHEREAS, the 2012 OSTS PEIS preferred alternative is the creature of a friendly lawsuit settlement agreement between the BLM and ideological opponents to oil shale development, and is therefore entirely pre-determined and pre-decisional in violation of NEPA, with no apparent rationale for revising the acreages approved in 2008; and

WHEREAS, the BLM has settled on a preferred alternative in the 2012 OSTS PEIS admittedly without having first analyzed its impacts; BLM should be required to withdraw the preferred status of the alternative until it has performed this analysis; and

WHEREAS, the acreage approved for Oil Shale and Tar Sands development in the draft 2012 OSTS PEIS preferred alternative bears no rational relationship to the stated purpose and need; and

WHEREAS, the Department of Energy has basically abdicated the responsibility Congress placed upon it to defend and uphold a viable oil shale energy program in America, leaving it instead to the BLM encumbered by a host of anti-oil shale pro-wilderness groups steering BLM's every move; and

WHEREAS, the alternative adopted in the ROD of the 2008 OSTS PEIS is now the No Action Alternative of the draft 2012 OSTS PEIS; and

WHEREAS, the 2008 OSTS PEIS chosen alternative is consistent with the multiple use, sustained yield of the Federal Land Policy Management Act (FLPMA); and

WHEREAS, the 2008 OSTS PEIS chosen alternative is consistent with county general plans and policies which call for responsible development of available energy resources; and

WHEREAS, the development and production of oil from oil shale has been proven beyond a doubt to be technologically and economically feasible; and

WHEREAS, this same technology to extract oil from the oil shale rock is not only economically feasible, *but it requires little to no consumption of water,* contrary to the myths which falsely claim that oil shale extraction requires large consumption of water resources; and

WHERAS, the energy captured in the extract of oil from shale (natural gas capture, etc.,) more than makes up for energy consumed in that extraction process, thus dispelling the myth that the oil shale extraction process consumes more energy than it produces; and

WHEREAS, the rising price of gasoline, coupled with ever increasing loss of good paying jobs due to the Administration's policies against energy development on western public lands, result in increasing hardships for families and the local economy; and

WHEREAS, the 2012 OSTS PEIS improperly limits technology testing to strictly in situ efforts and does not allow for development of other technologies; and

WHEREAS, the BLM has left insufficient time for the public and cooperators to meaningfully comment on the public draft 2012 OSTS PEIS by the present comment deadline of May 4, 2012, because a highly relevant commercial oil shale BLM regulation is not due to be published until May 15, 2012 and the public should have the right to view that regulation first and then submit comments on the draft 2012 OSTS PEIS in light of that regulation; and

WHEREAS, the same problems with lack of consistency with local plans and policies and failure to honor the input of cooperators and all stakeholders, also besets many public lands EIS projects, in addition to the 2012 OSTS PEIS. The cooperators from Utah and Wyoming have already unanimously requested for the No-Action alternative in the draft 2012 OSTS PEIS become the preferred alternative.

RESOLUTION

NOW THEREFORE, BE IT RESOLVED BY MESA COUNTY, STATE OF COLORADO AS FOLLOWS:

1. Mesa County declares the BLM's continuing to administer and carry out the 2012 OSTS PEIS to be an open contempt and flaunting of the Congressional Spending Moratorium first imposed in the 2011 Continuing Resolution and carried forward in all subsequent Congressional spending resolutions up to and including the present;

2. Mesa County calls upon the BLM to cease all further activities with respect to administering and carrying out the 2012 OSTS PEIS, because doing so constitutes an open contempt and violation of the Congressional Spending Moratorium against implementing, administering and/or enforcing Secretarial Order 3310, which Spending Moratorium was first imposed in the 2011 Continuing Resolution and carried forward in all subsequent Congressional spending resolutions up to and including the present;

3. Mesa County calls upon the BLM to immediately cease and desist all activities related to the above-referenced 2012 OSTS PEIS and immediately publish a revised notice in the Federal Register signifying its cessation of all work on the Programmatic EIS in obedience to the above-quoted Spending Moratorium. Otherwise, the BLM would be in contempt of Congress;

4. Should BLM continue to go forward with the 2012 OSTS PEIS regardless of these grievances, the only legally, viable alternative would be if the BLM adopted the No-Action Alternative, which is identical to the Alternative chosen in the ROD of the 2008 OSTS PEIS;

5. The BLM should extend the May 4, 2012 deadline for public comment on the draft 2012 OSTS PEIS at least 30 days after publication of the expected oil shale regulation due to be published on or around May 15, 2012;

6. The BLM should honor the input of cooperators, particularly if they are local governments, as required by Section 202(c)(9) of FLPMA, in all matters, not just with respect to the 2012 OSTS PEIS.

DULY MOVED, SECONDED AND PASSED THIS 16th day of April, 2012

BOARD OF COUNTY COMMISSIONERS OF
MESA COUNTY, COLORADO

By: _____
Chairman

ATTEST:

Sheila Reiner
Mesa County Clerk & Recorder

S:\DRFT-AGN\RESO\Tristate Oil Shale Resolution 2012.docx

NEWS RELEASE

Date: April 19, 2012

Contact: Jessica Peterson
Public Relations Director
(970) 244-1640
Jessica.peterson@mesacounty.us

Mesa County Opposes Changes to Federal Plans for Oil Shale Leasing

County Commissioners in three states are calling upon the Bureau of Land Management to stop the process for a new environmental impact statement.

The Mesa County Board of Commissioners has unanimously approved a resolution calling on the federal Bureau of Land Management (BLM) to stop its plans to change an existing environmental impact statement on oil shale and tar sands resources in Colorado, Wyoming and Utah.

"Mesa County has a long history of working closely with our federal agencies—including the BLM— and we still support the agency's 2008 environmental impact statement for our area," said Craig Meis, Chair of the Mesa County Board of Commissioners. "We do not support re-vamping the process to put more restrictions on energy development on BLM lands in our area."

Eleven counties in Colorado, Utah and Wyoming are joining together to oppose the process to re-analyze the potential environmental effects of leasing BLM lands to access oil shale and tar sands resources. The BLM has published a notice of its intent to prepare a new 2012 Oil Shale and Tar Sands Programmatic Environmental Impact Statement (OSTS PEIS).

The Commissioners highlighted the fact that oil shale and tar sands located in northeastern Utah, northwestern Colorado and southwestern Wyoming contain significant oil resources. Their resolution states that the 2012 OSTS PEIS will consider "removing from oil shale and tar sands leasing 'all areas that the BLM has identified or may identify... as lands containing wilderness characteristics.'"

"We feel the 2008 analysis—which took three years to complete—was very thorough and took into account local and state input," said Mesa County Commissioner Janet Rowland. "The preferred alternative in this new federal process aims to add restrictions to oil shale development that would have a serious negative impact on our local economy."

"Mesa County is a regional economic hub for western Colorado and eastern Utah," added County Commissioner Steve Acquafresca. "As local government representatives, we want to make sure our local economy, environment and quality of life are taken into consideration when these important decisions are made."

According to the resolution, "the preferred alternative in the draft 2012 OSTS PEIS drastically shrinks, diminishes and in many areas outright reverses virtually all of the lands made available for Oil Shale and Tar Sands development in 2008, and does so using the same data and science."

Mesa County's resolution calls upon the BLM to discontinue the 2012 OSTS PEIS effort. If the BLM moves forward with the 2012 planning process, the resolution recommends that Alternative A—no action—be chosen, as it is identical to the alternative chosen in the 2008 OSTS PEIS.

"The thoughtful and carefully regulated exploration and development of oil shale reserves is a vital component of energy development for our country and our local area," said Commissioner Meis. View his slide presentation online at: www.mesacounty.us.

"Mesa County—Creating a community of opportunities for all residents with a focus on the future."

RESOLUTION NO. 2012- 12

A RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS OF RIO BLANCO COUNTY, COLORADO, OPPOSING THE UNITED STATE BUREAU OF LAND MANAGEMENT'S (BLM) 2012 OIL SHALE AND TAR SANDS PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT, BLM PROJECT # WO-300-1310-PP-OSHL (HEREAFTER 2012 OSTS PEIS) FOR LANDS ADMINISTERED BY THE BLM IN COLORADO, UTAH AND WYOMING

Concerning Secretary of the Interior Secretarial Order 3310 issued December 22, 2010 ("Secretarial Order 3310").

WHEREAS, On April 14, 2011, the BLM caused to be published in the Federal Register, Volume 76, No 72/Thursday, April 14, 2011, pages 21003-21005, a notice of intent to prepare the above-referenced 2012 OSTS PEIS; and

WHEREAS, the preliminary purpose and need statement in the notice of intent, states the 2012 OSTS PEIS will analyze removing from oil shale and tar sands leasing "All areas that the BLM has identified or may identify as a result of inventories conducted during this planning process, as lands containing wilderness characteristics[.]" *Id.*, at page 21004; and

WHEREAS, the notice of intent further states at page 21004:

> "Lands that the BLM identifies as having wilderness characteristics will be considered during this planning initiative, as described above, and consistent with Secretarial Order No. 3310, dated Dec. 22, 2010, and BLM Manuals 6301 and 6302. Future leasing of lands determined by the BLM to have wilderness characteristics, if compatible with the allocation decisions stemming from this initiative, will subsequently be assessed in accordance with BLM Manual 6303, as appropriate (Le., where the BLM has not determined, consistent with BLM Manual 6302, whether the lands with wilderness characteristics at issue should be receive a wild lands designation, BLM Manual 6303 will apply)"; and

WHEREAS, this language documents the BLM's intent to implement, administer and/or enforce Secretarial Order 3310 and one or more of the BLM guidance manuals promulgated under Order 3310; and

WHEREAS, any attempt by the BLM to implement, administer and/or enforce Secretarial Order 3310, including any effort by the BLM to proceed further on the 2012OSTS PEIS, violates the spending moratorium of Section 1769 of the April 21, 2011 Congressional Continuing Resolution to Fund Fiscal Year 2011 through September 30, 2011, which states:

"For the fiscal year ending September 30, 2011, none of the funds made available by this division or any other Act may be used to implement, administer, or enforce Secretarial Order No. 3310 issued by the Secretary of the Interior on December 22, 2010"; and

WHEREAS, this spending moratorium has been carried forward in all subsequent Congressional spending resolutions up to and including the current spending resolution; and

WHEREAS, the 2012 OSTS PEIS, is an admitted attempt by the BLM to implement, administer and/or enforce Secretarial Order 3310 and its policies and objectives, all in violation of the Spending Moratorium of the 2011 Continuing Resolution; and

Concerning the 2008 OSTS PEIS

WHEREAS, the 2008 Oil Shale and Tar Sands Programmatic EIS (2008 OSTS PEIS) was required under Section 369 (d) (1) of the Energy Policy Act of 2005 and was prepared in cooperation with 14 Federal, state, and local governmental organizations; and

WHEREAS, the 2008 OSTS PEIS was three years in the making, and honored the input of a task force of Governors and other stakeholders as required by the 2005 Energy Policy Act; and

WHEREAS, the Record of Decision (ROD) for the 2008 OSTS PEIS amended 10 land use plans in Colorado, Utah, and Wyoming to make approximately 2 million acres of public lands available for potential leasing and development of oil shale and approximately 430,000 acres available for leasing and development of tar sands. Together with the regulations published in 2006 and 2008 for oil shale and tar sands resources, the 2008 OSTS PEIS and subsequent land use amendments constituted a reasonable and rational establishment of an oil shale and tar sands program as mandated in the Energy Policy Act of 2005; and

WHEREAS, the oil shale and tar sands program which the 2008 OSTS PEIS and related regulations delivered, was a reasonable response to the fact that oil shale and tar sands resources in the Green River Formation located in northeastern Utah, northwestern Colorado and southwestern Wyoming are estimated to be the equivalent of 8 trillion barrels of oil; and

WHEREAS, the 2008 OSTS PEIS chosen alternative is consistent with the multiple use, sustained yield of the Federal Land Policy Management Act (FLPMA); and

WHEREAS, the 2008 OSTS PEIS chosen alternative is consistent with the County Master Plan and policies which call for responsible development of available energy resources; and

WHEREAS, the alternative adopted in the Record of Decision (ROD) of the 2008 OSTS PEIS is now the No Action Alternative of the draft 2012 OSTS PEIS; and

Concerning the 2012 OSTS PEIS

WHEREAS, the preferred alternative in the draft 2012 OSTS PEIS drastically shrinks, diminishes and in many areas outright reverses virtually all of the lands made available for Oil Shale and Tar Sands development in 2008, and does so using the same data and science; and

WHEREAS, such a drastic reversal in lands available for Oil Shale and Tar Sands development between the 2008 PEIS and the 2012 preferred alternative, violates regulatory Task Force requirements of certainty for industry and investors; and

WHEREAS, such a drastic reversal of lands available for Oil Shale and Tar Sands development in 2008, constitutes a de facto, piece-meal revision of previous BLM Resource Management Plans, in violation of the Section 202 Planning Process under FLPMA; and

WHEREAS, the preferred alternative in the draft 2012 OSTS PEIS entirely ignores the input of the task force and stakeholders which the 2005 Energy Policy Act directed the BLM to honor and follow; and moreover the draft 2012 OSTS PEIS may well violate various memoranda of understanding (MOUs) with counties which require the BLM to publish the written input of cooperators who disagree with the preferred alternative; and

WHEREAS, the draft 2012 OSTS PEIS preferred alternative significantly restricts the acreage allotted in the 2008 PEIS for research and development leasing; and

WHEREAS, the draft 2012 OSTS PEIS preferred alternative threatens to arbitrarily undermine the process and the work utilized in creation of the 2008 OSTS PEIS, and essentially dismantle a reasonable and rational oil shale and tar sands program in violation of Section 369 of the 2005 Energy Policy Act; and

WHEREAS, the 2012 OSTS PEIS improperly limits technology testing to strictly in situ efforts and does not allow for development of other technologies; and

WHEREAS, the 2012 OSTS PEIS preferred alternative is the creature of a friendly lawsuit settlement agreement between the BLM and ideological opponents to oil shale development, and is therefore entirely pre-determined and pre-decisional in violation of NEPA, with no apparent rationale for revising the acreages approved in 2008; and

WHEREAS, the BLM has settled on a preferred alternative in the 2012 OSTS PEIS admittedly without having first analyzed its impacts; the BLM should be required to withdraw the preferred status of the alternative until it has performed this analysis; and

WHEREAS, the acreage approved for Oil Shale and Tar Sands development in the preferred alternative of the draft 2012 OSTS PEIS bears no rational relationship to the stated purpose and need; and

Concerning Oil Shale Facts

WHEREAS, the development and production of oil from oil shale has been demonstrated to be technologically and economically feasible elsewhere in the world; and

WHEREAS, some technologies to extract oil from the oil shale rock are not only economically feasible, *but require little or no consumption of water*; and

WHEREAS, the energy captured in the extraction of oil and other hydrocarbons from shale more than makes up for energy consumed in that extraction process; and

Other Concerns

WHEREAS, the rising price of gasoline, coupled with ever-increasing loss of good paying jobs due to the Administration's policies against energy development on western public lands, results in increasing hardships for families and the local economy; and

WHEREAS, the Department of Energy has basically abdicated the responsibility Congress placed upon it to defend and uphold a viable oil shale energy program in America, leaving it instead to a BLM encumbered by a host of anti-oil shale pro-wilderness groups steering the BLM's oil shale policy; and

WHEREAS, the BLM has left insufficient time for the public and cooperators to meaningfully comment on the public draft 2012 OSTS PEIS by the present comment deadline of May 4, 2012, because a highly relevant commercial oil shale BLM regulation is not due to be published until May 15, 2012, and the public should have the right to view that regulation first and then submit comments on the draft 2012 OSTS PEIS in light of that regulation; and

WHEREAS, the same problems with lack of consistency with local plans and policies and failure to honor the input of cooperators and all stakeholders, also besets many public lands EIS projects, in addition to the 2012 OSTS PEIS. The cooperators from Utah and Wyoming have already unanimously requested for the No-Action alternative in the draft 2012 OSTS PEIS become the preferred alternative;

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF RIO BLANCO COUNTY, COLORADO, THAT:

1. Rio Blanco County declares the BLM's continuing to administer and carry out the 2012 OSTS PEIS to be an open contempt and flaunting of the Congressional Spending Moratorium first imposed in the 2011 Continuing Resolution and carried forward in all subsequent Congressional spending resolutions up to and including the present one in effect.

2. Rio Blanco County calls upon the BLM to cease all further activities with respect to administering and carrying out the 2012 OSTS PEIS, because doing so is an open contempt and

violation of the Congressional Spending Moratorium against implementing, administering and/or enforcing Secretarial Order 3310, for which the Spending Moratorium was first imposed in the 2011 Continuing Resolution and carried forward in all subsequent Congressional spending resolutions up to and including the present.

3. Rio Blanco County calls upon the BLM to immediately cease and desist all activities related to the above-referenced 2012 OSTS PEIS and immediately publish a revised notice in the Federal Register signifying its cessation of all work on the Programmatic EIS in obedience to the above-quoted Spending Moratorium. Otherwise, the BLM would be in contempt of Congress.

4. Should BLM continue to go forward with the 2012 OSTS PEIS regardless of these grievances, the only legally, viable alternative would be if the BLM adopted the No-Action Alternative, which is identical to the Alternative chosen in the ROD of the 2008 OSTS PEIS.

5. The BLM should extend the May 4, 2012, deadline for public comment on the draft 2012 OSTS PEIS by at least 30 days after publication of the expected oil shale regulation which is due to be published on or around May 15, 2012.

6. The BLM should honor the input of cooperators, particularly if they are local governments, as required by Section 202(c)(9) of FLPMA, in all matters, not just with respect to the 2012 OSTS PEIS.

DULY MOVED, SECONDED, AND PASSED ON A VOTE OF 3 FOR AND 0 AGAINST THIS 16th DAY OF April 2012.

BOARD OF COUNTY COMMISSIONERS OF RIO BLANCO COUNTY, COLORADO

Shawn J. Bolton, Chairman

Kenneth C. Parsons, Commissioner

Kai M. Turner, Commissioner

ATTEST:

Nancy R. Amick, Clerk to the Board

ECONOMIC IMPACT OF FAILURE TO IMPLEMENT LEGISLATIVE MANDATES OF SEC 369, ENERGY POLICY ACT 2005

A WHITE PAPER

BY

ANTON DAMMER, M.S.

AND

JAMES BUNGER, PH.D.

MARCH 15, 2011

OUR NEED FOR DOMESTIC ENERGY IS INCREASING, NOT DECREASING

It is abundantly clear that US economy depends on affordable and available supplies of energy. While recent attention is being paid to prices, the long-term outlook places doubt on adequate supply. It is easy to see that the greater our domestic supply, and the more imported oil that is produced in the Western Hemisphere, the more secure will be our Nation and Economy.

Congress recognized these facts when they passed the Energy Policy Act of 2005 (Act). In particular, Sec 369 of that Act focused directly on promoting the development of liquid fuels from the Nation's vast unconventional hydrocarbon resources. In particular, the law provided for the leasing of federal oil shale lands and the study and mitigation of technical, economic and regulatory impediments to unconventional fuels development.

Immediately following passage of the Act, the Departments of Energy and Interior, assisted by the Department of Defense set about to pursue the mandates of Sec. 369. Tangible progress had been made in the prior Administration and this progress is outline in the Appendix at the end of this paper. However, further progress toward the goals of Sec 369 have not only languished, but in certain instances have been obstructed by the current Administration.

Given the increasing need for domestic energy, and the long lead times needed to produce such resources, what are the potential impacts of obstruction and delays in development of these resources?

DEVELOPMENT OF RECOMMENDATIONS

Following passage of the Act an Unconventional Fuels Task Force was formed comprised of cognizant federal agencies (Energy, Interior and Defense), States that contained resources (Colorado, Utah, Wyoming, Kentucky and Mississippi), and local officials from potential producing areas.

The Task Force was staffed by the Office of Petroleum Reserves, Office of Naval Petroleum and Oil Shale Reserves (NPOSR) who were charged with the responsibility of executing the mandates of Sections 369 (h) and (i). As of the end of 2008 NPOSR had completed all requirements save the "implementation" part of the program. That path to implementation is clearly defined in both the subject Task Force Report and the Strategic Plan: Unconventional Fuels Development within the Western Energy Corridor, both found at **www.unconventionalfuels.org**.

Simultaneously, the US Dept of Interior pursued their mandate to promulgate leasing regulations for oil shale. Part of this effort also involved the preparation of a Programmatic Environmental Impact Statement (PEIS), the updating of Resource Management Plans (RMPs) in the oil shale resource areas, and the offering and issuance of technology Research,

Development and Demonstration (RD&D) leases. By the end of 2008, the Dept. of Interior had completed the PEIS, had awarded 6 RD&D leases and on Nov 18, 2008 issued final leasing regulations.

The Unconventional Fuels Task Force prepared a schedule for development and itemized in some detail the impediments to that development. Many of these impediments have their origins in policy and legislation controlled by the Federal Government. The greatest limitation to expeditious oil shale development is the uncertainty over access to resource and understanding of Federal regulations governing Federal lands. Had these impediments been mitigated, and leasing proceeded as mandated in Sec 369, the US would be well on its way to substantial production of oil from these vast, secure domestic resources.

Instead, not only has the current Administration failed to implement the Task Force action items, but has actually withdrawn leasing, which would have engaged the private sector in advancing development. Additionally, they have allowed the regulatory process to remain in a state of confusion. In particular, they have threatened to reopen the RMPs, and they have threatened to change the terms of the RD and D leases. The Administration (through the Department of Interior) has been complicit in a recent court ruling (Feb 15, 2011) delaying indefinitely the commercial and RD and D lease activities. All of this adds uncertainty to any investment, and causes capital to remain on the sideline.

The question some in Congress are asking, is 'what are the implications of these adverse policies to our Nation's energy supply and economic security?' The adverse impact of this Administrative action can be quantified by comparing the *possible* with the *reality*.

THE ECONOMIC IMPACTS OF FAILURE TO IMPLEMENT RECOMMENDATIONS

As part of the Strategic Unconventional Fuels Program, the Office of Naval Petroleum and Oil Shale Reserves developed an economic model to project potential economic benefits that would accrue from an oil shale industry over a 25 year period, 2009 – 2035. Three different development scenarios were modeled on 2010 $45/bbl and 2035 $65/bbl oil:

1. Base Case: production of 0.5 million barrels per day by 2035 had no Government incentives other than a $40/bbl floor and was based on development of three major insitu production companies.

2. Moderate Case: Production of 1.5 million barrels per day by 2035 had a $40/bbl price floor and a $5/bbl production tax credit and was based on six insitu projects and one surface retorting operation.

3. Accelerated Case: Production of 2.4 million barrels per day by 2035 with a price floor of $40/bbl, $5/bbl tax credit, and cost shared demonstration facilities for three technologies and was based on a variety of 17 projects.

Each scenario had a pre-production start-up time from between nine years for the Base and Moderate Cases and four years for the Accelerated Case. The clock on these cases was to

have started in 2008. Indeed, the Department of Interior promulgated regulations for leasing on November 18, 2008.

With oil prices currently in the $100/bbl range and 2010 monthly closing prices averaging $79/bbl the economic benefits calculated in the model are modest. There are few experts who foresee an appreciable decline in future oil prices while many predict dramatic increases based upon continuing supply uncertainty and growing demand in developing nations. Technological progress in the private sector has been increasingly aggressive and productive. The cumulative economic benefits of the three cases in the model are:

Timeframe = 25 years	*Base*	*Moderate*	*Accelerated*
Production (Billion Bbls)	0.8	1.5	2.2
Federal Revenue	11	15	29
State & Local Revenue	7	13	23
Public Sector Revenues	18	28	52
Growth in GDP	71	146	255
Value of Imports Avoided (Billions $)	57	105	215

To adjust the model numbers to reflect the current situation, the following assumptions are applied:

1. Oil price is increased by a flat 20% (the difference between the monthly closing average in 2010 of $79/bbl and the models 2035 price of $64/bbl). This is obviously very conservative since the difference in the 2035 price in the model and closing price of oil on March 1, 2011 was close to 40%.
2. There is no need for price floors, tax credits, and Federal cost-shared demonstrations.
3. All projects are delayed by half of their economic life, or approximately 12 years.

Under those very simplified assumptions, that do not account for the loss of time value of money nor current oil price escalation, the cost of government inertia is substantial, as below.

Timeframe = 25 years	*Base*	*Moderate*	*Accelerated*
Production (Billion Bbls)	0.4	0.7	1.1
Federal Revenue	5.6	9	17.5
State & Local Revenue	4.2	7.3	14.8
Public Sector Revenues	10.3	16.3	31.2
Growth in GDP	42.5	87.6	152
Value of Imports Avoided (Billions $)	31.2	61.5	128

It should also be noted that oil shale development, as with other oil and gas industry developments, are a source of high paying employment. In the negative employment environment we are now experiencing in the United States it is estimated that delay of oil shale development would result in the loss of high-paying direct jobs on the order of 4850, 13,000, and 21,700 for the Base, Moderate, and Accelerated Cases respectively.

Additionally, indirect jobs in the private service sector are several times the number of direct jobs, and these are lost as well.

CONCLUSIONS

What makes oil shale important to United States national security is the nature of the resource itself. It is the largest hydrocarbon resource on earth. On a per acre basis, it is the most concentrated oil bearing resource on earth. Yet as a nation, we continue to avert attention from this valuable resource and consciously impede and deny those actions that are required to develop U.S. domestic resources in a safe and environmentally responsible manner. We continue, as a Government, to foreclose on our own success. This is mysteriously destructive behavior. In the Energy Policy Act of 2005 the President and the Congress of the United States declared that unconventional fuels, including oil shale, ***"are strategically important resources that should be developed to reduce the growing dependence of the United States on politically and economically unstable sources of foreign oil imports".***

Today the implied threat engendered in those words could not be more poignant.
Recent unrest throughout the Arab lateral has driven world oil prices over $100/bbl. In Section 369 of the Act Congress outlines a rational process to begin the requisite planning and analysis to fully understand and eventually develop our domestic oil shale resources. The important work accomplished by DOI has been indefinitely suspended through the settlement of the oil shale leasing regulations suit. The Unconventional Fuels Program within the Office of Petroleum Reserves in the DOE is being de-funded and essentially abandoned. All the extensive preparatory work accomplished by the Task Force and Ad Hoc Working Group is to be ignored and archived, to the detriment of the nation's energy security. It is in the hands of Congress to require that the provisions of the law be executed in a manner that will assure the objectives of the Act are accomplished.

APPENDIX – SUMMARY OF SEC 369 AND MANDATED ACTIVITIES

SEC. 369. OIL SHALE, TAR SANDS, AND OTHER STRATEGIC UNCONVENTIONAL FUELS.

Declaration of Policy. – Congress declares that it is the policy of the United States that

*(1) **United States oil shale, tar sands, and other unconventional fuels are strategically important resources that should be developed to reduce the growing dependence of the United States on politically and economically unstable sources of foreign oil imports;***
*(2) **The development of oil shale, tar sands, and other strategic unconventional fuels, for research and commercial development, should be conducted in an environmentally sound manner, using practices that minimize impacts; and***
*(3) **Development of those strategic unconventional fuels should occur, with an emphasis on sustainability, to benefit the United States while taking into account affected States and communities.***

There followed a number of provisions (Sections) of the Act to assign responsibility and assure implementation of the policy.

SECTIONS ***(c) thru (e): Leasing Program for Research &Development; Programmatic Environmental Impact Statement and Commercial Leasing Program for Oil Shale and Tar Sands.-***

The Secretary of the Interior was required to implement an oil shale and tar sands R&D leasing program to include: a Programmatic Environmental Impact Statement within 18 months; final leasing regulations not later than 6 months after the EIS; and begin commercial leasing no later than 180 days after publication of the subject regulations.

Accomplishments: *The PEIS and leasing regs have been completed. No commercial leasing has been offered or begun.*

SECTION ***(h): Task Force. -***

The Secretary of Energy, in cooperation with the Secretary of the Interior and the Secretary of Defense was to establish a Task Force to develop a program to coordinate and accelerate the commercial development of strategic unconventional fuels and initiate partnerships with Alberta and nations with oil shale resources. Further, the Task Force was to make such recommendations regarding promoting the development of strategic unconventional fuels resources within the United States as it deemed appropriate. The Act directs that the Task Force provide Congress and the President a report that describes their analysis and recommendations within 180 days. (Section 369(i) of the Act designated the Office of Petroleum Reserves to coordinate and provide staff support to the Task Force.)

Accomplishments:

- Task Force established, with representatives of Sec. of Energy, Defense, and Interior: Governors of Colorado, Utah, Wyoming, Kentucky and Mississippi; and three local representatives from potentially effected counties – January 2006.
- Twelve Task Force Meetings and three conference calls held - March 2006 and December 2009.
- Initial Report to Congress: *"Development of America's Strategic Unconventional Fuels Resources"*, forwarded to Congress and the President – September 2006.
- Three Volume comprehensive report, with recommendations, *"America's Strategic Unconventional Fuels"*, forwarded to the President and Congress – February 2007.
- Last Annual Report to Congress – December 2008

SECTION 369 *(i): Office of Petroleum Reserves.* -

Directed the Office of Petroleum Reserves to coordinate the creation and implementation of a commercial strategic fuel development program; promote and coordinate actions that facilitate development; and evaluate importance of fuels for the security of the United States. The Act directs the Secretary to submit a report to Congress and the President on activities under this section.

Accomplishments:

- Report to Congress and President, *"Activities, Accomplishments, and Plans Related to Section 369 of the Energy Policy Act of 2005"* completed and forwarded to Office of Management and Budget for clearance - January 2006.
- Established an Ad Hoc Unconventional Fuels Working Group, over 30 representatives of public and private interests, convening multiple strategic planning meeting - Jan. 2006 - October 2009.
- Ad Hoc Working Group Strategic Plan - November 2008.
- Comprehensive economics decision model *"National Unconventional Fuels Model"* - December 2005.
- Report profiling companies engaged in domestic oil shale and tar sands resource and technology development *"Secure Fuels from Domestic Resources"*- June 2007.
- Report *"Carbon and Water Resources Impacts from Unconventional Fuels Development in the Western Energy Corridor"* – Los Alamos National Lab Draft Completed June 2010.
- Report *" Oil Shale Research in the United States"*- June 2009

SECTION 369 *(l): Cost-sharing Demonstration Technologies.-*

The Secretary of Energy shall identify technologies for the development of oil shale and tar sands ready for demonstration at commercially representative scale. (Responsibility to Office of the Deputy Assistant Secretary for Oil and Gas Research and Development.)

Accomplishments: *None, due to lack of funding or appropriations.*

SECTION *(m): National Oil Shale and Tar Sands Assessment.-*

The Secretary of the Interior shall carry out a national assessment of oil shale and tar sands for the purpose of evaluating and mapping oil shale and tar sands deposits in the Green River Basin of Colorado, Utah, and Wyoming, Devonian shales east of the Mississippi; and areas of the central and western U.S. including Alaska, in that order of priority.

Accomplishments: *USGS has completed mapping the Colorado oil shale resource, increasing probable reserves estimates by 500 million barrels. Currently concluding work on Utah Green River Resource.*

SECTION *(p): Heavy Oil Technology and Economic Assessment.-*

The Secretary of Energy to update 1987 technical and economic assessment of domestic heavy oil resources prepared by the IOGCC, to include all of North America and all unconventional oil, including heavy oil, tar sands (oil sands) and oil shale. (Assigned to the Office of the Deputy Assistant Secretary for Oil and Gas Research and Development.)

Accomplishments:

- Report *"A Technical, Economic, and Legal Assessment of North American Oil Shale, Oil Sands, and Heavy Oil Resources"* - September 2007. University of Utah

Conclusion: The Task Force concluded that: ***"The Nation is substantially at risk, from an economic and security perspective, to warrant development of an unconventional fuels program with attendant policies and government actions to promote and accelerate industry development".*** There has been misguided criticism regarding what is perceived as a recklessly accelerated pace of development of unconventional resources. Criticism that is founded in a distorted and exaggerated recollection of the history of past attempts to develop these resources and fueled by an almost complete misunderstanding of the objectives of Section 369 and subsequent analyses and plans published by the DOE. The intent of the Unconventional Fuels Program is to design a creative, rational, effective, and measured development roadmap that will mitigate the impacts the critics seem to believe are inevitable. The approach envisioned and designed by the Task Force and the Ad Hoc Unconventional Fuels Working Group is essentially an integrated regional energy development roadmap called the Western Energy Corridor Initiative.

Without such a roadmap; without a clear understanding of the technical, economic, and social impacts associated with developing these resources – solid decision-making based on facts gives way to decisions based on fear, innuendo, and misinformation. A worse scenario

would be to rush development of unconventional resources in response to crisis, in the same manner as the ill-fated and much criticize Colony project in 1982. The reason this is such an important program is to prevent what the critics fear the most.

About the authors

Anton (Tony) Dammer served as Director of the US Office of Naval Petroleum and Oil Shale Reserves (NPOSR) from 1988 until he retired from Government in 2008. During that time he managed the US interests in these important domestic resources, and was the driver to raise the profile on oil shale over the past decade. He can be reached at dtdammer@cox.net.

James Bunger has conducted research in unconventional fuels for more than 40 years. He served as technical project consultant for NPOSR, and co-authored the 2004 DOE publication Strategic Significance of America's Oil Shale Resources, credited by some as reinitiating the technical and policy dialog on US oil shale. He can be reached at jwba@jwba.com.

LETTER TO THE SUBCOMMITTEE FROM DR. DAG NUMMEDAL, DIRECTOR, COLORADO ENERGY RESEARCH INSTITUTE, AND DR. JEREMY BOAK, DIRECTOR, CENTER FOR OIL SHALE TECHNOLOGY AND RESEARCH, COLORADO SCHOOL OF MINES

May 7, 2012

To:
The Honorable Andy Harris, Chairman
Subcommittee on Energy and Environment
Committee on Science, Space, and Technology
US House of Representatives
Washington, DC 20515

The Honorable Brad Miller, Ranking Member
Subcommittee on Energy and Environment
Committee on Science, Space, and Technology
US House of Representatives
Washington, DC 20515

From:
Dr. Dag Nummedal, Director
Colorado Energy Research Institute, and
Dr. Jeremy Boak, Director
Center for Oil Shale Technology and Research
Colorado School of Mines
Golden, Colorado 80401

Dr. Harris and Mr. Miller:

As the Committee on Science, Space, and Technology discusses challenges and opportunities associated with expanding development and use of unconventional oil and gas production technologies, we offer this letter to the Committee as a resource from the Colorado School of Mines.

The US and global fossil energy supply picture is currently changing at a faster pace than ever before due to the convergence of two trends: 1) the development of tools that allow extraction of oil and gas from shale, tight sandstones and carbonates, previously thought to be inaccessible, and 2) the growing recognition that a shift to natural gas as the principal fuel for electric power can do more to reduce greenhouse gas emissions over the next several decades than even the most optimistic scenario for growth in the renewable energy industry – although we should do everything we can to encourage renewables as well, because those are the only energy technologies where the fuel is free. In the long run, renewables will dominate the world's energy industry.

The United States has been the world's leading developer of this "tight" or unconventional gas now for more than 20 years, and over the past 5 we have also started the extraction of unconventional oil. The first point I would like to make is that this development did not occur by accident but through deliberate policies and actions. In fact, the development of America's global leadership in the unconventional oil and gas industry represents an excellent example of sound partnerships between the Federal government, leading industrial companies and research universities. Central to the development of this

unconventional energy industry were DOE's "Multi-Well Experiment", a federally funded set of experiments to fracture tight rocks to stimulate flow of gas in rocks where nature itself had not generated the appropriate fluid migration pathways. Most of these experiments were conducted in western Colorado in the 1980s. The program was managed by the Sandia National Laboratory, and co-investigators came from many universities, including the Colorado School of Mines.

The Multi-Well Experiment also stimulated independent industrial experiments which in many cases expanded on and went beyond the DOE-funded research. The federal funds not only covered the cost of key, essential experiments, but they also helped establish a culture of experimentation and creativity throughout industry. A quick look at DOE's charts on America's historical oil and gas production demonstrates the value and impact of these Federal programs in the 80s. No less than four major domestic industries have emerged from them:

1) Coal bed methane production. This was the first 'unconventional' gas industry that emerged because it is technologically the easiest. Basically, you just have to depressurize the coal seams to get the gas out of aqueous solution. Today, CBM accounts for 8% of national gas production. DOE funded a CSM-led project focused on managing the large volumes of produced water from CBM operations.
2) Tight gas came next. This refers to natural gas production from artificially fractured sandstones. This industry grew rapidly in the 90s and has now reached a level of about 20% of U.S. gas production. It is a very big industry today in the Rocky Mountains region, and also elsewhere. CSM's Reservoir Characterization Project, an industry funded consortium at CSM, and several other research consortia have played leading roles in the development of the science and engineering of the tight gas industry.
3) Shale gas came next – or actually in parallel – but it took longer to become a major national industry, because it is technically more challenging than fracturing the more brittle sandstones. Independent industrial pioneers played a very large role in developing the technologies that made gas production from shale possible. This industry has been growing very fast in the past 10 years, and is projected to become the dominant US natural gas resource pretty soon. The Unconventional Natural Gas Institute at CSM is actively pursuing a wide range of issues with respect especially to these complex rock systems.
4) Last, and perhaps most important from a national security perspective, is the development of production of oil from tight rocks, which can be shale, sandstones or carbonates. Again, the technologies have their 'roots' in the Multi-Well Experiment that started 30 years ago, and evolved a lot since. The most visible unconventional shale-hosted oil plays is the Bakken in North Dakota, but the industry is very rapidly expanding nationwide, including new shale oil production in Colorado, Texas and other states. After 40 years of decline in domestic oil production, U.S. oil production has now been increasing again for the past 2 years, at a significant rate. CSM has active industry consortia on both the Bakken and Niobrara. Initial funding for the Bakken project came from DOE's National Energy Technology Laboratory.

Along with the development of these resources has come the need to better understand fracturing of these tight rocks, and CSM, through its industrial consortium on Fracturing Acidizing and Stimluation Technology (FAST) and the Center for Rock Abuse have provided important multi-participant research teams to understand the physical properties and behavior of a wide range of reservoir rock types

This short and highly simplified look-back is important, because it demonstrates well how a strong, focused R&D partnership between the Federal government, corporations and universities help jump-start new industries. There are of course many examples in other fields of science and industry that demonstrate the same. We often hear in debates about federal funding for oil and gas research that "the wealthy oil and gas companies can pay for the research they need themselves". While true in principle, the statement misses the key point: American industrial progress is very much based on creativity. The Multi-Well Experiment, and the four new unconventional oil and gas industries that it created, were the results of combined use of federal, industrial and private capital in a highly creative R&D program.

Fortunately, one new program somewhat akin to the Multi-Well Experiment has recently been created and is now operating in its 7th year: the RPSEA program (Research Partnership to Secure Energy for America). This is a creation of the National Energy Policy Act of 2004, and funds basic and applied oil and gas exploration and production research as well as environmental damage mitigation technology development.

The RPSEA program has been remarkably successful in engaging more than 50 research institutions (public and private) and service companies across the nation in their sponsored research. The research funding awards are all based on formal peer reviews and the review system itself is the most rigorous that we have witnessed in any federal funding program we have participated in. First, the submitted proposals are sent for confidential reviews to the best scientists in the nation with active on-going research in the relevant topics. These reviewers score the proposals for their creativity and novelty. Those proposals that score high in round one are then submitted to a panel review where both industrial and academic researchers score the proposals again, this time very much based on whether or not the creative proposals also are industrially relevant. The final outcome is a first-class research program using federal funds very wisely combined with industrial cost share to further advance U.S. leadership in unconventional fossil energy developments.

CSM has received several RPSEA awards, which has funded research projects on fracture prediction, co-produced water analysis, microbial methane production, reservoir sand body architecture analysis, and reservoir simulation. The extensive industry leveraging of the Federal resources allocated to these projects demonstrates the relevance to the private sector of the research.

Allow me to comment briefly on the 'controversy de-jour': hydraulic fracturing of wells to access tight gas, shale gas and shale oil reservoirs. No industry is without some environmental challenges. We can eliminate the environmental challenges three ways:

shut the industry down, increase R&D to reduce the environmental risk, and/or provide affected people with correct technical information and compensate for all forms of damage (physical, chemical, acoustic, visual). History shows that research to reduce the risk is, by far, the most cost-effective strategy. The scientific and engineering advances made by the Multi-Well Experiment in the 80s and the "successor program" – RPSEA – today, have already spawned new and more environmentally-friendly drilling practices, better targeted well bores, many from multi-well platforms, vast improvements in the understanding of how to handle co-produced water, and better exploration to ensure hitting the 'sweet spots' for oil and gas production.

Researchers in academe, government or industry, and industrial executives, are now certainly aware that society's pathways to sustainable energy must include improved knowledge and understanding of all subsurface processes, and we are increasingly looking at integrated systems engineering approaches to all aspects of extraction and injection of rocks and fluids into and out of the subsurface.

Rising costs for oil have also led to a resurgence in interest in production of shale oil from oil shale by converting the solid hydrocarbons in these rocks through surface or in situ processes. Novel in situ processes for heating rock underground also depend upon understanding of fracturing processes driven by expansion of solids into liquids and gases. The oil shale industry has made great strides toward commercialization in the past decade, and now two companies are moving past the research phase to start planning commercial production of shale oil, potentially in the next 2-5 years.

CSM has been an active participant in this evolution, through geologic, geochemical, geophysical and geomechanical research on the Green River Formation of Colorado, Utah, and Wyoming through COSTAR, the Center for Oil Shale Technology and Research. In addition, CSM hosts the Oil Shale Symposium in Golden every year, the premier international event for government, industry, academic and stakeholder communities to discuss and understand developments in this area. Finally, the Oil Shale Information Office has made great strides in making legacy and newer material on oil shale available to these communities through digitization and cataloguing of its extensive holdings in the Tell Ertl Oil Shale Repository in CSM's Arthur Lakes Library.

DOE/NETL funding in the area has also supported projects at CSM to understand and evaluate the effects on local hydrologic systems of development of oil shale. This funding recognizes the Federal government's primary role as overall steward of the land in which these resources are found. No single leaseholder will have this responsibility, so there are important reasons for the government to invest in underlying research, and potentially in a coordination role (as was done in the 1980s) for understanding environmental impacts of oil shale development.

In addition, new evaluations are under way of the very large resources of natural gas hydrates potentially available in marine and arctic environments. Understanding of the formation of hydrates had been driven for years by the needs of pipelines to provide flow assurance. Now this research is providing an important basis for understanding of these

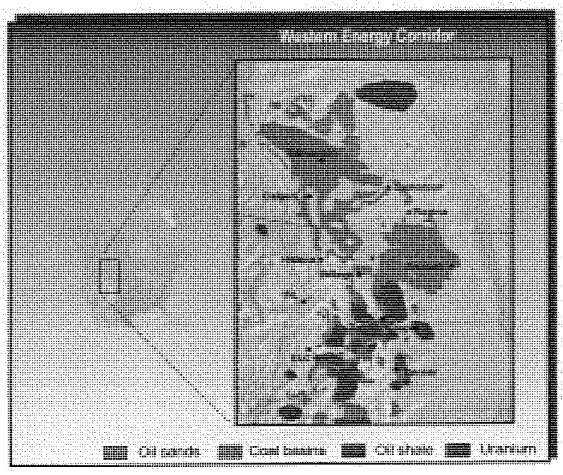
large potential resources, and the 30-year-old Center for Hydrate Research at Mines has played a leading role in that transition.

U.S. DEPARTMENT OF ENERGY, OFFICE OF NAVAL PETROLUM AND OIL SHALE RESERVES, NOVEMBER 2008, "STRATEGIC PLAN: UNCONVENTIONAL FUELS DEVELOPMENT WITHIN THE WESTERN ENERGY CORRIDOR"

Ad Hoc Unconventional Fuels Working Group

Strategic Plan

Unconventional Fuels Development Within the Western Energy Corridor



U.S. Department of Energy
Office of Naval Petroleum and Oil Shale Reserves

November 2008

This Strategic Plan for Unconventional Fuels Development within the Western Energy Corridor was conceived and developed by an ad hoc working group with the support of the Office of Naval Petroleum & Oil Shale Reserves within the Department of Energy's Office of Petroleum Reserves (OPR), pursuant to the requirement for OPR to "coordinate the creation and implementation of a commercial strategic fuel development program for the United States" set out in Section 369(i)(1)(A) of the Energy Policy Act of 2005 (Public Law 109-58). The ad hoc working group is comprised of representatives from industry, government, academia, and national laboratories.

Table of Contents

1. Overview 1

2. Mission 2

3. Vision 3

4. Situation and Challenges 3

5. Strategic Goals 5

6. Strategies 5

7. Conclusion 7

8. The Path Forward 7

Summary of the Unconventional Fuels Development Strategic Plan Within the Western Energy Corridor 9

Strategic Plan

Unconventional Fuels Development Within the Western Energy Corridor

1. Overview

Section 369(h) and (i) of the Energy Policy Act of 2005 (EPACT05) directed the Department of Energy (DOE) to develop an Unconventional Strategic Fuels Program. It assigned to the DOE Office of Petroleum Reserves (OPR) the responsibility to *"coordinate the creation and implementation of a commercial strategic fuels development program"* and provide an ongoing program of evaluation, assessment, and recommendations regarding activities required to accelerate the development and manufacturing of strategic fuels from domestic unconventional fuels resources. It also assigned specific responsibilities to the Department of the Interior and to the Department of Defense.

In 2006, the Secretary of Energy convened a Task Force on Strategic Unconventional Fuels consisting of eleven members[1] to develop the required Program. Coordination support for that effort was provided by OPR's Office of Naval Petroleum and Oil Shale Reserves (NPOSR). The Task Force evaluated the nation's liquid fuels situation and concluded *"...that the domestic and global fuels supply situation and outlook is urgent. Increasing global oil demand, declining reserve additions, and our increasing reliance on oil and product imports from unstable foreign sources require the Nation to take immediate action to catalyze a domestic unconventional fuels industry"*[2]. Two reports by the Task Force that contain resource-specific recommendations and integrated program development plans[3] were finalized in September 2006 and September 2007, respectively, and transmitted to the Congress and the President.

The next challenge facing government and industry is to coordinate, integrate, and organize the scientific and engineering efforts required to determine the potential impacts of this large development activity. To this end, an ad hoc unconventional fuels working group consisting of representatives from industry, government, academia, and national laboratories was organized by NPOSR to develop and execute plans that implement the Task Force's recommendations for accelerating and promoting the development of domestic unconventional fuels.

Unconventional Fuels Resources in the Western Energy Corridor

The Western Energy Corridor (Figure 1), which extends from Alaska through western Canada and the western United States, contains some of the world's richest deposits of hydrocarbons and energy minerals, including trillions of barrels of oil equivalent in place (BOE) of conventional oil, natural gas, coal, oil shale, oil sands, heavy oil, and uranium. Development of the world-class unconventional hydrocarbon resources within this corridor could help to alleviate U.S. energy supply vulnerability, providing a strategic source of energy, including liquid fuels and other products far into the future.

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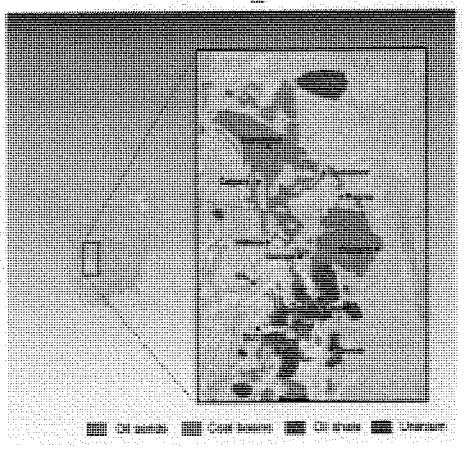
[1] Includes Secretaries of the Departments of Energy, Defense and the Interior; the Governors of the States of Colorado, Kentucky, Mississippi, Utah and Wyoming; and representatives of localities that would be impacted by the development of the unconventional resources.

[2] Task Force on Strategic Unconventional Fuels, 2007, America's Strategic Unconventional Fuels, Volumes I, II, & III, Completed September 2007.http://www.unconventionalfuels.org

[3] Ibid

Concurrent development of unconventional fuels and other energy and mineral resources will create increasing competition for limited resources of water, and impacts to air, habitat, and wildlife in the region. Local communities, infrastructures, and economies will face increasing demand for roads, electricity, law enforcement, labor and other services as a result of this development.

Figure 1. Selected Resources Within a Portion of the Western Energy Corridor



The Western Energy Corridor Initiative (WECI) has been conceived as a regionally-focused effort to provide guidance to policy makers, industry, and other stakeholders on possible scenarios for development, including assessing impacts to the environment and local communities.

The impetus for this effort comes from a common theme expressed by a broad spectrum of stakeholders that credible, science-based assessments are needed to quantify potential development impacts and benefits in the context of other conventional and unconventional energy resource development activity. Critical aspects of carbon management and responsible water use in a semi-arid environment must be addressed, as well as planned and ongoing energy resource development, and the environmental, water resource, infrastructure, labor, fiscal and economic demands that could be placed on the region under various development scenarios.

This Strategic Plan for Unconventional Fuels Development specifies an approach for addressing these major development issues and helping DOE and NPOSR to fulfill their program integration responsibilities under the EPACT05 in coordination with other federal agencies including, but not limited to, the Departments of the Interior and Defense. The Strategic Plan:

- Articulates the mission of the proposed effort in the context of the current and expected future situation facing the nation, the industry and potentially impacted communities,
- Identifies the challenges to unconventional fuels development,
- Identifies the numerous stakeholders whose interests must be considered,
- Presents major assumptions that influence the path forward,
- Sets forth a vision for the future and articulates goals that must be achieved to fulfill that vision, and
- Lays out a strategy for achieving those goals.

The plan builds on the analyses and plans prepared by the Task Force on Strategic Unconventional Fuels.

2. Mission

Bolster America's future fuel security by facilitating socially and environmentally responsible development of unconventional fuels resources in the Western Energy Corridor. Use sound engineering principles and science-based methods to define and assess benefits, impacts, uncertainties, and mitigation options, and to resolve impediments.

The initiative seeks to apply the principles of sound science and engineering and objective analysis to answer key questions about unconventional fuels development in the Western Energy Corridor that must be addressed to understand the potential benefits and impacts and to prepare the ground work for efficient commercialization of America's strategic unconventional fuels resources. These resources include oil shale, tar sands, coal-to-liquids, heavy oil, and oil that can be produced by carbon-dioxide enhanced oil recovery. Other unconventional fuels resources are not currently addressed by the strategic plan.

A key component of the mission is to provide valuable information to decision makers and other stakeholders to help understand and evaluate these complexities and to provide the objective analytical basis for crafting and implementing development plans.

3. Vision

The nation will benefit from increased supply of domestically produced fuels, reduced imports, economic growth, employment, and public revenues. Industry and policy makers will have the objective scientific and technical information needed to make responsible investment and policy decisions. World-class expertise of national labs, universities, industry, and other organizations will be integrated to address resource, technology, economic, environmental, social, and related issues pertaining to unconventional energy resource development resulting in sound public policy.

The Initiative envisions that government (local, state and federal), industry, environmental interest groups and other stakeholder will be provided with an objective evaluation of the potential impacts and benefits of various development scenarios.

The engineering and science-based analytical basis will be created to support an assessment of the potential for sustainable development of unconventional fuels resources. Policy makers will have access to the best technical resources for assessing how growth of an unconventional fuels industry might benefit the nation and affected regions and how it might impact the environment and local economies. This information will support the development of sound public policies.

By evaluating resource development options and their impacts and benefits under a range of scenarios and variables such as resource type, development pace, expected production levels, investment requirements, urgency, and impacts, this effort will enable the nation, affected states and localities, and private industry to prepare for and facilitate appropriate development.

Proactive communication with and input from a diverse range of public and private stakeholders will ensure that analytical processes and products are focused, timely, useful and dynamic.

4. Situation and Challenges

Situation

The United States faces an unprecedented threat to its national and economic security due to the economic costs and supply risks associated with our increasing dependence on imported oil and gas - commodities for which other nations are competing, and for which future supply may be inadequate to support our fuel needs. This dependence makes the United States vulnerable to numerous potential natural, geopolitical, or market scenarios that could result in acute disruptions to the nation's energy supply.

Recent increases in world oil prices, combined with increasing volumes of imports, have resulted in an enormous transfer of wealth from the United States to foreign oil suppliers, diminishing America's economic strength and stability. This situation suggests that the United States must consider responsible development of additional domestic hydrocarbon energy supplies, including the vast unconventional resources found in the Western Energy Corridor, to augment supply, reduce import dependence, enhance energy supply security, and strengthen the economy.

Unconventional fuels development will take place in an environment affected by internal and external market, economic, political, social, and technological forces and trends.

- **Market:** Global fuels markets are increasingly competitive; 77 percent of world proved reserves are controlled by national oil companies. Oil demand in some growing economies, e.g. India and China, is rising faster than industry can increase supply, contributing to rising oil and fuels prices.
- **Economic:** Higher oil prices make unconventional fossil energy resources more competitive and economically attractive. But as with conventional oil and gas, the capital costs for unconventional fuels are also rising due to global and regional competition for materials and workers.
- **Environmental:** Energy resource development must occur in compliance with existing and emerging law and regulation with the objective to minimize impacts on the environment. Pending initiatives to limit carbon emissions and establish "cap and trade" programs challenge industry to reduce carbon-dioxide (CO_2) formation and demonstrate cost-effective carbon capture and management strategies.
- **Technology:** Technologies already exist to recover and process unconventional fossil energy resources; some are already being applied at commercial scale outside the United States. Private industry is investing in research, development, and demonstration (RD&D) to improve process efficiency, reduce energy use, minimize water requirements, and limit environmental impacts.
- **Physical Infrastructure:** Physical infrastructure in the West may be inadequate to support high-volume energy development. Roads, rail, electric power, water systems, pipelines, and other distribution systems must be enhanced to support industry development, and associated growth.
- **Social:** Communities seek assurances that renewed unconventional fuels development will not result in a repeat of the "bust" of the 1980s, which impacted some local economies for many years. A goal is to ensure against the risk of bust, and to dovetail growth opportunities with potential declines in other industries, most notably conventional oil and gas.
- **Stakeholders:** The views and interests of a diverse set of public and private stakeholders will influence the scope and timing of unconventional resources development in the Western Energy Corridor and must be fully considered in the public discourse and subsequent development planning.

Development Challenges

Numerous strategic questions must be answered to facilitate responsible development planning:

- What are the expected impacts of various technologies and approaches for unconventional fuels recovery and processing on the environment (i.e. carbon emissions, air and water quality, surface disturbance, wildlife), and net external energy and water demand? How can these impacts be mitigated? Which approaches are best for sustainable energy production while reducing impacts?
- How will water, carbon, and other impact mitigation and management strategies affect process and project economics and industry development?
- What public infrastructure (including water supply) is needed to support regional unconventional fuels development under different development scenarios?
- How do current regulatory regimes and permitting processes constrain development or investment decisions? How can such processes be modified to facilitate planning without degrading environmental protection or regulatory compliance?
- What can be done to correct distortions and inaccuracies in the public's perception of unconventional energy resources and potential development impacts?

- What fiscal regimes can be applied to provide development funding to affected communities?
- What organizational structure is needed to integrate analyses and resources and avoid stove-piping issues?

5. Strategic Goals

To achieve its vision, the initiative seeks to achieve several specific goals:

- Increase and diversify domestic fuel production to reduce U.S. dependence on oil imports, create jobs, and stimulate economic growth.
- Produce and provide high quality, credible technical information related to unconventional fuel resources, technologies, energy infrastructure, environmental conditions, and development scenarios
- Understand the potential cumulative resource, environmental, infrastructure, and socioeconomic impacts and benefits of various unconventional fuels development scenarios.
- Assess socio-economic parameters of unconventional fuels development to inform and guide planning for industry development and community growth, avoiding adverse consequences and improving quality of life in affected development areas.
- Foster effective, credible and transparent outreach and communications with and among stakeholders.

6. Strategies

Development of western unconventional fuels resources is largely a "Western States" issue. However, development planning is made more complex by the Federal government's ownership and stewardship of energy and other resources, and transportation, water, and energy infrastructure in the West; and by federal environmental, fiscal, and other regulatory structures and processes that would apply.

As directed by Section 369 of the Energy Policy Act of 2005, and recommended by the Task Force on Strategic Unconventional Fuels, an integrated program organization and management approach is needed for this initiative to facilitate coordination, interaction and collaboration among federal, state, regional, and local participants, the scientific and technical community, and other participating stakeholders.

Planning Assumptions

- World oil supply and demand realities require the United States to consider all domestic energy resources.
- Hydrocarbon fuels will continue to be needed even as alternatives are developed and commercialized.
- Timely development of Western hydrocarbon resources is essential.
- Canadian unconventional fuels support U.S. energy security and will increasingly supply U.S. markets.
- Development of Western unconventional resources must be considered in the context of conventional hydrocarbon resources, renewable energy, and other resource development.
- Development must comply with existing law and regulation.
- Effective carbon management strategies are necessary and likely to be required.
- Planning and analysis must integrate ongoing CO_2 sequestration programs.
- Population growth in the West will increase water demand and competition for agriculture, energy, and other uses.
- Power generation or transmission capacity within the corridor may not be sufficient to support energy development and associated economic growth and may require expansion.
- Commercial leasing regulations may be needed before industry will invest significantly in oil shale development.
- Royalty and tax structures are needed to facilitate development planning and stimulate investment and should balance risks, needs and interests of investors, impacted communities, and the public.
- Many public perceptions about energy resource developments are not supported by sound engineering and science; more effective communication is required.
- Planning efforts must consider and integrate various responsibilities and activities of multiple federal agencies including DOI, DOE, DOE and EPA.

This initiative will fully consider and build upon the analyses, recommendations, and plans that were developed by the Task Force on Strategic Unconventional Fuels. Its scope will include unconventional fuels, including: oil shale, tar sands, heavy oil, coal-to-liquids, and oil producible by carbon dioxide enhanced oil recovery methods in the Western Energy Corridor.

The strategies to achieve the mission and associated strategic goals are described below:

Work Through Effective Partnerships

The activities to be performed will be conducted through an integrated partnership of government, national laboratories, and universities with input and collaboration of other stakeholders, including appropriate organizations in the Canadian provinces of Alberta and Saskatchewan, and other countries engaged in unconventional fuels development.

- **Conduct Outreach Efforts:** Develop a proactive and effective communications outreach program to seek input to program development, analysis, and planning.
- **Partner with National Laboratories and Universities:** NPOSR will establish partnerships with key regional national laboratories and universities with the scientific and engineering expertise to carry the initiative forward.
- **Work with International Partners:** NPOSR will partner with appropriate organizations in Canada (including Alberta and Saskatchewan) and other nations to facilitate information sharing regarding unconventional fuels development.
- **Facilitate Collaboration:** Support and facilitate effective and constructive interactions among program participants and stakeholders that help to build consensus. Interagency and intra-agency collaborative efforts will be pursued among responsible federal agencies (including DOE, DOI, and DOD), as well as offices and agencies of the relevant state and local governments. Coordination with DOI efforts would include, but not be limited to, resource assessment, data collection, and mapping.
- **Share Information:** Communicate activities, results, and products to stakeholder audiences through workshops, newsletters, websites, and other appropriate means.

Establish an Effective Program Governance Organization

- **Governance:** An Executive Committee will be comprised of representatives of the national laboratories, universities, and government. The Executive Committee will organize, lead, evaluate progress, and ensure achievement of goals and objectives. It will be supported by working groups focused on unconventional resources and crosscutting technical, environmental, and economic issues.
- **Budget and Funding:** Identify resource requirements; create a budget that combines available funding from participating organizations and congressional appropriations. The Executive Committee will seek and coordinate the allocation of funding for activities to be performed under this strategy.
- **Consider Forming a Western Unconventional Fuels Center**: Unconventional fuels development analysis and research fits within the scope and context of other research activities regarding energy development in the West. The potential attributes and benefits of a center of excellence focused on integrated assessment of western energy resources development issues and benefits will be evaluated.

Conduct Analysis to Resolve the Uncertainties Affecting Development

The study will pursue a multi-phased analytical approach consisting of three overlapping phases:

Phase I – Comprehensive Baseline Assessment: To enable accurate and quantitative evaluations of environmental and economic impacts of unconventional fuels development, predevelopment or baseline conditions must be established. Baseline information will include

various data encompassing energy and other natural resources, air quality, water quality and quantity, technology, policy, economics, population dynamics, regulations, etc.

Phase II – Analytical Tools and Framework: Assessing the cumulative impacts of unconventional fuels development will require the application of sophisticated modeling tools to characterize processes and activities at multiple scales and to consider the complex interdependencies of multiple alternative development scenarios involving diverse energy resources.

Phase III – Integrated Impact Assessment of Development Scenarios: Potential impacts will be assessed within the context of other social, energy, economic, and infrastructure development in the region unrelated to unconventional fuel development. Participants will use the analytical frameworks and tools developed in Phase II to facilitate a regional decision-making mechanism that will focus local, state, and federal governments on basin and intra-basin impacts, benefits, and costs. The developed tools will support preparation of energy development plans by integrating the results of scenario comparisons and future development trajectories arising from the Phase II activities.

Identify and Prioritize Focused RD&D

- **Identify RD&D needs and priorities** that must be pursued to facilitate responsible unconventional fuels development in the Western Energy Corridor.
- **Prioritize RD&D based on objective criteria.**
- **Support planning for an integrated technical program** that responds to both industry and public sector needs and priorities implemented through competitive solicitations.

7. Conclusion

The substantial unconventional fuels resources in the Western Energy Corridor will play an increasingly important role in addressing our Nation's energy security vulnerability. Developing these resources comes with significant technical, socio-political, environmental, economic and infrastructural challenges, and is interrelated with other resource developments in the region. To address these challenges, NPOSR has developed a strategy to provide the technical foundation for assessing various development scenarios that will be used to craft a regional energy development plan.

8. The Path Forward

This Unconventional Fuels Development Strategic Plan will be forwarded by the members of the Initial Executive Committee to the Secretary of Energy for his consideration and approval. To address the challenges identified above and implement this strategic plan, a more detailed implementation plan is required. To this end, NPOSR and its national laboratory partners have developed an approach for implementation planning. While this broad strategy applies to all unconventional fuel resources in the Western Energy Corridor, implementation will initially focus on oil shale resources.

The multi-phased effort is expected to take three years to complete. It is urgent that work begin quickly. Thus an Initial Implementation Plan for Oil Shale will be developed to identify and conduct baseline analyses that can be accomplished with available program resources. Additional program funding will be required to initiate and complete the full multi-year effort. The scope of work will be expanded to the full implementation plan for oil shale when additional resources become available.

Summary of the Unconventional Fuels Development Strategic Plan Within the Western Energy Corridor

Mission

Bolster America's future fuel security by facilitating socially and environmentally responsible development of unconventional fuels resources in the Western Energy Corridor. Use sound engineering principles and science-based methods to define and assess benefits, impacts, uncertainties, and mitigation options, and to resolve impediments.

Vision

The nation will benefit from increased supply of domestically produced fuels, reduced imports, economic growth, employment, and public revenues. Industry and policy makers will have the objective scientific and technical information needed to make responsible investment and policy decisions. World-class expertise of national labs, universities, industry, and other organizations will be integrated to address resource, technology, economic, environmental, social, and related issues pertaining to unconventional energy resource development resulting in sound public policy.

Goals and Objectives

- Increase and diversify domestic fuel production to reduce U.S. dependence on oil imports, create jobs and stimulate economic growth.
- Produce and provide high quality, credible technical information related to unconventional fuel resources, technologies, energy infrastructure, environmental conditions, and development scenarios
- Understand the potential cumulative resource, environmental, infrastructure, and socioeconomic impacts and benefits of various unconventional fuels development scenarios.
- Assess socio-economic parameters of unconventional fuels development to inform and guide planning for industry development and community growth, avoiding adverse consequences and improving quality of life in affected development areas.
- Foster effective, credible and transparent outreach and communications with and among stakeholders.

Major Strategies and Efforts

Work Through Partnerships

- Conduct outreach efforts
- Facilitate effective collaboration
- Create partnerships with or among:
  - -- National laboratories and universities
  - -- Federal, state, and local government
  - -- International partners (Provinces of Alberta and Saskatchewan; Estonia; Others
- Share information with participants and stakeholders

Establish an Effective Analysis and Planning Governance Organization

- Create Executive Committee
- Initial and long-term funding strategies
- Planning and evaluation
- Consider creation of a Western Unconventional Fuels Center

Conduct Analysis to Resolve Uncertainties Affecting Development

- Assess resources, technology development characteristics, constraints / opportunities
- Define / prepare decision support / and analysis tools
- Assess basin characteristics and potential impacts
- Conduct regulatory / permitting analysis
- Prepare development plans

Identify and Prioritize, Focused RD&D Needs

- Identify RD&D needs
- Prioritize RD&D
- Support planning for an integrated RD&D program to address needs / priorities