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THE POTENTIAL MODERNIZATION OF THE STRATEGIC PETROLEUM RESERVE AND RELATED ENERGY SECURITY ISSUES

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED FOURTEENTH CONGRESS

FIRST SESSION

ON

THE POTENTIAL MODERNIZATION OF THE STRATEGIC PETROLEUM RESERVE AND RELATED ENERGY SECURITY ISSUES

TUESDAY, OCTOBER 6, 2015

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Committee on Energy and Natural Resources

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THE POTENTIAL MODERNIZATION OF THE STRATEGIC PETROLEUM RESERVE AND RELATED ENERGY SECURITY ISSUES

TUESDAY, OCTOBER 6, 2015

U.S. SENATE
COMMITTEE ON ENERGY AND NATURAL RESOURCES
Washington, DC.

The Committee met, pursuant to notice, at 10:37 a.m. in Room SD–366, Dirksen Senate Office Building, Hon. Lisa Murkowski, Chairman of the Committee, presiding.

OPENING STATEMENT OF HON. LISA MURKOWSKI, U.S. SENATOR FROM ALASKA

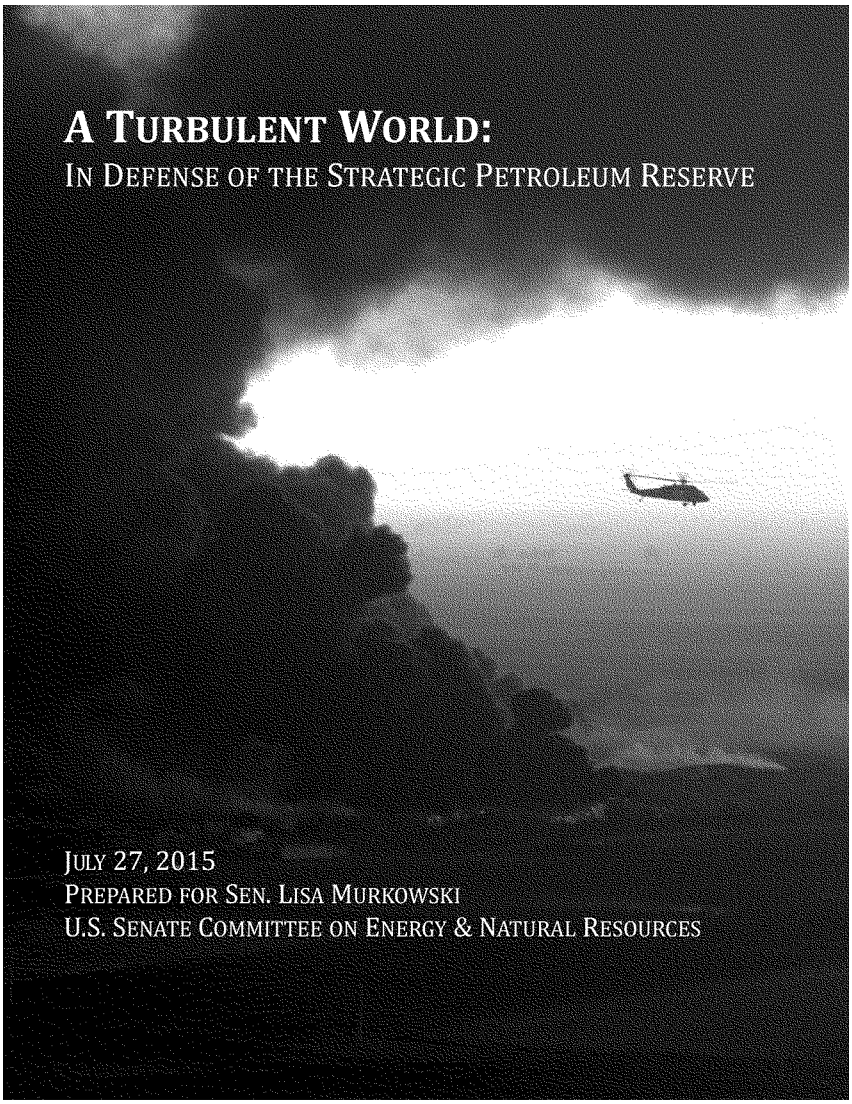
The CHAIRMAN. Good morning. I call this hearing of the Committee to order.

We have a lot of ground to cover this morning. We have a couple excellent panels of witnesses, so let us begin.

We are honored and pleased to once again have before the Committee the Secretary of Energy, Dr. Ernest Moniz. Welcome back. It is always good to see you.

We have an opportunity this morning to talk about the Strategic Petroleum Reserve (SPR) and other energy security related issues. Back in July, I prepared for the Committee a report on the Strategic Petroleum Reserve, A Turbulent World: In Defense of the Strategic Petroleum Reserve. If I must say so myself, it is pretty darn good. [Laughter.]

[The information referred to follows:]


A TURBULENT WORLD:
IN DEFENSE OF THE STRATEGIC PETROLEUM RESERVE
JULY 27, 2015
PREPARED FOR SEN. LISA MURKOWSKI
U.S. SENATE COMMITTEE ON ENERGY & NATURAL RESOURCES

A Turbulent World:
In Defense of the Strategic Petroleum Reserve

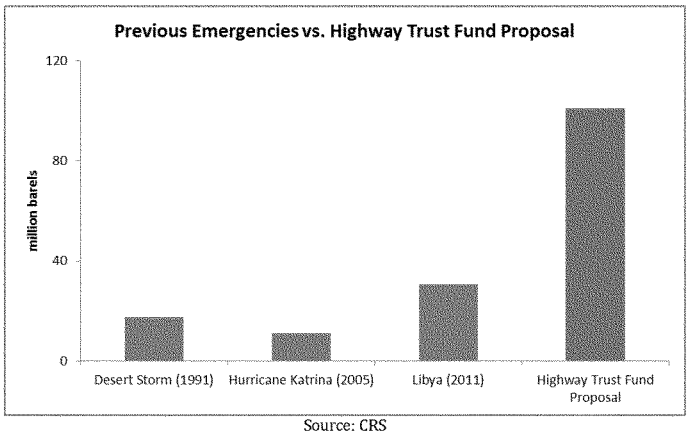
Prepared by Majority Staff for Chairman Lisa Murkowski
U.S. Senate Committee on Energy & Natural Resources
July 27, 2015

Introduction

The Strategic Petroleum Reserve (SPR) was originally authorized by the Energy Policy and Conservation Act of 1975. Today, the Senate is deliberating over the Developing a Reliable and Innovative Vision for the Economy (DRIVE) Act, known colloquially as the reauthorization of the Highway Trust Fund. Such a reauthorization, however, costs billions of dollars per year. The DRIVE Act presently includes a provision that authorizes the drawdown and sale of 101 million barrels of crude oil from the SPR during the 2018-2025 period as partial payment for a three-year reauthorization of the Highway Trust Fund. This report argues against such a sale, which would be unprecedented in scope and would occur at a time of elevated threats to global oil production and distribution.

Scope

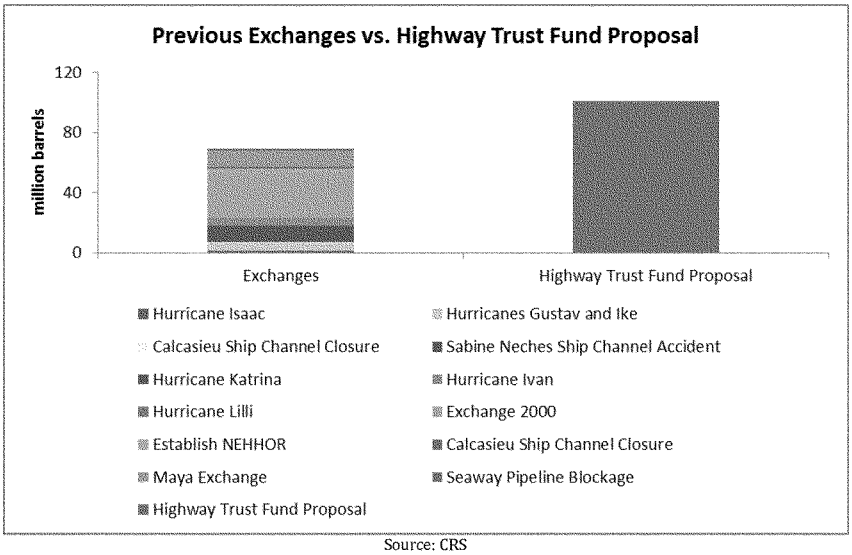
The President has only authorized three emergency drawdowns of the SPR. The first occurred in 1991 during Operation Desert Storm. The second occurred in 2005 in response to Hurricane Katrina. The third occurred in 2011 during the Libyan civil war. The combined total of all three drawdowns was 58.9 million barrels.[1]



Source: CRS

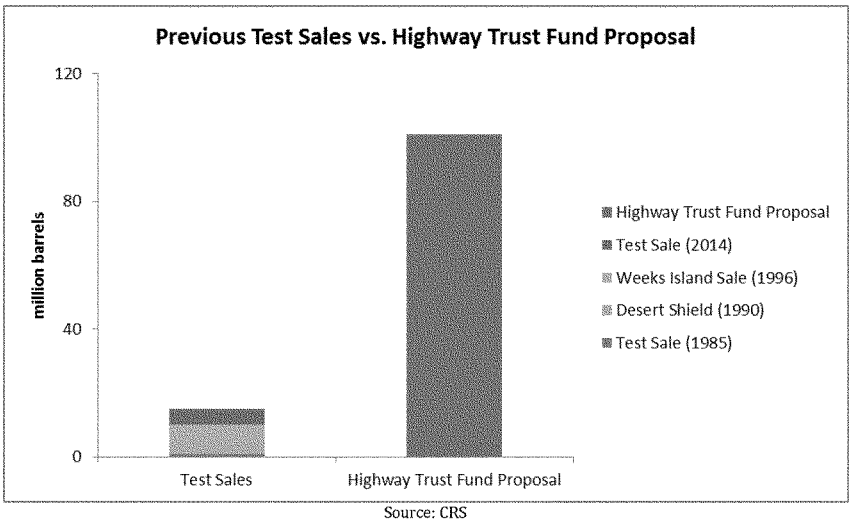
[1] Historical drawdown statistics are drawn from Congressional Research Service, *The Strategic Petroleum Reserve: Authorization, Operation, and Drawdown Policy* (August 27, 2013).

In addition to the presidentially-directed drawdowns, there have also been 12 exchanges of SPR crude oil for a variety of reasons. These have included the creation of new product reserves, as well as responses to natural disasters and other accidents. The combined total of all these exchanges was 68.9 million barrels.



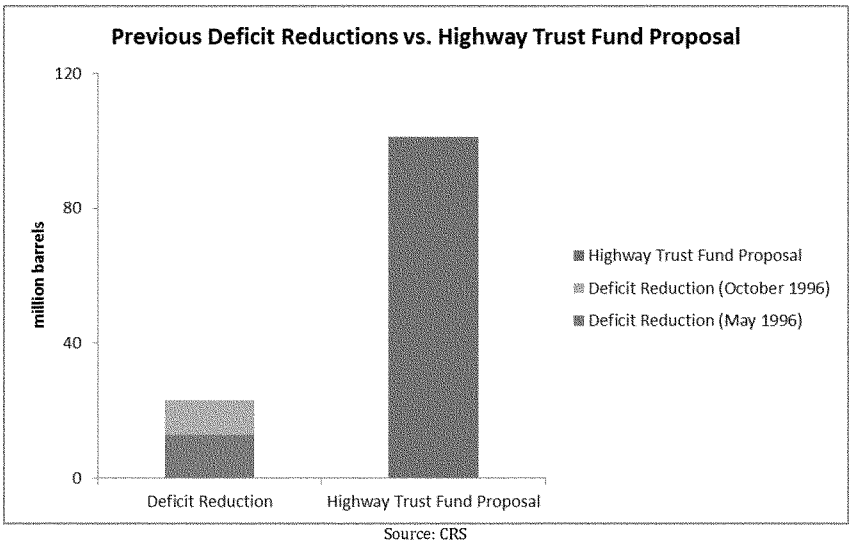
Source: CRS

Besides presidentially-directed drawdowns and exchanges, SPR crude oil may also be sold as part of "test sales." Purposes include demonstrating readiness, checking for maintenance requirements and assessing infrastructure needs. Three such sales have occurred for a total of 9.9 million barrels. (See Appendix A.) In addition, DOE conducted a 5.1 million barrel sale to decommission the Weeks Island facility in 1996.



Source: CRS

Finally, on two occasions in 1996, SPR drawdowns were mandated for deficit reduction purposes by Congress. The total of both drawdowns combined was 23 million barrels.



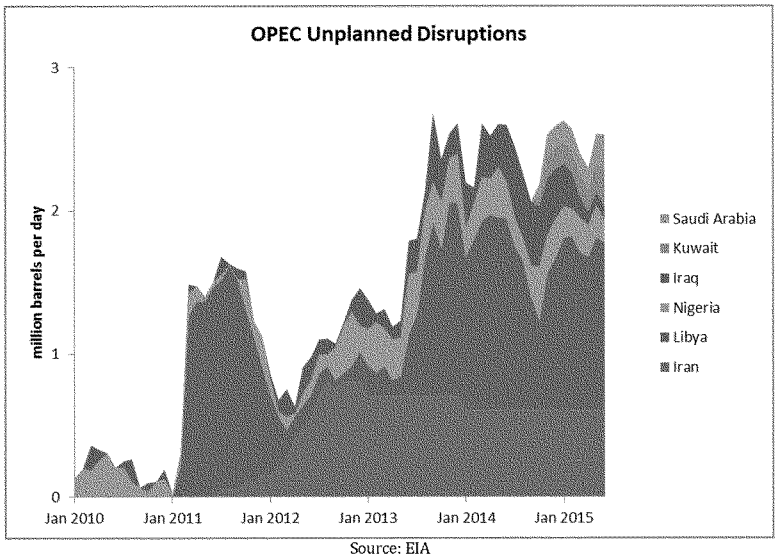
Source: CRS

In short, the federal government has drawn down the Strategic Petroleum Reserve numerous times over the past three decades for a total of 166 million barrels. A sale of 101 million barrels would be unprecedented in both its duration and volume.

Threats to Global Oil Production and Distribution

The United States is virtually unique among all members of the International Energy Agency in fulfilling its emergency stockpile requirement through government-controlled reserves. (See Appendix B.) The maximum notional drawdown rate of SPR is approximately 4.4 million barrels per day. The SPR would be able to put more barrels onto the global market more quickly than any other nation's emergency stockpiling system.

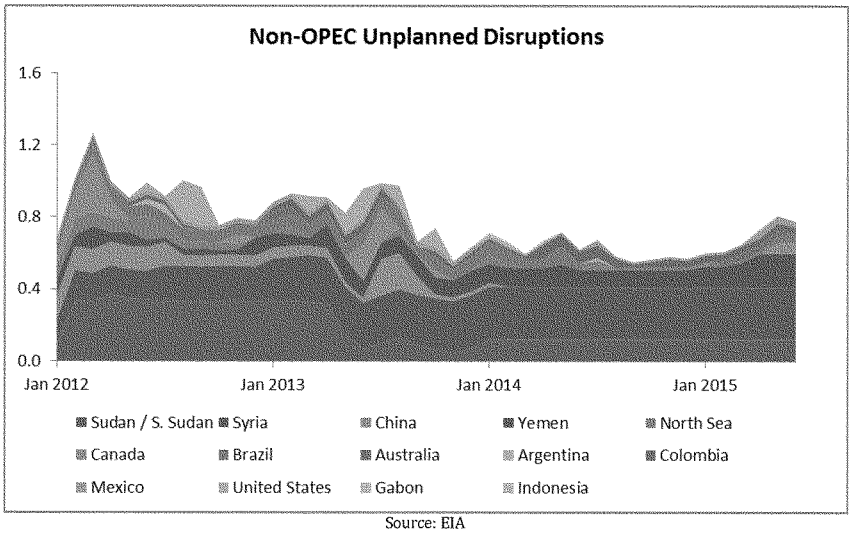
The proposal to sell SPR oil comes at a time of heightened unplanned petroleum production outages across the world. For example, violence rages in Libya, Nigeria, and Iraq, and tensions are high between Iran and the Gulf Arab states, including Saudi Arabia. Unplanned outages in the Organization for Petroleum Exporting Countries (OPEC) remain at elevated levels near 3 million barrels per day.[2]



Source: EIA

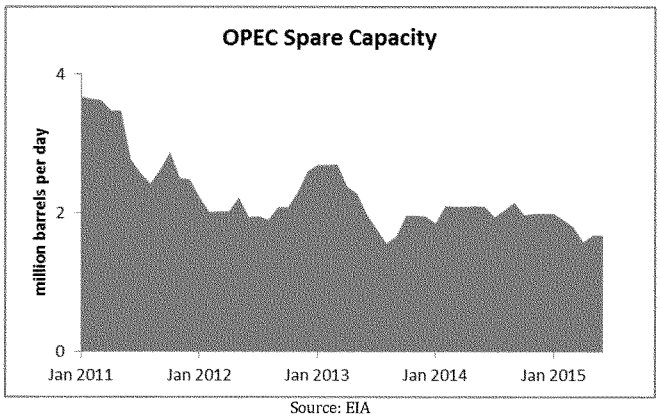
[2] All unplanned disruption and OPEC spare capacity statistics are drawn from EIA, *Short-Term Energy Outlook* (July 7, 2015): http://www.eia.gov/forecasts/steo/pdf/steo_full.pdf.

In addition to the outages among OPEC countries, many countries that are not members of OPEC are also experiencing unplanned supply disruptions. These include Yemen and Syria, for example, which are engulfed in civil war. These levels are hovering just under 1 million barrels per day.



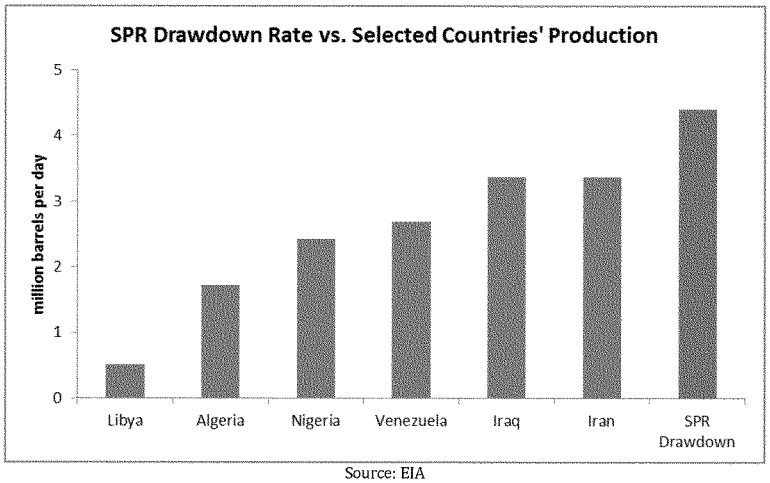
Source: EIA

A valuable proxy for oil production that could be quickly ramped up in the event of a crisis is OPEC "spare capacity." This has traditionally been the role of Saudi Arabia. The rise of North American oil production, however, has coincided with a decline in this spare capacity, from nearly 4 million barrels per day in 2011 to under 2 million barrels per day today. In other words, during an emergency the global oil market will have less ability to boost production in a timely fashion.



Source: EIA

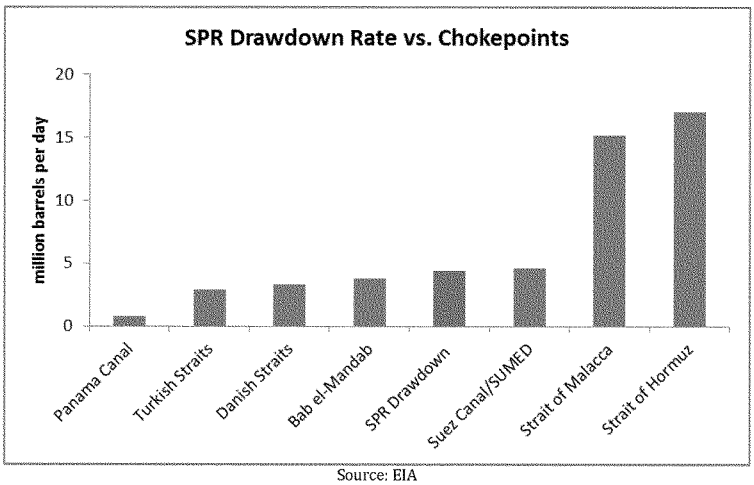
Another measure of assessing the SPR drawdown rate is to compare it to the daily production of selected countries. A capacity of 4.4 million barrels per day is higher than the production levels of several key nations, such as Iran, Iraq, Venezuela, Nigeria, Algeria, and Libya. The Strategic Petroleum Reserve would be a key asset for U.S. national security in the event that geopolitical tensions in and among any of these nations reached a crisis point.[3]



Source: EIA

[3] Production statistics are drawn from EIA, International Energy Statistics (2014): http://www.eia.gov/beta/international/.

Finally, the SPR could be called upon in the event that the world's oil transit chokepoints became threatened. A capacity of 4.4 million barrels per day is comparable to the amount of oil that flows past Yemen, for example, or through Egypt. It would be insufficient to replace barrels that were blocked in the Straits of Malacca or Hormuz, which are the world's two most important transit routes for petroleum, but American barrels would increase in their value immeasurably in such a scenario regardless.[4]



Source: EIA

Conclusion

The Strategic Petroleum Reserve is a vital asset in the arsenal of tools with which the United States may respond to global crises. A sale of 101 million barrels of crude oil from this reserve for purposes unrelated to energy security would be unprecedented in the volume of barrels flowing out of the SPR and would occur at a particularly dangerous time for international security.

Acknowledgments

Staff wish to thank the Congressional Research Service for its assistance with this report. The cover image is of a U.S. Army helicopter assessing an oil pipeline fire in Iraq.[5]

[4] Chokepoint statistics are drawn from EIA, *World Oil Transit Chokepoints* (November 10, 2014): http://www.eia.gov/beta/international/analysis_includes/special_topics/World_Oil_Transit_Chokepoints/wotc.pdf.

[5] Timothy Kingston (December 27, 2005): http://www.defense.gov/photos/newsphoto.aspx?newsphotoid=7489.

APPENDIX A:
CRS Memo Re: 2014 Test Sale

MEMORANDUM

To: Senate Energy and Natural Resources Committee
Attention: Tristan Abbey

From: Anthony Andrews, Specialist in Energy Policy

Subject: **Strategic Petroleum Reserve Test Sale 2014**

This memorandum answers your request for a summary of the 2014 Strategic Petroleum Test Sale. The Secretary of Energy authorized the test sale for up to 5 million barrels of crude oil from the Big Hill and West Hackberry Strategic Petroleum Reserve (SPR) sites. The two sites are part of the TEXOMA distribution system. DOE's Office of Petroleum Reserves conducted the test sale between March 2014 and July 2014 to evaluate the ability to sell, drawdown and distribute crude oil in accordance with requirements of Energy Policy and Conservation Act (EPCA) Section 161(g) and the competitive sales process in 10 C.F.R. 625. DOE justified the test sale based on significant changes in domestic crude oil production, increased imports of Canadian crude oil, and changes to crude oil distribution infrastructure upon which the SPR relies. The SPR Test Sale delivered 4,998,146 barrels of crude oil over a 47-day period that netted $468,564,599 in cash receipts to the U.S. Government. The entire timeline, from planning to collecting receipts, however, was closer to 7 months.

Legislative Authority

The Energy Policy and Conservation Act (EPCA) as codified in 42 U.S.C. 6241(g) directs the Secretary of Energy to "conduct a continuing evaluation of the drawdown and sales procedures. In the conduct of an evaluation, the Secretary is authorized to carry out a test drawdown and sale or exchange of petroleum products from the Reserve. Such a test drawdown and sale or exchange may not exceed 5,000,000 barrels of petroleum products."

Furthermore, the product cannot be sold " at a price less than 95 percent of the sales price . . . of comparable crude oil being sold in the same area at the time . . . ," and "to the extent that funds are available in the SPR Petroleum Account as a result of such sale, acquire petroleum products for the reserve within the 12-month period beginning after completion of the sale."

Test Sale Timeline

DOE reports that it conducted the test sale to exercise both the sales procedures and the drawdown process.[1] In summary, the test sale proceeded along the following time line:

- January 6, 2014–DOE Secretary and Fossil Energy Office begin internal to discussions to plan test sale.
- March 12, 2014–Notice of Sale issued offering 5 million barrels of light sour crude oil from the Big Hill and West Hackberry SPR sites in the SPR TEXOMA (Texas-Oklahoma) distribution system.
- March 14, 2014–37 bids received from 12 companies requesting a total of 18.5 million barrels of crude oil.
- March 17, 2014–Five companies announced as successful bidders, which were subsequently awarded contracts for 5 million barrels.
- March 31, 2014–Crude oil deliveries initiated.
- May 2, 2014–DOE Secretary announces creation of Northeast gasoline refined product reserve.
- May 16, 2014– Deliveries completed in 41 separate shipments; 4.62 million barrels (92.4%) by pipeline, and 380,000 barrels (7.6%) via tank barge to Gulf Coast refiners located in Texas and Louisiana.
- July 3, 2014–Financial transactions completed; $456.6 million deposited into the U.S. Treasury.

The test sale concluded with no personnel accidents or environmental incidents. All pipeline and marine deliveries were to Gulf Coast refiners located in Texas and Louisiana.

Table 1. Summary of Test Sale Contracts, Volumes, and Prices

Company	Number of Contracts	Contract Volume Bbls	Bid Price $	Total Bid $	Delivered Volume Bbls
Mercuria	1	40,000	$95.40	$3,816,152	40,118
Phillips 66	6	2,040,000	$100.23	$204,470,080	2,040,024
Marathon	5	1,200,000	$99.06	$118,876,500	1,200,024
Shell	3	1,220,000	$97.53	$118,981,040	1,217,075
ExxonMobil	2	500,000	$97.68	$48,838,475	500,905
Total	17	5,000,000	$99.00	$494,982,247	4,998,146

Source: DOE SPR Test Sale 2014 Report to Congress

Notes: Bid Prices are weighted averages. Mercuria is an energy and commodity-trading firm.

[1] DOE, Strategic Petroleum Reserve Test Sale 2014, Report to Congress November 2014.

Lessons Learned

DOE concluded that the test sale was successful exercise in demonstrating both the sales procedures and the drawdown process, but there were operational and procedural lessons that DOE learned about the TEXOMA Distribution Group:

Drawdown Process:

- Pipeline capacity on the Shell Ho-Ho pipeline is limited due to the large volumes of Eagle Ford crude oil shipped from Texas to Louisiana.
- Crude oil terminal storage-capacity at the Sun Nederland terminal is limited which could affect SPR distribution capability for purchasers without access to storage capacity at this terminal.
- Marine terminal distribution capacity is limited, and could pose a challenge to the SPR's marine distribution capability in the SPR TEXOMA Distribution Group for a drawdown of significant scope:
  - the minimum delivery quantity for barge delivery was reduced from 50,000 barrels to 40,000 barrels to encourage smaller coastal U.S.-flag barges
  - the minimum delivery quantity for tankers was reduced from 330,000 barrels to 290,000 barrels to encourage U.S.-flag ships
  - during the test sale, the Unocal marine terminal was up for sale and did not participate
  - new pipeline construction into Port Arthur, TX, is significantly increasing crude oil volume moved to storage terminals and is causing increased dock utilization rates and potentially impacting dock availability in the event of a future SPR drawdown
  - the Sun Nederland terminal, important to SPR marine distribution, plans to convert one of its five existing tank ship docks from crude oil to liquefied petroleum gas (LPG) service.
- Custody transfer flow metering limits drawdown at the SPR Big Hill site.
  - despite multiple delivery points to move SPR crude oil, design of the custody transfer flow metering-skid restricts delivery to a single delivery point at any one time; a 2nd custody transfer flow metering skid would improve distribution flexibility and reliability
  - equipment failure of the custody transfer flow metering-skid for 72-hours could have compromised crude oil delivery, underscoring the need for a second custody transfer flow metering-skid.

Sales Procedure:

- **Insufficient Bidding Time**
  - the 2 business-days period to submit bids was insufficient time for most bidders

- bidders generally require at least 5 business days to formulate their bids and acquire the necessary financial instruments (letters of credit and guarantees) to support their bids.

- **Payment Delays**
  - payment method used for the test sale did not lead to quicker payment of invoices
  - the Standard Sales Provision (SSP) payment clause stipulating payment due by the 20th of the month following delivery should remain in effect for future drawdowns.
- **Notice of Sale**
  - information on shipping terminal, points of contact, and certain technical details was not current (and was updated)
  - automated clearing house payment option is no longer acceptable (and was removed)
  - information on FEDWIRE payment method was not current (and was updated)
  - information on the Jones Act was not current (and was updated).
- **SPR Oil Valuation Model**
  - accuracy of valuing the SPR crude oil streams was validated

SPR Office Conclusions

DOE plans a number of actions in response to above learned lessons.

Sun Nederland Terminal – Storage capacity at the terminal is fully subscribed and may possibly affect the ability to distribute SPR crude oil should a purchaser not have access to storage capacity at the terminal during a drawdown. The SPR will discuss this situation with the terminal owner/operator to gain better insight and clarity into this issue.

Availability of U.S-Flag Vessels – Initially, 10.4% of deliveries were scheduled for ocean-going tankers. However, for unknown reasons, the successful offeror was apparently unable to charter a U.S.-flag vessel. After submitting a Jones Act waiver request to DHS for a non-U.S.-flag vessel, the offeror withdrew the request and rescheduled delivery via pipeline.

The SPR office was unable to determine whether larger U.S.-flag vessels were available at the time and is concerned whether their availability could play a factor in the event of a drawdown. The SPR office met with representatives of the U.S. maritime industry to discuss this issue and intends to meet with the U.S. Maritime Administration. The office also intends to reexamine the capabilities of the dock configurations at all contracted marine terminals in order to evaluate the types and sizes of vessels suitable for the docks.

Unocal Terminal – No bidders utilized the Unocal terminal as a delivery point during the test sale. The terminal's pending sale status could have been a factor. Conversely, the smaller daily volume deliverable under the existing SPR contract with the terminal (200,000 barrels/day) could have also been a consideration by bidders. The office intends to clarify this issue, and assess the feasibility of increasing contracted throughput volumes at this terminal.

TEXOMA Pipeline System – Changes in oil markets have implications for commercial infrastructure investment in the region and for the TEXOMA system and the entire SPR. The SPR office proposes to conduct follow-on analyses of potential commercial infrastructure investments and options to ensure future SPR marine distribution capability.

Custody Transfer Flow Metering – Sometimes called a fiscal meter or billing meter, a flow meter is used to determine how much of a commodity changes hands in exchange for some monetary or financial consideration. In order to improve distribution flexibility and reliability from the SPR Big Hill site, the SPR office intends to evaluate the feasibility of an additional custody transfer flow-metering skid.

Other Considerations

While the test sale revealed minor operational and procedural issues, none seemed to compromise the SPR's mission. However, an earlier sale had very much demonstrated the SPR's mission readiness. On June 23, 2011, the International Energy Agency (IEA) announced that its 28 member countries would release 60 million barrels of crude oil and refined products into the global market in response to Libya's curtailment of crude oil production. As part of that action, the President directed a drawdown of the SPR to meet the U.S. response obligations for 30 million barrels, and DOE issued a Notice of Sale and that same day. On June 24, 2011, DOE opened its web-based Crude Oil Sales Offer System for a five-day sale of 30.237 million barrels of light, sweet crude oil at a bid reference price of $112.78 a barrel. DOE received more than 90 offers for SPR crude oil, awarded 28 contracts to sell 30.64 million barrels of crude oil at an average price of $107.21 per barrel. The oil sold came from the Bryan Mound and Big Hill sites in Texas, and the West Hackberry, LA, site.

One factor had changed since the 2011 sale, however. In 2013, DOE awarded the Fluor Federal Petroleum Operations, LLC[2] a management and operating contract valued at $1.46 billion to run the SPR for a period of 5 years, with an option for an additional 5 years based on performance.[3] The change in the management contract would have been sufficient rationale for conducting a test sale as a training and readiness exercise.

Monetary amounts resulting from a drawdown, sale, and delivery of petroleum products from the reserve must be deposited in the SPR Petroleum Account under 42 U.S.C. 6247 – SPR Petroleum Account. The amounts "may be obligated by the Secretary of Energy for the acquisition, transportation, and injection of petroleum products into the Strategic Petroleum Reserve, for test sales of petroleum products from the Reserve, and for the drawdown, sale, and delivery of petroleum products from the Reserve."

As noted above, EPCA (42 U.S.C. 6241) authorizes the Energy Secretary to acquire petroleum products for refilling the reserve within the 12-month period beginning after completion of the sale to the extent that funds are available in the SPR Petroleum Account as a result of such sale. On May 4, 2014, Energy Secretary Moniz stated that the Department would establish a 1 million barrel gasoline reserve for the Northeast to provide some short-term relief in the event of significant disruptions. Locations in New York Harbor and in New England would each store 500,000 barrels of gasoline.

[2] Team includes members comprised of Parent Company Fluor Federal Services, Inc., of Arlington, Virginia and major subcontractors MRIGlobal of Kansas City, Missouri; Booz Allen Hamilton of Mclean, Virginia; and ASRC Petroleum Operations and Maintenance of Anchorage, Alaska.

[3] DOE Awards Management and Operating Contract for DOE's Strategic Petroleum Reserve, http://energy.gov/fe/articles/doe-awards-management-and-operating-contract-doe-s-strategic-petroleum-reserve.

The precedence for establishing the gasoline reserve may have some basis in the Northeast Home Heating Oil Reserve (NHHOR). In response to the 1999-2000 heating oil price spike and supply shortage, Congress authorized the Secretary of Energy to establish NHHOR in the Energy Act of 2000 (P.L. 106-469). As a 2 million barrel emergency stockpile of government owned heating oil, NHHOR was intended to meet roughly 10 days of demand by the Northeastern states at the time it was created. Subsection (e) of P.L. 106–469, §103(19)(B), struck out subsection (e) of section 6247 (SPR Petroleum Account) which previously read:

"(1) Except as provided in paragraph (2), nothing in this part shall be construed to limit the Account from being used to meet expenses relating to interim storage facilities for the storage of petroleum products for the Strategic Petroleum Reserve."

In striking out subsection (e), Congress established NNHOR separate from the SPR acquired "by purchase, exchange (including exchange of petroleum products from the Strategic Petroleum Reserve or received as royalty from Federal lands), lease, or otherwise, petroleum distillate for storage in the Northeast Home Heating Oil Reserve" (46 USC 6250a.).

APPENDIX B:
CRS Memo Re: IEA Stocks

MEMORANDUM

To: Senate Energy and Natural Resources Committee
Attention: Tristan Abbey

From: Robert Pirog, Specialist in Energy Economics

Subject: **International Energy Agency Stock Requirements**[1]

This memorandum is written in response to your request for an explanation of the institutional structures that can be used to satisfy the International Energy Agency's (IEA) emergency stockholding requirements. In addition, you requested a table that categorized IEA member countries by their chosen stockholding structure. You provided IEA source material to provide content for this memorandum, including Energy Supply Security, 2014, a presentation by Martin Young, the Head of the IEA Emergency Policy Division, and a webpage concerning energy supply structures. A review of this material has revealed inconsistencies among the documents concerning how some countries should be identified with respect to their stockholding structure.

Stockholding Structure

The IEA requires each member country to hold stocks of crude oil and/or petroleum products equivalent to 90 days of net imports for use in emergency situations.[2] A degree of flexibility exists with respect to the choice of institutional structure allowed to fund and/or manage the required stocks. According to the IEA, stocks may be held as industry stocks, government stocks, or agency stocks, or some combination thereof. An additional term used by the IEA is public stocks, which the IEA defines as the sum of government and agency held stocks.

Industry Stocks

Stocks held by industry, irrespective of whether they are held as crude oil or petroleum products, for commercial purposes, or to meet government rules, all count toward the IEA 90-day stock requirement. Typically, firms involved in the oil industry—importers, refiners, and product suppliers—are required to hold various minimum numbers of days of stocks. The IEA reports that 15 out of 29 member countries used industry stocks to meet all, or part, of their IEA stockholding obligations. Seven countries chose to

[1] This memorandum draws heavily on, International Energy Agency, "Energy Supply Security 2014," in all sections.

[2] Net imports are imports minus exports, the nation's net dependence on world oil markets. IEA member countries that are net exporters of oil are exempt from emergency stockholding requirements. These countries include Canada, Denmark and Norway. However, Denmark and Norway have stockholding structures in place. Australia has no stockholding requirements for industry, nor does it hold public stocks.

use industry stocks to meet the totality of their obligation. Nine countries place no requirement on industry to meet IEA requirements.

Government Stocks

Government-owned stocks are financed and managed through the central government and are held strictly for emergency purposes. Six countries hold government stocks.

Agency Stocks

Some IEA member countries have chosen to establish separate agencies through legislation that have the responsibility of holding all, or part, of the countries' emergency stocks. These agencies can be administered by the government, or be industry-owned, or led.

IEA Member Structures

Table 1 categorizes the IEA member countries' stockholding systems. The categorizations in the **Table** have, for some countries, varied over time. For example, Belgium began with an industry-based system which transitioned over several years to an agency-based system. The United States is unique in holding government stocks, all in crude oil, to meet the 90-day net import replacement requirement.

Table 1. IEA Stockholding Structures, 2014

Type of System	Agency	Government	Industry	Agency/Industry	Agency/Gov't
Countries	Belgium, Estonia, Germany, Hungary, Ireland, Slovak Republic	Czech Republic, New Zealand, United States	Greece, Luxembourg, Norway, Sweden, Switzerland, Turkey, United Kingdom	Austria, Denmark, Finland, France, Italy, Netherlands, Portugal, Spain	Japan, Korea, Poland

Source: International Energy Agency, "Energy Supply Security 2014," Table 2.1, p. 32, and Martin Young, "US SPR's International Role", CSIS, May 6, 2015.

Notes: Differences between the Martin Young and Energy Supply Security 2014 tables, notably the positions of Belgium and Switzerland, were resolved for consistency with the Energy Supply Security 2014 table. In addition, Australia and Canada have no stockholding systems. Differences between Energy Supply Security 2014, Table 2.1 and the accompanying text on pages 30-33 were resolved in favor of the usage in Table 2.1 for consistency.

The CHAIRMAN. I would recommend it to you all if you have not had an opportunity to read it.

We have some pretty unparalleled opportunities here in the United States with regards to our oil and our oil production. While it is good and strong, I think it is important that we be ever vigilant in this area. OPEC's spare capacity has fallen, unplanned production outages persist in Iraq, in Libya and elsewhere and further trouble always seems to lurk just over the horizon.

The Strategic Petroleum Reserve remains critical to our nation's energy security, and it is an asset. You will hear me repeat, as often as I possibly can, that this is about a national security asset.

I think it is important that we focus on the energy security aspect of it. It is an insurance policy, absolutely. It is a source of leverage and stability for us from a geopolitical perspective, absolutely.

While I believe it should be modernized, I think the question that many of us have asked is, what exactly does modernization really mean? I am going to make four brief points this morning in that direction.

The Administration proposes some $2 billion in new funding for SPR life extension projects and to improve marine distribution capability. I think that these proposals merit careful consideration by the Committee. I look forward to hearing from Secretary Moniz as he makes the case on these.

I had an opportunity back in July to tour one of our Strategic Petroleum Reserves, and I think that ensuring operational effectiveness of the Reserve should be a first priority for us. We cannot let these lapse into disrepair so that they cannot fulfill the purpose which is intended and again, taking us back to energy security.

Second, the Administration is also studying the creation of petroleum product reserves on the West Coast. This is PADD 5 and on the East Coast, PADD 1. I am not opposed, in principle, to building additional product reserves, but I do have some reservations about them. Petroleum products have a much shorter shelf life than crude and a much more direct impact on the American consumer. Guarding against the use of the SPR for political purposes, I think, should be an enduring concern for all of us.

Third, I am also not opposed, in principle, to revising the emergency release authorities as the Administration and some of my colleagues have proposed, but generally, I am wary of proposals that expand the power and the ability of the Federal Government to intervene in the free market. Any sort of "preemptive release" clause must be very carefully examined. While the Quadrennial Energy Review briefly discusses this proposal, I do not think that the Administration has, as of this point in time, made a convincing case for new authority. I look forward to the discussion on that as well.

The final point, and I raised this in the white paper that we released in July, the Strategic Petroleum Reserve does not necessarily exist in a vacuum. Up in Alaska the Trans-Alaska Pipeline (TAPS) is another vital piece of energy infrastructure and it too is vital to our national security, yet we are seeing its throughput decline at a deeply troubling pace. TAPS must operate for decades to come. We have got the resources in our state to ensure that it does.

I think when we are talking about energy security our focus should be broad in evaluating our energy security, pursuing all of our options, including further increases in domestic production.

I am going to close my comments again by reiterating that we call it the "Strategic Petroleum Reserve" for a reason. As the name suggests, we hope never to use it. We hope to use it as that strategic reserve, but we keep it around for good reason. In the event that something happens, if there is an event, whether it is in the Straits of Hormuz or wherever it may be, in case the world slips and we find ourselves in need, we need to know the strategic asset, this national energy security asset, is there.

I have said before that it would be a mistake to treat the reserve as anything but a reserve. It is not an ATM for new spending or a vestige of our national energy policy. If we begin to treat it as that, I think, we risk selling at the wrong time, at the wrong price and losing its substantial benefits.

So again, I am looking forward to having a good discussion about energy security in this context with not only the comments from the Secretary, but our second panel as well.

With that I will turn to Ranking Member Cantwell.

STATEMENT OF HON. MARIA CANTWELL, U.S. SENATOR FROM WASHINGTON

Senator CANTWELL. Thank you Madam Chairman, and thank you for holding this hearing on modernization of the Strategic Petroleum Reserve and related energy security issues. I thank Secretary Moniz and the other witnesses for joining us for this very important discussion. I especially want to thank the Secretary for his leadership on the Quadrennial Energy Review, which is an important document that helps frame the discussion of our nation's energy policy priorities and infrastructure needs.

In July, this committee successfully reported out the Energy Policy Modernization Act on a bipartisan basis. Senator Murkowski and I had many discussions about the pieces of that legislation but there was one thing that we could easily agree on. And that was the critical importance of the Strategic Petroleum Reserve.

Forty years ago, we created the Strategic Petroleum Reserve to prevent economic and security impacts of crude oil supply disruptions. That's exactly what had happened with the Arab oil embargo in 1973. The 1975 law that created the SPR specifically authorizes the president to draw down the SPR, if he or she determines there is a severe energy supply interruption. The core policy reason for the reserve hasn't changed since then-nor should it.

The Strategic Petroleum Reserve is our most important, Federal, energy security asset. We need it just as much today as we did then. Perhaps even more so, given the energy market volatility we have seen over the past decade. The global oil markets may have changed—but so have the nature of the threats to the infrastructure, which is so key to our economic and national security.

We make commitments to the International Energy Program, and supply interruptions could happen at any time. Whether it's response to volatility somewhere else in the world or a natural disaster like hurricanes, we are seeing with increasing frequency dev-

astation to our critical energy infrastructure. So you just never know when you may need to use the oil in the SPR.

Even with more U.S. oil being produced today, we need to have emergency crude oil contingency plans.

There are several immediate and medium-term geopolitical risks capable of rendering severe or even catastrophic oil supply losses, such as possible attacks on major Middle East supply nodes or routes, major weather events, or severe disruptions originating in places like Nigeria or Venezuela. Any of these situations could result in major disruptions and trigger an SPR drawdown.

Our colleagues on this committee are quite familiar with the findings of the Quadrennial Energy Review (QER).

The report notes that, "Challenges remain in maximizing the energy security benefits of our resources in ways that enhance our competitiveness and minimize the environmental impacts of their use....the network of the oil distribution has changed significantly."

The QER explains that the Strategic Petroleum Reserve's ability to protect the U.S. economy from severe economic impacts in the event of a supply emergency or associated price spike has been diminished by infrastructure congestion—literally, the congestion of too much product not being able to get the product to where we want and when we want.

In fact, the Department of Energy did a test sale in 2014 and identified a series of challenges within the SPR distribution system. Investments are needed to modernize the SPR to make sure the infrastructure has the ability to respond.

The SPR is in need of $2 billion worth of repairs and upgrades. However, it is estimated that the $2 billion investment to modernize the SPR can help save the U.S. economy approximately $200 billion in the event of a sustained and large oil supply disruption.

So we'll hear from Secretary Moniz about some of these issues—about the fact that some of the salt caverns were built in the 1930's and that some of them raise issues of their integrity. At least two caverns have been taken offline. Some of the wells are more than 60 years old. We need to invest in above-ground infrastructure like water, brine disposal, power distribution systems and physical security—all the things that will help us respond to an emergency.

And because pipelines have essentially reversed direction of flow since the SPR was built 40 years ago, that's where this issue of congestion comes in and a strategy of how are we going to deal with that congestion to make sure that we are going to get product to the market, so it would have the intended impact that we would like it to have.

So once again, I thank the Secretary Moniz for his work on the QER—a long process but a good roadmap for telling us what we need to do to improve our infrastructure—not just on the SPR, but on other issues as well. And I thank the chair for holding this important hearing."

The CHAIRMAN. Thank you, Senator Cantwell.

At this time we will turn to the Secretary of Energy, Dr. Ernest Moniz.

Welcome to the Committee. We look forward to hearing from you about this very important national energy security asset.

STATEMENT OF HON. ERNEST MONIZ, SECRETARY, U.S. DEPARTMENT OF ENERGY

Secretary MONIZ. Thank you, Chairman Murkowski, Ranking Member Cantwell, and distinguished members of the Committee. I have submitted a fairly detailed testimony, so I will just make a few summary comments here to open up the discussion.

Clearly we need an energy security policy based on 21st century energy market changes, challenges, vulnerabilities and needs. Its key components are a modernized SPR configured to enable appropriate draw down and distribution capacity, energy infrastructure, the resilience and reliability including emergency response and a broader concept of energy security to include our international engagements, our allies and our partners.

I'll touch on the latter two points very briefly and make a few more comments on the petroleum reserve.

As you have both said, it's our nation's most central Federal energy security asset, and it should be treated as such. Some have concluded that selling large volumes of oil from the SPR for purposes not related to energy security will have no or little impacts on its energy security benefits, and I do not subscribe to those views. In fact, I believe the SPR remains an extremely powerful and valuable energy security tool.

As we evaluate the energy security value of the SPR we must take into account several factors including, this is particularly relevant—relative to 1975, the change nature of oil markets since the SPR was established. We are linked to the global market, we are exposed to global prices and including disruption driven global price spikes, and these historically have had significant economic impact even if there is little direct impact on our imports today.

Second, our international commitments not only our obligation of 90 days of import protection but also another international obligation which is based upon oil use, not oil imports, and that is our obligation based upon the last data to provide 43 and a half percent of the amount of a total coordinated OECD response to a disruption. So again, I think it's important to emphasize that we have an import obligation and an oil use dependent obligation.

And then third, the actual distribution capacity of the SPR. The 2014 test sale did identify a significant gap between the SPR's drawdown and distribution capacities. Much of that is driven by what's happened in the last several years in terms of the changed scale and geography of our oil production.

To address disruption scenarios a key need would be our ability to get SPR oil onto the water to supply coastal refineries.

Changing markets and international commitments are not the only concern with the SPR. Like much of our publicly supported infrastructure the SPR needs additional investment to maximize its value. In this case funding in three distinct areas.

One is deferred maintenance. The President's budget for Fiscal Year 2016 proposes a major down payment on the backlog of SPR deferred maintenance, cutting it in half. Unfortunately the House and Senate Appropriation bills marks, if enacted, would not support that. Indeed we might be going in the wrong direction in terms of increased deferred maintenance.

Second, life extension. Almost 40 years old and some caverns are much older than that. The SPR needs a significant life extension program to ensure its effectiveness for decades to come in such areas as crude oil transfer and security.

And third, modernization. We also need to modernize the SPR to accommodate, again, the dramatically different locations and volumes of domestic oil production and changes in global oil markets.

The Quadrennial Energy Review, a QER, that's been alluded to, released in April, examined what the SPR would need to protect the U.S. economy in an energy supply emergency. As already stated, roughly $2 billion are needed, about $800 million for life extension and about $1.2 billion for modernization such as dedicated marine terminals to respond quickly in emergencies.

The return on these could be huge. A study out of Oak Ridge suggests that, for example, adding about two million barrels per day distribution capacity could save our economy in a major disruption tens of billions of dollars, up to $200 billion depending upon the nature of the disruption.

So we need a robust SPR to guard against the economic harm of such a major disruption, and this is not theoretical. If we look at many events in the Middle East, including just last week the Russian military intervention in Syria, adding another element of geopolitical uncertainty in that entire region.

Just to finish with a couple of words on energy infrastructure, resiliency and reliability. This was discussed extensively in the QER. This is challenging.

Our existing infrastructure is not always well matched to our supplies. We have aging facilities prone to failure. We have climate change impacts that we must guard against which put many facilities at risk. And of course, we have enhanced concerns about cyber and physical attacks that could take a heavy toll. The QER had over 60 recommendations for addressing infrastructure needs.

Finally, just to end by saying that a collective approach to energy security in the international sphere is what we need today. This situation in Ukraine and growing European dependence on a dominant supplier of energy is what stimulated a lot of discussion within the G7 plus EU in terms of this collective responsibility. I've just returned from the G20 Energy Ministers Meeting in Istanbul where this dialog continues, and the reality is that this is an important and sensitive time in this arena. It's a time when we are, in fact, encouraging other major countries to buildup their petroleum reserves to work collectively with ours. And so, I think, we need to be very careful about the signals we send today in terms of collective energy security.

I appreciate the opportunity to come here and look forward to the discussion and to working further with the Committee.

[The prepared statement of Secretary Moniz follows:]

Testimony of Secretary Ernest J. Moniz
U.S. Department of Energy
Before the
Senate Committee on Energy and Natural Resources
Hearing to Examine the Modernization of the
Strategic Petroleum Reserve and Related Energy Security Issues
October 6, 2015

Thank you Chairman Murkowski, Ranking Member Cantwell, and distinguished Members of the Committee. I appreciate the opportunity to be here today to discuss the Strategic Petroleum Reserve (SPR) and related U.S. energy security matters.

The International Energy Agency (IEA) defines energy security as "the uninterrupted availability of energy sources at an affordable price. Energy security has many dimensions: long-term energy security mainly deals with timely investments to supply energy in line with economic developments and sustainable environmental needs. Short-term energy security focuses on the ability of the energy system to react promptly to sudden changes within the supply demand balance." This definition helps to frame the issues I would like to discuss today. I would like to acknowledge that S. 2012, the Energy Policy Modernization Act of 2015, as marked up by this committee, includes a provision requiring the Department to complete a long-range strategic review of the Strategic Petroleum Reserve within 180 days of passage of the bill. The Department is currently actively engaged in just such a study.

U.S. energy security must be placed in the context of the current U.S. energy profile that has dramatically changed over the last several decades, accelerating in the last five or six years. We are now the number one producer of oil and gas in the world and are producing more oil than we import for the first time in decades. Renewable energy technology deployment is rising and prices are falling. Energy efficiency policies and technologies are contributing to flat or declining demand for both oil and electricity. In response to low natural gas prices, industry has announced over $100 billion in new energy-intensive manufacturing projects. Carbon emissions are down as low-priced natural gas replaces coal-fired power generation.

Challenges remain, however, and many of them carry direct implications for our energy security. The April 2015 Quadrennial Energy Review (QER) concluded that in key areas, our energy and related infrastructures have not kept pace with changes in the volume and geography of oil and gas production. The expected growth over the next 30 years in the volume of imports and experts transported by sea, for example, has major implications for oil, natural gas and coal. Sixty percent of the oil Americans consume arrives in a U.S. port, including all of Alaska's crude. Overall marine freight by tonnage through coastal ports is expected to increase domestically between 2010 and 2020, while over the next 20 years, the total volume of imports and exports through U.S. ports could double. The surge in waterborne and rail shipments of crude may be a factor in delays at some inland and coastal ports and, as noted, port traffic is expected to grow over the next decades.

Also, extreme weather events are projected to increase; they have regional and possibly national-scale impacts including extreme heat waves, droughts, and wildfires that can damage electricity infrastructure or reduce transmission efficiency. U.S. temperatures are projected to continue rising in the coming decades. Electricity transmission and distribution systems carry less current and operate less efficiently when ambient air temperatures are higher. Case studies indicate that sudden, extreme heat can cause transformers to malfunction or stop working. Increasing temperatures also will likely increase electricity demand for cooling, which could increase utilization of transmission and distribution systems during peak demand periods. Increasing air and water temperatures also reduce the efficiency of power plant cooling, which increases the risk of partial or full shutdowns of generation facilities and loss of the grid services that they provide during heat waves.

Drought is also an extreme weather event. In 2014, California experienced its third driest year in 119 years of record keeping. As a consequence, California hydroelectric generation was significantly reduced. In June 2014, California hydroelectric generation was only 59 percent of the June average of the preceding 10 years. While earlier this year, the Energy Information Administration indicated that system reliability was not affected by the drought-related reduction in hydroelectric generation, this resource plays an important role in providing load leveling and energy storage for system operators; potential effects on system flexibility and rates should continue to be monitored. Sea level rise and storm surge is also a growing concern. Recent DOE modeling and analysis for the QER concluded that by 2030, a Category 1 hurricane in the Gulf of Mexico would increase the exposure of the region's electrical substations to storm surge and sea-level rise by over 30 percent, from 255 substations to 337; importantly, this region is also home to over 50 percent of the Nation's electricity-dependent refineries and the SPR.

There are also new non-weather related vulnerabilities for our energy systems including cyber and physical attacks on infrastructure. Over half of the cyber incidents reported to DHS's Industrial Control Systems Cyber Emergency Response Team in 2013 related to energy installations, with the next highest percentage in the low double digits. Physical attacks on substations have exposed significant supply chain and reliability concerns with large transformers; the loss of critical large transformers can result in large electricity disruptions. Such a loss could be due to the customized nature of the components and the associated manufacturing requirements as well as physical attacks (such as the Metcalf incident). In addition, all of our critical energy infrastructures are reliant on electricity, placing a very high premium on a reliable, modern and hardened electric grid and raising new concerns about low probability-high consequence events such as electro-magnetic pulses and geo-magnetic disturbances.

Importantly, the U.S. remains a large oil consumer and is a large oil product exporter; this directly ties us to global oil markets and oil price volatility. Energy security is a broad and collective responsibility, especially in light of America's unique global security posture. The energy situation in the U.S. enhances our energy security, as the global market is experiencing continued uncertainty generated by events in Africa, the Middle East, and Russia, raising the possibility of global oil price shocks. I note that the current instability in the Middle East is not theoretical — we only need to look at events in Syria in the last week, where Russian military activity further increased geopolitical uncertainty. There is also reduced spare capacity in the world. Further, Saudi oil minister Al Naimi recently indicated that it would take 90 days for the Kingdom to bring spare capacity fully online; during this interval, in combination with private inventories, and

conservation incented by price signals, government-controlled strategic stocks could be essential for dampening oil price shocks.

It is time to take a fresh and comprehensive look at how we define and implement an energy security policy that is based on 21st century energy market changes, challenges, vulnerabilities, and needs.

Key Components of a Modern Energy Security Plan

Today, I would like to discuss key components of a 21st century energy security plan, tracking the definition of energy security I referenced earlier: a modernized Strategic Petroleum Reserve that has an infrastructure configured to enable drawdown and distribution capacity sufficient to defend the U.S. from economic harm associated with disruptions. I would like to discuss this in the broader context of energy infrastructure resilience and reliability including emergency response; and broader and more collective view of energy security, a concept that promotes the notion that our energy security is affected by the security of our allies, friends and partners, and is advanced by a set of principles and subsequent actions of the G-7 partners (the U.S., Canada, UK, France, Germany, Italy and Japan) and the European Union (EU). These components and many of the associated issues are analyzed in detail in the Administration's first installment of the QER, released last April. The QER included many recommendations related to these components of a modern energy security plan. I would like to discuss both the context and rationale for these recommendations, starting with the Strategic Petroleum Reserve.

The U.S. Response to Oil Supply Disruptions and the Strategic Petroleum Reserve.
The Strategic Petroleum Reserve was authorized in 1975 to mitigate oil supply disruptions that are "... likely to cause a major adverse impact on the national economy." The SPR is currently the Nation's most central energy security asset and should be treated as such.

Today's low oil prices, increased domestic oil production and reduced U.S. oil import dependency have led some to conclude that selling large volumes of oil from the SPR for purposes not related to energy security will have no impact on its energy security benefits. This view fails to recognize that the SPR remains an extremely powerful and valuable energy security tool.

Like much of the Nation's publicly-supported infrastructure, however, the SPR needs additional investment to maximize its value. The Reserve needs funding to enhance its value in three distinct areas:

- **Deferred maintenance**: Funding for routine maintenance has been repeatedly deferred. The President's budget for Fiscal Year (FY) 2016 included a significant down payment on the backlog of SPR deferred maintenance. The House and Senate appropriations bills would actually result in a further increase in deferred maintenance — to $58.8 million in the House bill and to $65.6 million in the Senate bill.

- **Life extension:** The SPR is almost 40 years old and is in need of a significant life extension program. The last life extension program was in the mid-1990s, with a 20 year time horizon, meaning the facilities are currently due for major life extension improvements. The scope of this life extension will likely include major improvements in

the following areas: crude oil transfer; raw water; brine disposal; power distribution and lighting; physical security; brine drive caverns; and general infrastructure.

- **Modernization:** How oil supply moves in this country has changed since the SPR was authorized in 1975. The resulting focus of a modernization program should be to "invest to optimize the SPR's response capability…to increase the incremental distribution capacity of the SPR by adding dedicated marine loading dock capacity at the Gulf Coast terminus of the SPR distribution systems." I will discuss these needs in detail shortly.

Several factors should be considered when evaluating the energy security value of the SPR. The first is the nature of oil markets themselves that have evolved since the late 1970s when the SPR and its authorities were established. At that time, domestic oil prices were controlled, oil production was declining, there was no spot market, OPEC had recently imposed an oil embargo, and a global oil commodity market as we know it today did not exist.

Modern oil markets have evolved in several key ways:

- U.S. oil production has dramatically increased, our imports are declining, oil prices are de-regulated, and oil is the largest and most liquid traded commodity in the world.

- As the market has evolved, so too has the nature of the impacts of an oil supply disruption.

- In today's global market — to which we are linked by our oil consumption and growing levels of product exports — the U.S. is exposed to global price volatility and spikes; U.S. wholesale gasoline prices track *international* wholesale oil prices, as demonstrated by EIA analysis. When global prices spike, U.S. prices spike.

- In current markets — we don't expect this structure to dramatically change in the foreseeable future — it may be that the value of the SPR should be measured less by days of import protection and its ability to move physical supplies to inland and much more by its capacity during a major disruption to satisfy domestic demand while diverting imports into the global oil market in order to mitigate harm to the U.S. economy.

It is important to consider what metrics are the most appropriate for determining the right size of the SPR; we are well above our international commitment on days of import coverage. There are, however, important concerns about a focus on days of import protection as the sole measure of an appropriate size for the SPR, including statutory requirements in the Energy Policy and Conservation Act; and the current U.S. obligation to provide 43.5 percent of the amount of a total coordinated response consistent with our fraction of global consumption levels; this commitment is unrelated to days of oil import protection.

These concerns about the harm to the U.S. economy from oil supply disruptions are well-founded. Previous oil price spikes have been typically followed by two to three years of weak, world-wide economic growth — four decades of data indicate that two to three years of slow economic growth have coincided with oil price shocks. High oil prices after the first Gulf War contributed to a drop in global GDP from three percent to one percent in a year, for example. According to the White House report, *The All-of-the Above Energy Strategy as a Path to Sustainable Economic*

Growth, (July 2014), "Historically, temporarily high oil price shocks arising from foreign supply disruptions have cut GDP growth and reduced employment. This link is not perfect, and not every oil price shock has led to an economic slowdown, but … the empirical evidence points to a negative link between oil price spikes and economic activity." The price elasticity of oil demand has become much lower and the reliance on oil from transportation has changed only marginally since the establishment of the SPR.

Another — and related — consideration for policy makers is the distinction between the SPR's size, its drawdown capacity and its distribution capacity. At roughly 695 million barrels, the SPR is the largest government-owned stockpile of oil in the world. But its size is only as important as its ability to move oil into the marketplace. The SPR has a design *drawdown capacity* — the ability to pump and move oil from its caverns — of 4.4 million barrels per day (mmb/d). However, the SPR's *distribution capacity* is the capability to *deliver* SPR oil to the marketplace via the network of commercial pipelines and marine terminals to which it is connected. New patterns of oil supply and demand among U.S. oil producers and refineries, along with associated changes in the U.S. midstream, have significantly reduced the ability of the SPR to distribute incremental volumes of oil during possible future oil supply interruptions.

To understand this degradation in distribution capacity, it is important to examine recent changes in the location and volumes of domestic oil production. Historically, oil and oil products in the United States have tended to flow from *south to north* to inland refineries. Recent and dramatic increases in domestic oil production and the location of that production have altered this pattern, with oil from Canada, the Bakken formation in North Dakota and Montana moving from *north to south* to the Gulf of Mexico. Canada is now our largest source of imports. Significant new quantities of crude oil from the Eagle Ford and Permian shale basins also are moving to Gulf Coast refineries. To accommodate these new volumes, pipelines which once flowed north have been reversed to flow south, with ramifications for the broader distribution system. In addition, the rapid growth of petroleum product exports from Gulf refineries has increased the commercial utilization of marine terminals in that region. U.S. exports of non-crude petroleum products from the United States averaged a record 3.8 mmb/d in 2014, a nearly four-fold increase over the last decade.

To optimize the impact and value of the SPR in the event of an emergency, the SPR's three distribution systems in the Gulf of Mexico need to be able to deliver oil to Gulf Coast refineries, as well as put crude oil onto ships to move it to east and west coast refineries. If the SPR cannot load oil onto barges and tankers without disrupting commercial shipments, SPR sales could be offset by a corresponding *decrease* in domestic crude oil shipments or exports of domestically produced petroleum products, neither of which is desirable for collective energy security. In this scenario, the available space for loading the SPR oil could affect the ability of the SPR to add *incremental* barrels to the market.

Concerns about SPR infrastructure limitations were analyzed in the QER. The conclusion: in order to ensure that the SPR is able to deliver incremental barrels of oil to the U.S. market in the event of an oil disruption and not simply back out domestic production, the SPR needs dedicated marine terminals. The effect of moving this incremental oil into US markets would be to re-route oil destined for the US, enabling it to go to other countries. This would effectively increase overall global oil supplies with a corresponding reduction of the negative impacts on the U.S. economy associated with global price spikes.

Changing markets are not the only concern with the SPR. As noted, the SPR is nearly 40 years old. The Department is working to address deferred maintenance for regular operations and maintenance within the regular budget process, although this remains an ongoing issue.

Investment in facility life extension is also needed. The last SPR life extension program was completed in the mid- 1990s with a 20-year plan; two decades have now passed and some SPR infrastructure is nearing the end of its design life and major investments will be needed in the near future to ensure the SPR's reliability for the next 20 years. The infrastructure and equipment to support a drawdown — including storage caverns and wellbores — is both large and complex. Assuming the current size and configuration of the SPR, within five years, there will be challenges regarding cavern storage capacity for maintaining crude oil inventory levels. Already two caverns have been taken offline and removed from service due to operational issues. Most of the SPR wells were drilled in the late 1980s and early 1990s, although several of the wells are 60-plus years old. Informed by the SPR Strategic Review, these structural issues will need to be addressed in order to maintain the SPR's current operational readiness and drawdown capability.

Under the controlled conditions of the 2014 SPR test sale, a number of issues were identified, including the gap between the SPR's drawdown and distribution capacity. Concerns about this gap and its implications for energy security were analyzed in the QER. The QER underscored the need for an effective SPR modernization program that would address infrastructure issues and reflect current market and energy security conditions. While a detailed cost review is underway, top-line funding needs are understood. As outlined in the QER, investments for life extension and modernization in the range of $1.5 to $2 billion are necessary to ensure the SPR is able to protect the U.S. economy in an energy supply emergency. Of this amount, approximately $800 million is needed for life extension and $1.2 billion for adding dedicated docks and terminals to ensure that in an emergency, the SPR can put sufficient *incremental* barrels of oil into the market. Modeling and analysis supporting the QER also indicates that adding two million barrels per day of dedicated distribution capacity could avoid a very large loss to the U.S. economy in the event of a single severe international oil supply disruption.

The ability of the SPR to continue to provide strategic and economic security against foreign and domestic disruptions will remain diminished if investments to repair and replace aging infrastructure and modernize the SPR's capabilities are not made. To be sure, any changes in the configuration or size of this energy security asset must be done prudently. In the context of market response, the SPR needs to be large enough, its distribution capacity sufficiently decongested, and its authorities robust enough to optimize its value for mitigating economy-damaging oil and gasoline price spikes associated with an oil disruption. In this regard, the QER also recommends changes in the SPR's authorities that would strengthen the ability to respond to disruptions in a more timely and effective ways and to more closely reflect the evolution of global oil markets. Specifically, the QER recommends that SPR authorities be updated so that:

- the definition of severe energy supply interruption includes an interruption of the supply of oil that is likely to cause a severe increase in the price of petroleum products; and
- the requirement that a severe increase in the price of petroleum products *has* resulted from such an emergency situation be changed to a requirement that a severe price increase will *likely* result from such emergency situation.

These provisions are designed to make the definition of severe supply interruption consistent with the uses of the SPR and to enable faster action to mitigate harm to the U.S. economy. I will discuss product reserves later, but the Northeast Gasoline Supply Reserve operates under SPR authorities and the Northeast Home Heating Oil Reserve operates on its own statutorily-established authorities. These two facilities should be able to operate in concert but the triggers for their use are different; the QER recommends that they operate under a single authority to ensure coordinated actions if needed.

As the pending FY 2016 appropriations bills illustrate, current budget sequestration funding levels dramatically shortchange the very investments that are most essential to long-term economic growth, including infrastructure, research and development, training and education. It may be that we can create a net increase in the SPR's energy security value by selling a small portion of its current crude oil inventory — raising the requisite $2 billion to cover the costs of life extension and modernization activities.

In addition, we have international obligations related to the SPR and its use. Consultation with the IEA and its member countries is important as we work to maximize the effectiveness of the SPR. I would also note that we have been actively encouraging other countries — IEA members and non-members — to build or increase strategic reserves. This should figure into our calculus as we develop policies for, or that affect, the SPR.

Energy Infrastructure Resilience, Reliability and Emergency Response.
Energy infrastructure resilience and reliability, including emergency response, are a growing concern and a key component of a modern energy security strategy.

By the IEA's definition of energy security and many other measures, enhancing the resilience and reliability of our energy infrastructures, systems and components is an increasingly important. President Obama highlighted the fundamental need for resilient and reliable energy infrastructures in Presidential Policy Directive 21, in which energy infrastructures were described as "uniquely critical," and as noted in the QER, "the consequences of ...hazards to infrastructure broadly affect social welfare. They go beyond the ability of a system to operate and address the vitality of our naitonal safety, prosperity and well-being."

Ensuring energy infrastructure resiliency and reliability is challenging. The transformation of our energy landscape — dramatic increases in oil, gas, renewable energy resources — requires new infrastructures, and our existing infrastructures are not always well-matched to new sources of supply. Our energy infrastructures are aging — the gas main that tragically downed two apartment buildings and resulted in eight deaths in New York City last year dated back to the 1880s. The imperatives of climate change and increases in extreme weather event strongly suggest that we need to simultaneously harden and modernize our energy systems. These critical systems also face new and growing vulnerabilities, including cyber and physical incidents, and there is a growing interface between energy and IT systems; this could create new cyber vulnerabilities at the same time it enables real-time responses to supply and demand and helps improve system operations.

In addition, our energy infrastructures are increasingly interdependent and all are dependent on electricity. Hurricanes Katrina and Rita, for example, downed 85,000 utility poles, 800

distribution substations, and thousands of miles of transmission lines. On the worst day of these sequential events, the Nation lost almost 30 percent of its refining capacity. Three weeks after Rita hit, oil markets were still short around two million barrels a day.

Billion dollar weather events, especially severe storms, have risen dramatically in the last 15 years — indicators of the vulnerabilities of our energy systems to climate change and costly disruptions — and are a major indicator for energy security needs and requirements in the modern context. East coast hurricanes are on our minds this week. Hurricane Sandy killed 159 people and knocked out power to 8.66 million customers. Nearly two weeks after the storm, product deliveries from terminals in New York Harbor had only returned to only 61 percent of pre-storm levels, forcing industry to seek work-arounds to resume supplies. Hurricanes also pose a threat to 4,000 offshore rigs and refineries in the Gulf of Mexico. Power outages from weather events have gone from five to 20 per year in the mid-1990s to 50 to 100 per year in the last five years. Drought is affecting the water needed to cool thermoelectric plants. Importantly, the greenhouse gas emissions associated with our energy systems contribute to many of the threats to their reliability and resilience.

The vulnerabilities of our energy systems not only have an impact on our energy security, they have an impact on our national security as well. A Defense Science Board Task Force noted in 2009 that "….any assessment of the risk to military missions from grid failure must also take into account the ability of the national pipeline system to provide fuel to installations where it critically warrants." That same year, a Department of Defense paper noted that "energy security programs...are valued as investments in long term US national security..."

Several of the QER's findings on energy infrastructure resilience and reliability bear repeating:

- **Mitigating energy disruptions is fundamental to recovery and resilience.** Mitigating energy disruptions is particularly important because other critical infrastructures rely on energy services to operate, and these interdependencies are growing. Should disruptions occur, it is essential to have comprehensive and tested emergency response protocols to stabilize the system and begin recovery.

- **TS&D infrastructure is vulnerable to many natural phenomena.** These include hurricanes, earthquakes, drought, wildfires, flooding, and extreme temperatures. Some extreme weather events have become more frequent and severe due to climate change, and this trend will continue. Sea-level rise resulting from climate change, coupled with coastal subsidence in the Mid-Atlantic and Gulf Coast regions, increases risks and damages to coastal infrastructure caused by storm surge.

- **Threats and vulnerabilities vary substantially by region.** In many cases, a particular natural threat or infrastructure vulnerability will be region specific (e.g., Gulf Coast hurricanes threatening refineries), diminishing the utility of national, one-size-fits-all solutions for reliability and resilience. Regional solutions are essential

- **Recovery from natural gas and liquid fuel system disruptions can be difficult.** Although liquid fuels and natural gas disruptions are less likely than electricity disruptions, it is relatively more difficult to recover from disruptions to these systems than

electric systems. Recovery from natural gas disruptions is particularly difficult because of the need to locate and repair underground breakages and restore pilot lights for individual customers.

- **Cyber incidents and physical attacks are growing concerns.** Cyber incidents have not yet caused significant disruptions in any of the three sectors, but the number and sophistication of threats are increasing, and information technology systems are becoming more integrated with energy infrastructure. There have been physical attacks; while some physical protection measures are in place throughout TS&D infrastructure systems, additional low-cost investments at sensitive facilities would greatly enhance resilience.

- **High-voltage transformers are critical to the grid.** They represent one of its most vulnerable components. Current programs to address the vulnerability may not be adequate to address the security and reliability concerns associated with simultaneous failures of multiple high-voltage transformers.

- **Shifts in the natural gas sector are having mixed effects on resilience, reliability, safety and asset security.** The addition of onshore shale gas infrastructure benefits natural gas resilience by decreasing the percentage of infrastructure exposed to storms. The Energy Information Administration reports that the Gulf Coast percentage of natural gas production went from 18 percent in 2005 to 6 percent in 2013. On the other hand, overall reliance on gas for electricity has gone up, creating a new interdependence and grid vulnerability. Furthermore, additional export infrastructure resulting from the gas boom would increase vulnerabilities to coastal threats, such as sea-level rise.

- **Dependencies and interdependencies are growing.** Many components of liquid fuels and natural gas systems—including pumps, refineries, and about 5 percent of natural gas compressor stations—require electricity to operate. The interdependency of the electricity and gas systems is growing as more gas is used in power generation.

The private sector, States, and the Federal Government all play crucial roles in ensuring that energy infrastructures are reliable, resilient, and secure. There is also a temporal aspect to maintaining energy system resilience and reliability. Severe weather, aging infrastructures, maintenance issues, and physical attacks on energy infrastructures require emergency responses and continuous planning/exercises for such events. In this regard, under the Department of Homeland Security's National Response Framework Emergency Support Function 12 (ESF-12), DOE is responsible for coordinating emergency responses for the energy sector with all of these entities.

There were several lessons learned from Hurricane Sandy that inform DOE's responsibilities under ESF-12. First, fuels distribution is a key element of an effective emergency response; in an emergency, consumers need refined products, not crude oil, and they need it quickly. An example was seen in the aftermath of Hurricane Sandy. After one week of Sandy's landfall, less than 20 percent of stations in New York City were able to sell gasoline. In part this was attributable to the absence backup electrical generation at gasoline stations. The City had to prioritize fuel distribution, starting with emergency responders and those responsible for repairing infrastructure. In its post-Sandy analysis, the City recommended that it "Explore the creation of a

transportation fuel reserve to temporarily supply the private market during disruptions." DOE subsequently established a gasoline reserve in the Northeast, in locations and with contract provisions that would help expedite distribution of gasoline in the event of a supply disruption.

Another important lesson underscored by Sandy and seen in several previous hurricanes is the need to more fully understand and manage energy infrastructure interdependencies, especially reliance on electricity, as this is critical to, among other things, providing and moving fuels in an emergency. In Sandy, fuel distribution was hampered by the reliance of pumps on electricity. Backup generation, microgrids and other options could help mitigate these distribution problems.

The damage from extreme weather events can impose large costs on the energy industry, local communities and the Nation. The impacts of emergencies on energy consumers are significant. Hurricane Katrina caused three critical pipelines — which cumulatively transport 125 million gallons of fuel each day — to shut down for two full days and operate at reduced power for about two weeks, leading to fuel shortages and temporary price spikes. Addressing energy infrastructure resilience — ability of a system or its components to adapt to changing conditions and withstand and rapidly recover from disruptions — is a longer-term component of an energy security strategy that should be designed to both harden existing infrastructure and make it more resilient over time, even as it adds capacity for supporting economic development.

Making infrastructure more resilient in advance of a disaster will ultimately reduce the demand for, and the costs of, emergency, rapid response actions. As noted in the QER, a statistical study of FEMA mitigation awards, while not specific to energy projects, found that the awards had a benefit-cost ratio for mitigation investments of 4:1. A forward-looking investment strategy for critical energy infrastructure would benefit from more than just hardening — to spend investment dollars more wisely, it is essential to focus on modernizing energy transmission, storage and distribution infrastructures at the same time that they are being hardened. As a matter of policy, we also need to acknowledge that our energy systems cross state borders and that these systems include both public and private entities

There are over 60 actionable recommendations in the QER. The following are some highlights of its recommendations on policies and programs to enhance resilience, reliability and security of our energy infrastructures:

- Establishing a program to provide competitively awarded grants to states to demonstrate innovative approaches to TS&D infrastructure hardening and enhancing resilience and reliability. A major focus of the program would be the demonstration of new approaches to enhance regional grid resilience, implemented through the states by public and publicly regulated entities on a cost-shared basis;

- Updating and expanding state energy assurance plans. DOE should undertake a multi-year program of support for state energy assurance plans, focusing on improving the capacity of states and localities to identify potential energy disruptions, quantify their impacts, share information, and develop and exercise comprehensive plans that respond to those disruptions and reduce the threat of future disruptions;

- Accelerating natural gas pipeline replacements to enhance safety and reliability and reduce methane emissions;

- Modernizing the grid with a major focus on establishing valuation frameworks for a range of services and technologies such as efficiency, capacity, distributed generation and storage;

- Establish a program to provide competitively awarded grants to states to demonstrate innovative approaches to transmission, storage, and distribution infrastructure hardening and enhancing resilience and reliability; and; and

- Analyzing the policies, technical specifications, and logistical and program structures needed to mitigate the risks associated with loss of transformers, including whether new Federal regulatory authorities or cost share are necessary and appropriate. Approaches for mitigating this risk should include the development of one or more transformer reserves through a staged process

Most of these recommendations include a strong state focus. Utility business models and jurisdictional limitations may not, however, advance the most comprehensive and effective approaches to our growing energy infrastructure vulnerabilities. There are few more important federal roles than ensuring that the public has reliable and affordable energy, there are rapid and effective responses to energy and related emergencies, and that the energy infrastructures of the future are resilient and secure.

As you know, I was the Department of Energy (DOE) Under Secretary during the Clinton Administration. When I returned to DOE after a 13 year absence, I was struck by the imperatives of what is, in reality, a new and complex mission for the Department — energy infrastructure, resilience, reliability and emergency response with significant operational and cross-cutting aspects and requirements to ensure that these issues are effectively and appropriately addressed. The requisite energy system view is not reflected directly in DOE's organizational structure.

A Broader Approach to Energy Security.
Finally, I would like to turn to a brief discussion of collective energy security, an obligation that we have to our allies, friends and partners with benefits that ultimately accrue to the U.S. and its interests at home and abroad.

Until recently, the concept of energy security has focused on "oil security" as proxy for "energy security." The crisis in Ukraine and growing European dependence on a dominant supplier, however, has put a spotlight on the need for an expanded view of energy security that more broadly encompasses the needs of the U.S., our allies, and trading partners.

At the urging of President Obama, these linkages were advanced by the G-7 leaders at the Hague Summit in March 2014, at which G-7 energy ministers were instructed to address energy security issues in concert with the European Union (EU). In May 2014, the G-7 energy ministers and the EU articulated a set of principles that emphasized the importance of an updated, broad and collective approach to energy security, where it was noted that "energy security is not only domestic — it is dependent on interaction in the global interconnected market." Acknowledging

the need for "a modern and collective definition of energy security," the G-7 Energy Ministers and EU representatives adopted this set of seven principles, summarized as follows:

- Develop flexible, transparent and competitive energy markets, including gas markets;
- Diversify energy fuels, sources and routes, and encouragement of indigenous sources of energy supply;
- Reduce greenhouse gas emissions, and accelerating the transition to a low carbon economy, as a key contribution to enduring energy security;
- Enhance energy efficiency in demand and supply, and demand response management;
- Promote deployment of clean and sustainable energy technologies and continued investment in research and innovation;
- Improve energy system resilience by promoting infrastructure modernization and supply and demand policies that help withstand systemic shocks; and
- Put in place emergency response systems, including reserves and fuel substitution for importing countries, in case of major energy disruptions.

These principles were endorsed by the G-7 leaders a month later in Brussels, as was the concept of collective energy security where in the associated communique, the leaders noted, "energy security must be at the center of our collective agenda and requires a step change to our approach to diversifying energy supplies and modernizing our energy infrastructure." In May of this year, there was a follow-on meeting of the G-7 energy ministers in Hamburg. Once again, we affirmed our commitment to collective energy security and identified priority areas for collaboration.

This broader definition of energy security does not discount the importance of oil security. Indeed, the crisis in Ukraine — where fuel oil might help replace lost gas supplies for heat and some power generation in the winter — underscores the importance of oil and oil products to energy security. The crisis in Ukraine also highlighted the vulnerability of our European allies to increasing reliance on a single, dominant supplier for much of its energy supplies. This is not only true in regard to natural gas. A European Commission (EC) document released last year noted, "...the Commission recognizes that some European refineries are optimized for using Russian crude, that EU refining capacity is increasingly in the hands of (a shrinking number of) Russian owners, and that the EU is a net importer of Russian diesel."

Natural gas and nuclear power are a central piece of the energy security equation, particularly in Europe. This was underscored by Ukraine and the vulnerabilities this crisis has exposed for Europe in general, and specifically about increasing its reliance on Russia for its energy supplies. Europe currently meets about 30 percent of its natural gas demand with Russian imports; more important, however, is the fact that several EU members get 70 to 100 percent of their natural gas from Russia via Ukraine transit pipelines. Russia's efforts to expand the Nord Stream pipeline would further cement European dependence on Russian gas and increase Russia's political leverage over Europe. In addition, countries in Eastern Europe with Russian designed nuclear power plants currently rely exclusively on Russia for nuclear fuel and spent fuel disposal, despite the fact that at least one other fuel supplier has produced fuel that has been formally qualified for use in those Russian-designed reactors. Further, nuclear power and the trajectory of nuclear plant closures in Europe and Japan raise additional issues about energy security and climate goals that need to be incorporated into agendas that promote mid- to long-term energy security for the U.S.

and its allies and other friends. Finally, climate change mitigation and energy efficiency need to be included in any mid- to long-term energy security discussions.

Since May 2014, G-7 countries, including the U.S. and the EU, have been working on policies and programs to address the collective energy security principles articulated in Rome. U.S. actions related to collective energy security are significant and address all of the principles. A very short list of federal actions to address collective energy security, both domestically and internationally, include expediting the LNG export approval process; diplomatic support for the Southern Gas Corridor pipeline system to diversify sources of natural gas supply to Europe (characterized by the State Department as "an important contribution to global energy security"); budget requests for a grid modernization program, state emergency response grants, and efficiency programs; supporting an ongoing, U.S.-chaired Carbon Sequestration Leadership Forum to help reduce CO_2 emissions from fossil-fuel combustion (eight ministers will attend this forum in Saudi Arabia this November); and initiatives to harmonize North American energy laws and regulations. DOE also organized a recent workshop, which included European participants, to develop ways to measure and value energy security; work on this valuation initiative continues.

The QER itself reflects the Administration's commitment to the G-7's collective energy security principles; it highlights Administration actions and includes analysis and recommendations that address all of the seven energy security principles. DOE has briefed the EU and 31 countries ranging from Bangladesh to Bolivia to China to Bulgaria on both the substance of the QER and the process for its development.

Our G-7 and EU allies have also been actively promoting a collective approach to improving energy security. EU member states and contracting parties of the European Energy Community announced in May 2014 that they were conducting natural gas stress tests, which were released in October 2014; the quick turnaround of these analyses speaks to the priority that the EU and the Energy Community participants attached to the issue. With strong U.S. political support, the European Commission has refined its list of energy infrastructure "Projects of Common Interest" to advance the most important gas and power inter-connections among member states to create integrated, functioning gas and power markets throughout Europe. The EU also is developing a new directive on security of supply for natural gas that will likely encourage each member state to have at least three sources of gas supply. Finally, there is a new EU electricity market design directive under development that is expected to be completed in 2016.

I have been encouraged by the collective work on energy security with our allies, friends and partners and, as you can see, there is a significant amount of activity taking place in this arena. I have just returned from the G-20 meeting in Istanbul, where this dialogue continued and I look forward chairing an IEA ministerial in November focused on energy innovation, also on the list of key energy security principles. It is an important and sensitive time in this arena — a good time to send the right signals on our commitment to collective energy security and a bad time to send the wrong ones.

Madam Chair, Ranking Member Cantwell, members of the Committee, I appreciate the opportunity to share my thoughts on the Strategic Petroleum Reserve and related energy security matters and look forward to the Committee's questions.

The CHAIRMAN. Thank you, Mr. Secretary.

Your concluding words are the ones that I find most intriguing. You are over in Europe, you are in Istanbul at the G20, you are working in this collective approach that you have been talking about with our G7 or EU allies and the focus is on improving energy security from a broader perspective. You come home from that meeting and the discussion here is the Congress is looking to sell off parts of that strategic reserve that we are encouraging other nations to participate in, to again, build out and enhance this collective energy security.

Tell me how this works when the United States is trying to persuade China, trying to persuade India, to participate in these international energy security conversations? Isn't it a little bit hypocritical for us, as a country, to be saying come on in and yet we are basically treating our energy security asset as the cash machine here?

Secretary MONIZ. Well of course we are, as you know, and as called for in a product of your Committee, we are carrying out a strategic study which we expect to finish next May basically, in terms of what we need to do in terms of the size and the authorities of the petroleum reserve.

Now without those I am not going to talk about a specific size. But the fact is that, as I said, that the markets are totally different today than they were in the 70's. The real issue is a major disruption that leads to a substantial price excursion which affects all of us. And that's why we are working with China and by the way, the collaboration is excellent. They have come and visited our SPR. We have a visit to their developing SPR in November. They are building up toward a 500 million barrel petroleum reserve in China. India is building up reserves as well.

So again, as I said earlier, I think this is a time of considerable geopolitical uncertainty and what we need is a more unified international collective response to the economic risks we would all face.

The CHAIRMAN. I would certainly hope that we would agree that we need a consistent response too. We cannot ask them to move forward in this collective approach while at the same time we are weakening our own energy security cushion, if you will.

I appreciate you saying you cannot comment on the right sizing of the SPR at this point in time. You are going through the studies. I was walked through all of the varied layers of analysis that will be part of that review, but wouldn't it be premature for us to be selling off portions of the reserve before we have that considered analysis, before we really know what the right size is, before we really understand how aspects of this modernization need to proceed?

Secretary MONIZ. Well I would certainly assume that that's why Congress has asked us to do the study.

The CHAIRMAN. Well.

Secretary MONIZ. Was to be able to have a detailed and significant analysis. And this analysis is being performed with many, both analytical companies and universities to bring together, I think, the first really integrated strategic look in a very, very long time.

The CHAIRMAN. And a very necessary...

Secretary MONIZ. And we certainly would like to have that answer.

The CHAIRMAN. A very necessary review. I think it is something that we asked for a reason, and I would certainly hope that we would take advantage of this considered review before we weaken our ability to utilize the recommendations that come with this.

Right now we have a mindset here in this Congress, and I, unfortunately, even with your guidance here, even within the Administration, that says we need this money now because we need to spend it on a transportation bill, and if we do not spend it on a transportation bill somebody is looking for another bill on the House side. They have already identified it for research in the healthcare world.

We are looking at this as nothing more than a cash machine at a time when we are looking for more money, and I think that this is wrong and irresponsible.

I believe very, very strongly that what we need to do is make sure that as we move to modernize, as we move to make sure that we have that strong energy asset, we do not erode our ability to utilize it in the time of an emergency when we do not know what is going on. We do not know what may come next, but we know that if we drained it out and we do not have the flexibility to move when we need it then there is going to be a lot of fingers pointing saying where did it go? I think part of what we are trying to ascertain here is what is it that we need and how can we be smart with this as our energy asset?

Senator Cantwell?

Senator CANTWELL. Thank you, Madam Chair, and thank you, Mr. Secretary, again, for your work on the document that helped produce the focus here.

Explain why the 90-day requirement should not be the only consideration that we should be looking at when we are talking about modernization?

Secretary MONIZ. Well, Senator Cantwell, again, the 90 days is certainly an international obligation based upon imports. But as I said, we also have an international obligation based upon the use and that is the 43 and a half percent of draw down capacity for a coordinated response.

But second, beyond the international obligations I just believe it's in our best interest to have a very strong petroleum reserve. That is what gives us the flexibility to respond if there is a very major disruption. And we have had brainstorming sessions, workshops, with external experts looking at what are the risks of major disruptions and they certainly are there, major disruptions, perhaps more than three million barrels a day, for example, suddenly disrupted. And by the way, the risk also of multiple disruptions because things could be linked.

So, as I said, that has the expected impact of a major price spike in those cases. We are in a situation with a diminished global reserve capacity, and so it's being able to use government stocks in a rapid way that could ameliorate the economic harm that we might face.

Senator CANTWELL. Do you think the President should have new authority in this area?

Secretary MONIZ. Well we have said that in the QER it raised the issue of a variety of authorities. Some of them are very specific such as with the two product reserves they have very, very different authorities for use. And we think that should be harmonized within the petroleum reserve.

But then there are more, bigger policy issues, such as how one defines what a major disruption is in the sense of having the ability to respond when there is likely to be a major price spike as opposed to after there's been a major price spike. So those are the kinds of policy issues that I think we need to discuss in terms of looking at authorities appropriate to what is now a genuine global market in contrast to the market of the 1970's.

Senator CANTWELL. In the Quadrennial Energy Review you also talked about and we had a couple of votes here in Committee about commodity congestion—the inability for utilities to even get products, based on the competing commodity needs. So I think the Quadrennial Review does a pretty good job of outlining the fact that we need to improve there as well. I wish people here would swim in their own lanes when it comes to these things, but usually that is not how the legislative process works. Clearly we have to do both. Is that correct? We have to improve infrastructure commodity passage or as my colleague from Minnesota who is not here at the moment talked about the fact that utilities in Minnesota who have requirements to serve their consumers could not get their coal supply actually to them because of commodity congestion. That is the same problem, the underlying issue here is about the oil market. So it is getting the oil and getting other commodities to market takes both an infrastructure improvement and a modernization of the SPR. Is that correct?

Secretary MONIZ. Yes, it does. And there, in terms of the SPR modernization, yes, there is a congestion issue in terms of the Gulf of Mexico. But that issue, as you say, is much, much broader than that in terms of our energy infrastructure. I believe there has been some progress, for example, with regard to the train congestion. I met with the CEO of one of the major railroads, BNSF, and understood the steps that they are taking to try to not have a repeat of those kinds of issues.

So I think there's a lot of work going on in the private sector, but the fact is we haven't yet caught up to the incredible increase in our gas and oil production from new geographies. We also have things like large crops, etcetera, all coming together to lead to some congestion.

So in the QER in addition to specific energy infrastructure, we also had recommendations because it was an Administration-wide document. We also had shared infrastructures that all commodities use as part of the focus as well.

Senator CANTWELL. Thank you.

Thank you, Madam Chair.

The CHAIRMAN. Senator Barrasso?

Senator BARRASSO. Thank you very much, Madam Chair.

Welcome back.

As you talk about the role that energy plays in our national security, global security, in your testimony you advocate for an expanded view of energy security that broadly encompasses the needs

of the United States, our allies and trading partners. You go on to say the crisis in Ukraine highlighted the vulnerability of our European allies to increasing reliance on a single dominant supplier for much of its energy supplies. You explained, it is not only true in regard to natural gas, but also crude oil. Your words. You cite the European Commission's finding that some European refineries are optimized for using Russian crude, and the EU refining capacity is increasingly in the hands of a shrinking number of Russian owners.

So I am encouraged the Administration continues to approve U.S. liquefied natural gas exports, but I question about the Administration, why it seems to be dithering when it comes to crude oil exports. Do you agree the U.S. crude oil exports would benefit the energy security of our allies and trading partners and if not, why not?

Secretary MONIZ. Well, sir, again, first I think, it's important that we do distinguish, you had this discussion before, I think, in terms of the natural gas and oil situations in the United States being quite different. In natural gas we are, of course, I mean, we, with some Canadian imports, although those have gone down too. We are essentially self sufficient and our export will very shortly start the exports with LNG out of the lower 48.

On oil it's still very different where we are a seven million barrel a day importer of crude oil, a much greater exporter now of oil products, of course.

So the specific issue raised, as you well know, it's in the responsibility of the Department of Commerce to make that policy judgment. But it is also true that recent studies including the last summary study of the EIA on the congressionally requested studies on exports show that the impacts for the next 10 years or so are likely to be pretty modest, to put it mildly, in terms of exports.

Senator BARRASSO. Because I guess I would ask if that is your litmus test if crude oil imports have to get to zero or near zero before the Administration would support crude oil exports because we all know that much of our nation's refining capacity really was built to handle heavy crudes that are imported from outside the United States, not what is being produced in the United States right now as a result of technological advances and with fracking and how we get to this oil. It is very different in terms of what our refining capacity is. But is that your litmus test? We have to get to zero of imports before we can export what is essentially a different product.

Secretary MONIZ. No, sir, I did not say that. Of course, we should emphasize again, we are exporting. I think it's now four million barrels, maybe a bit more, of product. That goes to South America and Europe, so they are getting the benefit of our increased production. That's the first point. I've forgotten my second point now. [Laughter.]

Secretary MONIZ. The product, okay, maybe that was——

Senator BARRASSO. Last month the White House Press Secretary said we will not support legislation like the one that has been put forward by Republicans, but last week the Senate Banking Committee advanced legislation introduced by Senator Heitkamp, a Democrat, to repeal the crude oil export ban.

It does not seem the Administration supports efforts to move this bill according to the White House spokesperson. Does the Obama Administration oppose all legislative efforts to repeal this crude oil ban?

Secretary MONIZ. Well the, by the way, I thought of my other point.

Senator BARRASSO. Oh, good.

Secretary MONIZ. Which was on the additional production of light oil. The fact is that when you look at spreads, Brents, WTI, Louisiana Light, it's hard to argue that there's been a lot of production being hemmed in by current rules.

Secondly, I would note again, of course, commerce, again, is responsible. They have taken two steps. One was the ruling on lightly processed, high API oil to be exported as a product. Secondly, more recently, the approval of the swap with Mexico of light for heavy.

So I think the Commerce has taken steps to address this and it's on their desk in terms of any further steps.

Senator BARRASSO. When you talk about production being hemmed in, of course that means jobs lost in the United States in the oil industry from people that are actually out there working, trying to just make a living and put food on the table. So it is a consideration for our economy.

Secretary MONIZ. But Senator, again, the evidence today is that this is not occurring. The EIA's analysis would say that if there were substantially greater production in the United States somewhere up north of 12, then there might become an impact there. But right now the evidence does not suggest a major impact.

Senator BARRASSO. Final question. The Nord Stream pipeline running from Russia to Germany under the Baltic Sea circumvents Eastern Europe. I understand a number of Eastern European leaders have expressed opposition to expanding Nord Stream. I do not know if that came up at your recent meeting. But what, if any, steps is this Administration taking to stop the expansion of Nord Stream?

Secretary MONIZ. Well, of course, we are working with our European colleagues both at the national level and at the European Commission level. The European Commission has made it very clear in their energy security plan that they are looking for diversification of supply which the Nord Stream would not do.

We have been advocates and frankly, to answer your question, yes, these were discussed a few days ago in with the G20. We remain, for example, very strong advocates of getting Caspian gas into Europe, through the Southern corridor that needs additional interconnections. Greece to Bulgaria, etcetera.

In addition we're very interested in, don't have a direct role, but we maintain the discussions in terms of the production and monetization of Eastern Mediterranean gas, Israeli, Cypriot and of course, Egypt now, potentially with a major find.

I think those are the issues that really add to diversity of supply and would increase European energy security.

Senator BARRASSO. Thank you.

Thank you, Madam Chairman.

The CHAIRMAN. Thank you.

Senator Manchin?

Senator MANCHIN. Thank you, Madam Chairman, and thank you, Mr. Secretary, for being here and I appreciate your input.

Sir, you just mentioned that we have about seven million barrels a day of imports that we depend on, and that is going to stay, I think EIA even forecasts are about four million even way up into the future.

Secretary MONIZ. Of crude oil?

Senator MANCHIN. Of crude oil, coming into the United States of America, right?

Your predecessor, Secretary Chu was here, and I asked him a question. I said, about coal to liquids since we have 250 million known reserved tons of coal and what I think, two barrels of oil can be produced from one ton of coal. Now that is about 500 million barrels of reserves and I think Saudi Arabia only has about 260 billion barrels of reserves. Sooner or later we are going to have to use the resources we have not to be dependent on foreign oil. If you use the coal to liquids incorporated with biomass feed stock he believed it would have a neutral, if any, a reduction of carbon footprint. Do you feel the same about that? I mean if we would advance that type of technology? The only thing we are considering is asking for a pilot project to show that we can do it.

Secretary MONIZ. So, Senator Manchin, first of all I think the interesting technology prospect it would be coal with carbon capture and potentially biomass feed stock together.

Senator MANCHIN. Yes, CBD.

Secretary MONIZ. Theoretically possibly even become completely carbon neutral or negative.

Senator MANCHIN. Negative.

Secretary MONIZ. Potentially.

Senator MANCHIN. Right.

Secretary MONIZ. In terms of the biomass part. So these are, these kinds of conversion technologies are being researched right now. As with a number of technologies there's a ways to go on terms of cost.

Senator MANCHIN. You are claiming from the investment from a pilot project?

Secretary MONIZ. Yes, no, so I think on the research side, I think, this is the kind of potential, you know, home run that——

Senator MANCHIN. The State of West Virginia, as you know, would be very much interested in using and developing this pilot project.

Secretary MONIZ. Right, right.

Senator MANCHIN. With the DOE because we think down the road you are going to, with the Bakken and all that kind of leveling out, we are going to have to have an energy policy here that does not make us more dependent on foreign oil.

Secretary MONIZ. Yes, I might also add that, our military has also been interested in exploring this technology.

Senator MANCHIN. Yes and I think they have used it in B52s and found that it performed extremely well, if not better, than the conventional fuel.

Secretary MONIZ. Yes, I think making the fuel to, as a perfectly replaceable fuel.

Senator MANCHIN. Yes.

Secretary MONIZ. Is certainly possible.

Senator MANCHIN. Well, sir, I would hope.

Secretary MONIZ. So we can talk about that.

Senator MANCHIN. Yes, I hope that you would consider that because the whole State of West Virginia will continue to do the heavy lifting if you help us, work with us.

With that being said, on the export of crude I know my concern was this with the export of crude. It is hard to go home and explain why we would be exporting when, basically, the prices here can be so volatile.

But the more you look into it, I thought if we did it from a strategic standpoint, I think in the legislation that the Chairman has been moving, it makes a lot of sense to me. I support it wholeheartedly. It moves it strategically and also gives the President a chance to use a trigger and basically stop the export if the oil prices spike here and the pump price goes up.

Would it not be advantageous for us to use our strategic oil, using it basically to help our allies not be dependent on the oils around the world that do not benefit us and revenues that are used against us, strategically? If you looked at export strategically?

Secretary MONIZ. Well, again, the again, to repeat. We, again, we are significant net, significant net importers of crude oil or we are importers.

Senator MANCHIN. Right.

Secretary MONIZ. Of crude oil, and we are major exporters of oil products.

So the issue is, for example, okay, if I take the Mexico situation. There, as I said earlier, Commerce approved a swap of light for heavy. So it was a question of grade, in this case, because the Mexican refineries are quite short of light oil. So that's a case where there was a good match between a swap. Okay?

But also as I said earlier the reality is, in terms of the big picture, the current oil market analysis does not suggest that there is an inability, for example, of the American refining system to handle the light oil at least at today's production levels. So again, the EIA analysis really requires a seasoned impact only when the production gets significantly larger, and you see that in terms of the spreads of the various prices.

As far as price goes, by the way, it's again worth repeating. Another EIA result of, I forget, maybe six months ago, part of the series of five that the Congress requested. And that it showed, pretty clearly, that our domestic product prices, like gasoline, are linked to the global price and not to the domestic price of say, WTI.

Senator MANCHIN. Yes, well, I thank you, sir. My time is running out.

I would just say that the State of West Virginia would be very interested in partnering up with the Department of Energy for a coal biomass to liquid with carbon capture. We think we can show it can be done. It can be a tremendous advantage for our country and put us, strategically, in a position, I think, that would make us independent, very much independent of foreign oil.

Secretary MONIZ. I'm happy to follow that up with you, Senator Manchin.

Senator MANCHIN. Thank you, sir.

Secretary MONIZ. Yup.

The CHAIRMAN. Let us go to Senator Cassidy.

Senator CASSIDY. Mr. Secretary, I want to point out that we could do a lot for train congestion moving crops to market by building the Keystone XL pipeline as the State Department reports said would save workers lives and lower carbon footprint. I do not know why we don't, but nonetheless, it is a political decision.

You, in your testimony, repeatedly referred to the relative sea level rise in the Central part of the Gulf Coast which is Louisiana. I emphasize "the relative" because it is subsidence, as you point out in your testimony, much more so than it is rising sea levels.

So just to put it on record, will you agree that we should take whatever steps we can to make Louisiana's coast line more resilient so that as these LNG export facilities are being built they are not going to get wiped out, as you mention on page 13, or the refinery capacity, you spoke of going down after Hurricanes Rita and Katrina, were preserved even in the setting of another storm? Is that a fair statement?

Secretary MONIZ. Absolutely. The Gulf is, obviously, as you well know, absolutely a critical energy hub for the whole country. And the coastline issues, the storm surge issues, are very, very important for the Gulf and therefore, I think, for the country's energy system.

Senator CASSIDY. Thank you for saying that.

I will point out that both Senator Cantwell's energy statement as well as the Department of Interior's would take the money that Louisiana is slated to receive under the GOMESA program which by our state's constitution has to be used for coastal restoration and redirects it elsewhere. If you will, it removes the very resources needed to increase that resilience that you, several times in your testimony, point the national importance thereof.

So thank you. I did not mean to set you up on that, but it just so flows. [Laughter.]

Secretary MONIZ. I——

Senator CASSIDY. It just so flows that it is just like I cannot understand why people concerned about sea level rise are taking resources away from Louisiana which are so critical to our nation's infrastructure.

Next, one of the things, oh, by the way, this is also in the EIA report. It also points out that there have been spreads as much as $20 in the relatively recent past between Brent and WTI. Now, as we know, Louisiana Light Sweet typically sells at a premium relative to Brent and so the report, just to point out, when you say significantly it is not astronomic. It goes up to 13.5 million barrels per day by 2025 which would actually be a reasonable increase. We certainly have the capability to do that, and it does point out that if we did so and we exported oil, gasoline prices would fall for the American consumer. So we have to point out that if we lift the export ban, gasoline prices fall. I am not sure, but that might have been a little bit lost. You did not intend to obfuscate that, but it may have been a little lost in what you were saying. So——

Secretary MONIZ. If I may comment, Senator Cassidy? I do want to emphasize again, the 13 and a half million barrels a day production was in the high resource case, not in the reference case.

Senator CASSIDY. Correct.

Secretary MONIZ. So and the high resource case without a low price is the one where one got a significant, about a 400,000 barrel a day impact, as I recall.

Senator CASSIDY. Yes, but also it pointed out that——

Secretary MONIZ. In that high case.

Senator CASSIDY. I think it is the Aspen Institute, but it was echoed by Larry Summers who said that if we allow oil exports we could increase the American GDP by as much as 1 percent by 2020 resulting in hundreds of thousands of jobs. Those are the blue collar workers who are independent of the decreased price of gasoline. I will point that out again, the Aspen Institute, Larry Summers, both touting that we could increase GDP by 1 percent and that would be really good for the average American family right now.

Granted it might not happen just because of market conditions, but if it does occur we increase GDP, we lower gasoline prices, and we create more American jobs. Again, it just seems like something we should be doing.

Let me ask one more thing, and this is purely out of curiosity. Chris Smith, I think it was, testified to Energy and Commerce last April. He made a statement which I do not quite follow. He says, "the impacts of overall supply disruption of global oil markets would have the same effect on domestic petroleum product prices regardless of U.S. import levels or whether or not U.S. refineries import crude oil from disrupted countries."

Now I am all for the SPR but I have to admit I read that in preparation for this hearing and I was thinking what is the purpose of the SPR if there is no lessening of the impact upon us? Do you follow what I am saying? I can show you the quote. It is from Chris Smith's testimony and, for everybody else's reference, he is the Assistant Secretary.

Secretary MONIZ. Yes.

Senator CASSIDY. I know you know. [Laughter.]

Secretary MONIZ. I would have to discuss his quote with Chris Smith. But let me just say that, again, the issue of a SPR use in the current market could be very important even in some scenarios of major disruptions where the disruption is not to our direct imports. It's actually——

Senator CASSIDY. I get that. It is global.

Secretary MONIZ. That actually we'd have to have incremental barrels from the SPR get in there to back out some of those imports so that the global market can be rebalanced.

Senator CASSIDY. Well, I told——

Secretary MONIZ. So I'm not sure if that's what he was discussing or not.

Senator CASSIDY. It just seemed like kind of counter to the whole thing, but looking at this quote and if you can get back to us.

Secretary MONIZ. Okay.

Senator CASSIDY. Thank you all.

Secretary MONIZ. Certainly.

Senator CASSIDY. I yield back.

The CHAIRMAN. Senator Stabenow?

Senator STABENOW. Well thank you, Madam Chair.

First, thank you for holding this hearing. I could not agree with you more in your comments, as well as our Ranking Member, about the fact that the SPR should be kept for energy security and infrastructure investments and the idea of doing one offs for some other bill makes absolutely no sense. So thank you very much for holding the hearing.

Let me also say that I think this really is a long game. I think we would all agree with the fact that when we look at energy security it is about the long game. Whether it is the Strategic Petroleum Reserve or frankly if it is how we expedite LNG exports or ending restrictions on U.S. exports of crude oil, these really are all the long game for us in terms of our country and where we go.

I just have one comment and I do not know, Mr. Secretary, if you would want to respond to this. But it seems interesting to me that we are talking about selling off reserves right now when prices are so low. It seems like, from a purely financial standpoint, a taxpayer dollars standpoint, that we would want to be selling off reserves when prices are high not when they are low. It seems like even from a financial standpoint this does not make any sense. I do not know if you have analyzed it from that standpoint but——

Secretary MONIZ. Well I would just observe that with the 2014 test sale, I would say we sold high and we bought low. [Laughter.]

Senator STABENOW. Yes, my point, Okay.

Let me ask something slightly different on energy security, but a very, very important piece of this as we look at all of our infrastructure, and that is something that has impacted Michigan very directly. The safety of our pipelines and particularly in the area of oil pipelines we have had, as you know, a devastating pipeline break back in 2010, the largest domestic cleanup, $1.2 billion to clean up the Kalamazoo River. It was just a disaster.

Now we have a situation where we are very, very concerned, people all over Michigan, the state is concerned, about a 62-year old pipeline that runs under the Mackinac Straits that connects Lake Michigan and Lake Huron that if, in fact there was a break, would devastate the Great Lakes, 20 percent of the world's fresh water. There have been a number of different models that have been done of what this would mean, but it is devastating.

Senator Peters and I introduced legislation to address the safety concerns around the pipelines that run throughout the Great Lakes both under the water as well as along the water line, and I understand that accelerating natural gas pipeline replacements is one of the 60 actions of the Quadrennial Energy Review recommendations as it relates to enhancing energy infrastructure. I know that PHMSA has direct safety oversight as it relates to oil pipelines, but is there an opportunity for the Department of Energy to help modernize as well as improve the safety of oil pipelines because it is going to serve no one if we have these pipelines breaking whether it is from a safety standpoint, environmental standpoint or from an energy security standpoint?

Secretary MONIZ. Well Senator Stabenow, I think you've obviously raised a critical question in terms of the aging of a lot of our energy infrastructure, gas pipes, oil pipes in this case, etcetera. So

I personally think that we need a national commitment to really upgrade our infrastructure and while doing it also make it much more resilient to the kinds of risks that we are seeing.

Now as far as DOE and the specific area, as you said, PHMSA has the responsibility and Secretary Fox is certainly very concerned about this. We do work with PHMSA in providing, essentially, technical assistance. So our laboratories, for example, work with them on that. We don't have the regulatory authority but we do provide technical assistance.

Senator STABENOW. I would just say, Madam Chair, that as we look at infrastructure, I would hope, as we are talking about upgrading pipelines and so on, that we include safety, even though it has a broader jurisdiction across other agencies. The whole question of what is happening in terms of the lines, obviously, has very broad implications and again is something that we are deeply concerned about given what happened back in 2010. In 2010 in Michigan we saw the devastation, and we want to make sure our pipelines are working and that they are safe.

Thank you.

The CHAIRMAN. Thank you, Senator Stabenow.

Senator Portman?

Senator PORTMAN. Thank you, Madam Chair. Thanks for holding the hearing today on SPR. Dr. Moniz, thanks for appearing before us and for our conversation last night.

We have talked a lot today about SPR in relation to energy security and national security. I want to talk to you about another energy and national security issue, and that is having a domestic source of enriched uranium.

You have said consistently when you dab a domestic source for our nuclear navy, for our nuclear arsenal, particularly the production of tritium which comes from lowly enriched uranium, also for our commercial power plants and of course, for our efforts at nonproliferation around the world to be able to offer a source. I am very concerned, as you know, about the fact that we seem to be pulling the plug on our ability to have that enrichment capability.

I am also concerned about the cleanup at the Piketonsite. I was very concerned when warn notices were given to about 500 employees at the Piketon plant. We also have about 236 employees who are with the new technology, the American Centrifuge project, who were affected by those warn notices. They could have been laid off by the end of this month.

When I was at Piketon about 10 days ago I got a chance to speak to employees there. They are frustrated. They are angry, understandably, and so am I, particularly by the total surprise on the American Centrifuge announcement with regard to the new technology.

For 3 years now we have been requesting two things from the Administration, two very simple things. One, tell us how much you need to complete the funding consistent with the commitments that you all have made. Second, give us a plan, a long term plan, for the funding of the cleanup. Unfortunately the Department of Energy has done neither.

In 2008 candidate Obama made specific commitments to support the plant and cleanup the site quickly. He talked about the fact

when it goes long you increase the costs. It has undue environmental risk, as he said. I totally agree with him.

In 2009 DOE made a Secretarial commitment to the community to accelerate the cleanup and complete the work by 2024. That was a Secretarial commitment made to us. The DOE press release at the time said the agency was accelerating the cleanup, among other things, in an effort to jump start the local economy and create jobs. The community is now being told that the cleanup will not be completed until 2044 at the earliest. They are saying between 2044 and 2050.

The Federal Government has a responsibility, obviously, and a commitment to clean up this site. It has got to be cleaned up so that the site can be redeveloped, and it has to be cleaned up for the safety of the community. As the President said in his comments and, of course, it has to do so to be sure we would make and keep the commitment to the work force and the local economy which is already troubled.

Last week Congress passed a spending bill, as you know, which funded the government until December 11th, 2015. A number of us worked on this, and we got language in that bill that includes additional funding authority for the cleanup and for the American Centrifuge plant for the layoff, to keep the layoffs from happening while the CR continues in operation.

If you could give me a yes or no answer on these questions I would appreciate it. First, does DOE intend to use the funding authority we have in the CR to spend at the FY'15 levels for the D and D work done at the gaseous diffusion plant to prevent the involuntary layoffs from happening on the cleanup side?

Secretary MONIZ. As we discussed we are getting close to finalizing a plan where we think we can accomplish the avoidance of involuntary layoffs on the D and D work, hopefully for the entire fiscal year, but it does depend upon our receiving the House mark.

Senator PORTMAN. I am talking about the CR. Are you saying that between now and December 11th there will not be layoffs?

Secretary MONIZ. Well, so the plan that we're finalizing is to, yes, avoid involuntary layoffs during the CR. It entails risk for the rest of the year to——

Senator PORTMAN. I am going to get to the rest of the year.

Secretary MONIZ. Oh, okay.

Senator PORTMAN. I need a commitment to just yes or no on using the authority we have given you in the CR.

Secretary MONIZ. Again, we're finalizing the plan. We're getting very close. That is what I am——

Senator PORTMAN. Dr. Moniz, you cannot even give us a commitment that there will not be layoffs between now and December 11th?

Secretary MONIZ. I feel very confident that we will get there. I need a little more time to finish the plan and notify the contractor, but that's what we are working toward, no involuntary layoffs during the CR for the D and D work.

Senator PORTMAN. Well that is a surprise, because I thought we had a commitment from you all during the CR at least not to have any layoffs. We have been given the authority. We worked hard to get this language in there.

Secretary MONIZ. The issue, again, the issue is one of risk. And that's why we want to be very open with you, as I was last night, that if we make——

Senator PORTMAN. Last night you were talking about next steps which is after December 11th. You were not talking about the CR.

Secretary MONIZ. No, they are linked.

Senator PORTMAN. I am concerned about this.

Secretary MONIZ. They are linked and——

Senator PORTMAN. Well, obviously we would like to see——

Secretary MONIZ. We are——

Senator PORTMAN. I was going to ask you about the commitment after that, and I appreciate your interest in suggesting last night that you would, indeed, be willing to put an anomaly.

Secretary MONIZ. Yes, we are——

Senator PORTMAN. For the——

Secretary MONIZ. All I am going to say, Senator, again, we are finalizing the plan that will not have involuntary layoffs in D and D through the CR with the idea that that will continue for the rest of the year if we get the House mark. That's the situation.

Senator PORTMAN. Well, that is of course what we all hope for.

Secretary MONIZ. Right.

Senator PORTMAN. And beyond that we need to have that commitment that in your budget for next year which you are already preparing which is going to be here in the House and Senate right after the first of the year that you will have adequate funding in there. Last year you underfunded it by about $80 million.

Can you give us a commitment that you will have in the President's budget for the next fiscal year, Fiscal Year 1917, adequate funding for cleanup?

Secretary MONIZ. Well I cannot discuss the FY'17 budget at this stage. That is clear.

We are trying to get adequate funding for all of our cleanup activities, and right now it's hard to fit everything into the budget box.

Senator PORTMAN. Your cleanup request in this last Fiscal Year was $80 million less than what was appropriated by Congress in FY'15. Again, we are talking about extending the cleanup even further, more and more layoffs, if you all do not put in your budget the funding that you have committed to over time, not just the President, but the Secretarial commitment. We are talking about just keeping the funding at least level so there is some certainty and predictability at the site. I do not think that is too much to ask.

Secretary MONIZ. I have every intention, hope, to do exactly that but I cannot discuss the FY'17 budget until we've gone through all the tradeoffs and working with, as you know very well, with OMB on this.

Senator PORTMAN. So with regard to the cleanup itself we cannot even get a commitment on the CR. That concerns me a lot. But a commitment for you to try to work with us on both the CR and beyond the CR with regard to having an anomaly in the longer term budget whether it is an omnibus or a CR or some combination.

With regard to the new technology, the American Centrifuge project, again, I was surprised, as were the workers at the site, to

learn that you were planning to pull the plug on the new technology. This is the only domestic source. You have testified before this Committee in the past that we need to have a domestic source of enriched uranium to support our nuclear weapons program and our nuclear naval reactor program. Have you changed your mind on that?

Secretary MONIZ. Absolutely not. And we are not pulling the plug on this technology. The program continues. The issue is that for the last two years operating the pilot facility without spinning the pilot machines we have learned things of an operational nature. We were able to resolve a technical issue with the machines.

But two things led to that and I have to say, unfortunately, I completely agree for the site a decision namely No. 1 is that scrubbing really hard on the need for enriched uranium using American origin technology we were able to extend the timeframe for that very, very dramatically. Something I'm happy to come and discuss with you in the days ahead. Secondly, the technical judgment made is that continuing to spin the machines will not give us any more technical knowledge on the technology that we will preserve. We are not pulling the plug, but right now it's hard to justify to taxpayer's $50 million for something that we think will have little to no technical return.

Senator PORTMAN. Mr. Secretary, my time is up.

Just quickly let me make this point very clearly. There are 120 centrifuges spinning. This is a test site, as you say. Its application, it can go to commercial grade because of that.

You are pulling the plug on that entirely and $6 billion of taxpayer funding into that. To have to reconstruct that it is going to be enormously costly. You said you would only do it after issuing a report that was due to Congress in April. You never gave us the report.

I received the report last night, last night, after you had already made your decision two weeks ago without informing us. We had to hear about it from the press. I think those 326 workers deserve to know what is going on, but also our country deserves what is going on.

We are not going to have the ability to say that we can enrich uranium in this country with a domestic source. I think that is frightening. I think it is bad for our national and economic security and energy security and certainly consistent with what we talked about in the SPR today.

Thank you, Madam Chair.

The CHAIRMAN. Let's go to Senator Franken.

These are important questions to the Secretary, and I appreciate that but I will remind colleagues we do have a second panel as well.

Senator Franken?

Senator FRANKEN. Thank you, Madam Chair.

Thank you, Mr. Secretary for all your service.

As you note in your testimony a continued need for the Strategic Petroleum Reserve partially stems from continued reliance on oil for transportation. This suggests that energy security can also come from diversifying our transportation fuels portfolio and improving vehicle efficiency. I believe that the best way to protect our

economy from oil supply shocks may be to reduce the need for that oil in the first place.

Can you talk more about the advantages of alternative fuel sources as they relate to energy security? Wouldn't an abundant source of alternative fuels lower the likelihood that we would have to draw down from the Strategic Petroleum Reserve?

Secretary MONIZ. Senator Franken, yes, in fact the G7 plus EU energy security principles that were updated in 2014 reflected exactly the point that you made that efficiency and alternatives are part of energy security.

So what we are doing to continue to focus on reducing oil dependence is three fold. One, both regulation and substantial technology development for much more efficient vehicles, automobiles all the way up to Class A trucks. Secondly, the development of advanced alternative fuels and particularly liquid fuels, biofuels. Third, electrification of transportation as three thrusts that can lower our oil dependence.

Senator FRANKEN. Well, speaking of biofuels, one of the key motivations for the RFS, the renewable fuel standards, is to diversify our transportation fuel supply so we are not dependent on imported oil.

There is a bill that has been proposed in the Senate that really targets ethanol. Ethanol is something that increases the octane of gasoline in the mix that helps us replace lead and it is something that is required.

Do you think that maintaining the RFS target line with the Energy Independence and Security Act of 2007 helps reduce U.S. reliance on international oil?

Secretary MONIZ. Well I'm not going to get into the issue of those kinds of standards which, of course, the EPA has responsibility. But what we will——

Senator FRANKEN. Oh, come on. [Laughter.]

Secretary MONIZ. What we will continue to do, however, is to develop the technologies for advanced biofuels.

Senator FRANKEN. And look at——

Secretary MONIZ. And clearly ethanol today is 10 percent of our gasoline.

Senator FRANKEN. I am conscious of time so I want to make sure I get in under the five.

What I took from your testimony was basically not so fast on the SPR. Basically that oil is low now, but what you are saying is these markets change and there is a reason to have this there to prevent shocks and that part of that might be, we do not export oil now, but we export oil products. That if there is a spike around the world, we cannot let it hurt the global economy. That we fall victim to shocks, even though we are now because of the oil and gas revolution here, fracking etcetera, we are in pretty good shape but that we need this in order to make sure that we are able to respond to global shocks and that we are able to help our global partners so that their economies are strong. That is why we need to keep the infrastructure and respond to the different—I am summarizing your testimony.

Secretary MONIZ. Mm-hmm.

Senator FRANKEN. I want to thank you for that, and I want to urge my colleagues to read that very thoroughly.

Thank you.

Secretary MONIZ. If I may, just to add a little color to it. In fact, if you go back——

Senator FRANKEN. I am sorry about my colorless description. [Laughter.]

Secretary MONIZ. Sorry?

Oh, no, no. [Laughter.]

Secretary MONIZ. Well that is because you were reading my testimony. [Laughter.]

Secretary MONIZ. But actually there's an interesting event if you look back to 2000, the Fall of 2000, August/September time period. That's when Britain was having the trucker's strikes and slow downs. They were exporting a million barrels a day of net exporters. It did not protect them from global price spike which led to all those problems. And then it turned out somewhat, well, not by accident, that perhaps simultaneously we used the SPR, not for a sale, but for a swap, a time swap. And that, let's just say it took a lot of froth out of the market.

Senator FRANKEN. Could you add that color next time to your written testimony? [Laughter.]

Secretary MONIZ. Okay, or I could send you and make like, do notes.

Senator FRANKEN. No, I am not that particular color.

Secretary MONIZ. Oh.

Senator FRANKEN. I am just saying that——

Secretary MONIZ. Oh.

Senator FRANKEN. In your written testimony that it be more interesting.

Secretary MONIZ. Okay, alright. I will. [Laughter.]

Senator FRANKEN. I mean it is interesting but in a——

Secretary MONIZ. I'm not sure my colleagues would appreciate that. [Laughter.]

The CHAIRMAN. Senator Daines?

Senator DAINES. Thank you, Madam Chair.

Speaking of color, going back to, and this is for Senator Franken as well, 1973 with the oil embargo and then the 1975 ban on oil exports. Senator Franken in 1975 was a new writer for a brand new show called Saturday Night Live—in 1975 when the oil export ban was put in place. I was looking at the stats. Senator Murphy would have been two years old. Senator Gardner was a year old, and Tom Cotton was not yet born. [Laughter.]

In 1975, 40 years ago and to think about that, I mean, it was ABBA, it was Captain and Tennille, it was the Eagles, and I was in seventh grade. But it was a response to an acute crisis that we had, certainly. I remember it with what happened there with the oil embargo.

Secretary MONIZ. Gas lines.

Senator DAINES. Now as we go back we fast forward here, and I think, Secretary Moniz, you are a brilliant man. You are a forward thinker.

I am still somewhat surprised that we have a policy in place that is 40 years old that served a purpose 40 years ago but argue is ir-

relevant today as we move from a scarcity environment to one of abundance. Now the United States is the largest producer of oil and liquids in the world, surpassing both Russia and Saudi Arabia.

My question is now that it looks as if the ban on Iranian oil exports will be lifted, what countries in the world have a ban on oil exports?

Secretary MONIZ. I don't know the full answer to that question. Obviously in the United States, we have partial, a partial ban.

Senator DAINES. I want to make sure I have my facts right, but I do not know of another country that has a ban on oil exports now that we are going to be lifting the ban on Iranian exports with——

Secretary MONIZ. I just don't know that.

Senator DAINES. Right. So why? Why should we have this ban in place? Why should the United States be the only country in the world with a ban on most oil exports when we export coal, natural gas, gasoline? Why not export oil?

Secretary MONIZ. Well again, we are, as you just inferred, we are major exporters of oil products. So we refine the product——

Senator DAINES. But why have the ban on oil?

Secretary MONIZ. So again, the, look, again, as I said earlier, that's obviously a policy decision in the Department of Commerce. But I go back to the fact that the EIA analysis certainly shows, certainly in anything like today's and projected markets, rather small impact of whether that's in place or not.

Senator DAINES. But does it make sense? You think about all the countries in the world and now the United States is the leading producer of oil and liquids, No. 1 in the world, and we have a ban on exports because of a law passed by Congress 40 years ago. Why does that make sense?

Secretary MONIZ. Well, I mean, of course, again, just to repeat. We are also a seven million barrel a day importer of oil. So we are a huge importer of oil. That's just a fact. So I think what it still——

Senator DAINES. But Senator Barrasso got back to you though, you know, the forces driving that certainly is the way of refining capacity is laid out in terms of the heavy verses light.

But I am looking forward to continuing to work with the Chair here as well as having a good, vigorous debate on lifting this ban, allowing the forces here. The jobs that will be created, the tax revenues created and importantly the topic of this hearing is back on energy security and the importance thereof, that I hope we move forward and remove that ban.

Secretary MONIZ. Well, it's the law.

Senator DAINES. It is and this is the body that makes the laws and can change the law. I hope we can get the White House to work with us to remove that ban. I think it will be tremendous for our national security, global security as well as for economy.

We have one drilling rig right now operating in Montana. The Bakken carries over from North Dakota into Montana. We have one drilling rig currently operating in Montana. I recognize you have the ups and downs in prices, but I think we have a tremendous possibility.

Secretary MONIZ. But again, Senator, I think the current global market is one that does not look, it does not seem to be, in a reality, looking for that oil. That's just a fact. In fact if you——

Senator DAINES. But why not allow the forces of the free market? Why would we, unilaterally, be the only country in the world to ban oil exports? Now that Iran's ban is lifted why would we be the only country to have an oil export ban?

Secretary MONIZ. I look forward to your answer. [Laughter.]

Senator DAINES. I do not have a good answer. I am looking forward to your answer, those who oppose lifting the ban.

I am out of time, Madam Chair. Thank you.

The CHAIRMAN. Thank you, Senator Daines.

We keep trying to get an answer here about when the Administration is going to support us in removing this outdated ban. We will keep working on it.

Senator Warren?

Senator WARREN. Thank you, Madam Chair.

Thank you, Mr. Secretary, for being here.

I want to ask about Strategic Petroleum Reserve. I understand that under certain circumstances drawing down our emergency oil reserves could make good financial sense, could make good strategic sense. We should have a conversation about how large the Strategic Petroleum Reserve needs to be on a going forward basis.

There have been recent congressional proposals to sell off a large amount of this emergency supply of oil. I want to focus on just two features of these bills that have been proposed. They are not there because anyone has made the case that we need a smaller reserve nor is there a proposal to sell it off because anyone thinks this is a great time to sell.

Nope, the reason for the proposed sales of the emergency oil supply is to fund the government. In fact, the bills would set the quantities of oil to be sold years in advance with no flexibility at all. If oil prices are low they could drop to $1 a barrel and under these provisions you would still have to sell them or if there were good policy reasons not to sell like we have emergency needs to hold on to the reserve.

Secretary Moniz, is this approach an efficient way to manage the Strategic Petroleum Reserve?

Secretary MONIZ. Well again, I think it's key that I think we are doing an unprecedented, integrated, strategic study of this to be ready in May and that this Committee has certainly encouraged that. So I think, obviously, one would like to have the results of that analysis before moving forward.

I might say there are even other factors that have not yet been discussed. For example, there are special authorities to be able to use 30 million barrels of the reserve only if one has a base of at least 500. So there are a whole variety of issues.

As I mentioned earlier, our international obligations are not based only on imports, they are also based on use and so because of our responsibilities in the show down, in a draw down. So I think, clearly, I think our analysis will greatly inform, I think, this discussion.

Senator WARREN. Well, thank you, Mr. Secretary.

I just want to be clear about what is happening with these current proposals mandating a massive, inefficient and inflexible sell off of the Strategic Petroleum Reserve years in advance is just one more bad idea for how to finance government. Look around. Oil prices are at strategic lows. This is a high cost gimmick to let some people avoid facing the fact that loopholes for billionaires and giant corporations are leaving us with too little money to keep our highways in working order and to fund essential services like medical research.

It is time to act like grownups and figure out how we are going to pay for the critical investments that will help build a future for everyone. We will never get there if we do not get serious about making sure that everyone in this country, even billionaires, even big and powerful corporations, that everyone is pulling their weight. Selling off our Strategic Petroleum Reserve is just not a way to do that.

Thank you, Madam Chair.

The CHAIRMAN. Senator Capito?

Senator CAPITO. Thank you, Madam Chair.

Thank you, Mr. Secretary.

Mr. Secretary, during the 2014 test sale a number of infrastructure concerns were brought to light. You said repeatedly today and then throughout your testimony the woeful situation in terms of our infrastructure in moving the product whether it would be pipeline capacity because of the geographic shifts in our oil markets, the dock availability, you talked about the rail as well. Well I share your concern here, and it has been estimated that $1.5 to $2 billion would be needed to increase distribution capacity.

Here is my concern. All of our states, I am certain, certainly my state of West Virginia, have a lot of coal as we have talked about with Senator Manchin. We also have a lot of natural gas. Trying to site pipelines through residential, national forests, certainly throughout all of our states is getting more and more difficult.

So if the need is as big as $1.5 to $2 billion, what kind of leadership can we expect from the Administration? It was already mentioned that the Keystone Pipeline was vetoed. What kind of leadership can we expect from the Administration to help meet this challenge of not just making sure existing pipelines are safe, but creating and building those new pipelines that we know we are going to need?

Secretary MONIZ. Thank you, Senator.

If I may just clarify two things. One is just the distribution requirements of the petroleum reserve, particularly the Maritime requirements are about a billion or 1.2 of that total, not——

Senator CAPITO. Oh.

Secretary MONIZ. Because 800, roughly speaking 800 million, we think, is what we need for the life extension and then 1.2 would be for the Maritime distribution.

Senator CAPITO. So when you say life extension of existing pipelines?

Secretary MONIZ. No, no, no. So this is up in the petroleum reserve so——

Senator CAPITO. Okay.

Secretary MONIZ. So it's basically, it's just old. [Laughter.]

Senator CAPITO. Right, I get that.

Secretary MONIZ. And we need to extend its life for another——

Senator CAPITO. So this estimate does not really even include creation and modernizing the infrastructure?

Secretary MONIZ. Pipeline distribution, no, it does not. So it's——

Senator CAPITO. So what would your estimate on that be? I mean, we heard Senator Stabenow talk about safety issues.

Secretary MONIZ. I really don't have an answer to that. I can give you an answer to a slightly different question but to give you an idea of scale in the QER we estimate that the modernization, the replacement, the upgrading of natural gas distribution pipes which are mainly in urban areas, that's in the hundreds of billions of dollars. So that's the scale of that——

Senator CAPITO. So we have the same problem with——

Secretary MONIZ. So we have a huge infrastructure issue. We heard from Senator Stabenow about the pipe protecting the Great Lakes, etcetera. I don't know how to pay for it, but I think we need to have an enormous infrastructure renewal program.

Senator CAPITO. I would agree with that. I think my question sort of goes to another issue of this we have to have a leader here who is going to lead the way through this very difficult permitting issue that we are seeing all across the country, whether it is, kind of, dragging your heels and not meeting deadlines, bringing up road blocks when permitting is almost at the end. Well we have a real problem here with this, not to mention the money.

Even if you had the money in the best of the world, we are still not able to move a lot of these projects forward and that is very frustrating, I think.

Secretary MONIZ. I might add, just to add to what you're saying, it's not only pipelines, but it's also high voltage transmission lines.

Senator CAPITO. Right.

Secretary MONIZ. Have challenges.

Senator CAPITO. Windmills. Yes?

Secretary MONIZ. Including to bring distant wind.

Senator CAPITO. Right.

Secretary MONIZ. To market, so——

Senator CAPITO. I am talking about just siting a windmill.

Secretary MONIZ. So one thing that—oh, I see, but I'm in but then you have to do that.

Senator CAPITO. It is different.

Secretary MONIZ. You have to be able to move it.

Senator CAPITO. Right.

Secretary MONIZ. And so, well, I think one thing that we did and maybe I take some comfort in that I think the Quadrennial Energy Review that we did, I think, is in fact, helping get a discussion going, at least, of this. And that's something that we want to continue.

Senator CAPITO. Thank you.

Secretary MONIZ. Yes.

Senator CAPITO. Thank you, Madam Chair.

The CHAIRMAN. Thank you, Senator Capito.

Senator Risch?

Senator RISCH. Mr. Secretary, thank you for coming today.

To go off topic, just slightly, I am sure you have on your calendar, October 21st which is——

Secretary MONIZ. I do have October 21st on my calendar

Senator RISCH. Well, actually more than just the date itself. As you know I appreciate your warm affinity for the labs. Senator Durbin and I, as you know, are co-chairmen of the National Lab Caucus and we are going to host that event right here in this building, the historic Dirksen building on October 21st. Last year on our inaugural event you blessed us with your presence, and I hope you will do likewise again this year.

Secretary MONIZ. Oh that is certainly my intention.

Senator RISCH. We appreciate that.

Secretary MONIZ. And in fact——

Senator RISCH. It is a great, great time to show off the labs. It amazes me, the lack of understanding that most members have of the labs, what they do, how many there are and the important role they play in advancement of certain things that the private sector cannot advance. I will be looking forward to seeing you there and showing off the Idaho National Laboratory again.

Secretary MONIZ. Absolutely.

As you know the theme will be on national security this time. Maybe I will note another October 21st invitation. In the morning, preceding lab day, we will also have an event that will celebrate 20 years of science/space stockpile stewardship which has been an enormous success not only in certifying reliability of our stockpile, but in literally, inventing new science and technology to accomplish the job. So I'm always happy to advertise for the labs.

Senator RISCH. I am looking forward to it.

On topic could you talk for just a minute about, from a 30,000 foot level, how our new found ability to produce petroleum through fracking and otherwise plays into the SPR? Obviously that is very old, our strategic reserve philosophy and facilities, but since then we have become a lot better producers, if you would, than what we had before. So how does that dovetail together? What does that speak to?

Secretary MONIZ. Well I would say there are two distinct issues. One is let's say at the operational sense. In the operational sense things like the Bakken, for example and more Canadian imports have really changed and Eagle Ford and Permian Basin going to the Gulf, etcetera. A lot of pipeline reversals, a lot of flow going North to South whereas historically it was South to North, that plus the sheer volume, increase in volume, leading to Gulf of Mexico Maritime congestion. Those are the issues that, in fact, have led us to say that we should really update the distribution capacity of the SPR. So that's one effect.

The second, very different kind of effect, is obviously the impact in terms of U.S. and global markets. Again, even though we are still major importers, we import a lot less than we were, especially net with products.

So now we are part of this global market which again, is a market that did not exist in the 70's. It is a whole different focus away from, kind of, national supply to the issue of the global market functioning and frankly, major disruptions leading to potential eco-

nomic shocks that hurt us and the global economy. It's really those two different aspects, I would say.

Senator RISCH. Okay, it is a good description. Thank you so much.

Thank you, Madam Chairman.

The CHAIRMAN. Thank you, Senator Risch.

Senator Lee?

Senator LEE. Thank you, Madam Chair.

Thank you, Mr. Secretary, for being here today and for your service for our country.

I wanted to followup on some other questions including some of the questions that were asked by Senator Warren with regard to the SPR.

Can you tell me, first of all, do you have any idea as to when would be the optimal time to sell either all or part of our Strategic Petroleum Reserve inventory and what factors do you think Congress should consider before authorizing any effort to draw down the SPR?

Secretary MONIZ. Well, for one thing I think it's, again, this analysis, that's a rather extensive analysis, a year long analysis, that we are carrying out which Congress has asked for. Again, that will be probably in May that we'll have that analysis. So that's critical.

But then I think it's also connected to the authorities. Again, we've recommended a reexamination of the authorities appropriate to current markets. That comes in because, as I mentioned earlier, there's already in law a threshold for being able to use certain authorities in terms of likely impacts on prices. So I think it's a complicated intersection, but certainly the analysis will be a major, major, hopefully, major stimulus to our discussion.

Senator LEE. Yes, I certainly hope so. It could have major implications. For example, if we were to sell 200 million barrels next year that would generate by most estimates a little over $17 billion, $17.3 billion, I think. Whereas if we sold the same 10 years later, 200 billion barrels, it is estimated that would generate about $22 billion. So there is a $4.7 billion, almost $5 billion, delta between what that would yield next year and what it would yield 10 years from now. So I think we have to be careful about that.

Secretary MONIZ. May I just interject?

Senator LEE. Sure, sure, please do.

Secretary MONIZ. Just to say that for example, I know you just picked a number, 200 million barrels. But that's an example of something that would impact the authorities that are currently available in law in terms of this threshold. So it's a big deal.

Second, there are issues of, you know, ultimately the question we're asking is how do we configure the petroleum reserve, physically and in terms of regulations and authorities, to maximize our energy security?

Well one of the things that we discussed earlier is that we have this analysis from Oak Ridge that investing $2 billion in life extension and modernization can give us protection at the tens of billions to potentially $200 billion in one single, major, global disruption.

So I think those are the things we have to balance and see how to best use the asset.

Senator LEE. Right, we also have to balance what it is costing. Having it is not free. I think we have spent $24 billion in putting it together and maintaining it over the years. We——

Secretary MONIZ. Well, it's about $200 million a year of annual operating costs although we should add to that about $50 million for maintenance, deferred maintenance.

Senator LEE. Right, right, and if you use it only three times, relatively modest quantities, but——

Secretary MONIZ. When I buy my home fire insurance I hope to use it zero times.

Senator LEE. Sure, sure. [Laughter.]

Senator LEE. But I hope there are things we can do to find some efficiencies.

Another question I wanted to ask you, and it just relates to the fact that in order to become a member of the International Energy Agency (IEA) and it is part of that organization's agreement on international energy, the U.S. is required to hold stocks that are equivalent to no less than 90 days of net imports.

Now my understanding is that that can be satisfied either through a government held reserve like the SPR or through reserves held by industry. My understanding is also that the U.S. private industry held stocks as of June 2015 that are equivalent to 208 days of net imports. Does the industry's large petroleum reserves obviate or in any way lessen the need for the government owned, government operated, Strategic Petroleum Reserve?

Secretary MONIZ. Not in my view. Let me comment that again, I'll spend most of the time on what you asked, but again, our international obligations are twofold. One is the import metric, and the other is the oil use metric of 43 and a half percent of coordinated distribution.

Now going to the first metric, if you like, well today, if you talk about crude oil we have 99 days. But if you talk about the net crude oil end products, we have about 137 days, okay. That's just a fact. Now with regard to the—and again, I'm not saying that's the right metric, but that's—those are the facts.

Now if we go to this question of the private stocks. First of all, today, of course, those stocks are somewhat anomalously high because of the market conditions and the supply/demand questions. So those will go up and down. However, when other countries, let's say European countries, obviously, in the IEA, use their private stocks it's because they also have statutes requiring what the private sector does. We don't have that. And I'm not sure that's the place we want to go or you want to go. So that's one point.

And the second point is that, obviously, government's motivation really is the public good. And you know, there can be in some circumstances mismatches between a private sector imperative which, after all, their imperative is actually to minimize inventories consistent with their operating requirements and you know, etcetera. I mean, that's really what their job is.

So I just think there's a, certainly in the absence of the current legislative approach that I mentioned earlier, I just think that having it in the public hands to respond to a disruption that affects our entire economy is the place that we should be.

Senator LEE. Thank you, Mr. Secretary.

Thank you, Madam Chair.

The CHAIRMAN. Thank you.

Senator Hoeven?

Senator HOEVEN. Thank you, Madam Chairman.

Thank you, Mr. Secretary, for being here today.

Perhaps in a counterintuitive way isn't it very important that we allow, that we lift the oil export ban in order to reduce our dependence on the SPR based on studies performed by the Energy Information Administration, part of the Department of Energy?

Now what they indicate is that for our industry to expand and grow in this country, our energy industry, including oil and gas, it is important that we are able to compete in a global market. We are disadvantaged by the ban on oil exports. So if we want our industry, our domestic industry, to continue to expand and grow, we need to lift the ban on oil export per the studies the EIA has put forward from your agency; therefore, that would make us less dependent on the SPR.

Secretary MONIZ. I'm not—well, okay——

Senator HOEVEN. With a more robust industry——

Secretary MONIZ. Two issues.

Senator HOEVEN. We are less dependent on the SPR.

Secretary MONIZ. One is, one point I'll just make is, okay, the main point I'll make is that I don't really see that.

First of all, okay, the EIA reference case to 2025 did not have any material impact in terms of the ban. It's only in the very high resource case, stretching it and without low price, that you got some material impact of a few hundred thousand barrels a day in 2025 but not in the reference case, the expected case.

Secondly, even if we are producing, okay, a few hundred thousand barrels a day more that in no way changes our linkage to the global oil price and the exposure to a price spike. In fact, if anything, it's both the fact that we are connected to the crude oil global market and the fact that we are and, I believe, will continue to be major oil product exporters, we are exposed, just as in that anecdote I gave about Britain in 2000. We are exposed to the global oil price spike and that's really the modern issue in terms of what the SPR does for us.

Senator HOEVEN. The point being if we are allowed to compete in the global economy we will have a more robust oil and gas industry in this country than we will have if we are not allowed to compete. With a more robust industry we are less dependent on the SPR.

Secretary MONIZ. Well, again, I'm sorry, Senator Hoeven, I don't——

Senator HOEVEN. And it is not only the EIA. The other studies have shown that by lifting the oil export ban we not only expand our industry, we also create more jobs and economic activity in our country. So why wouldn't we want to do that and in fact make ourselves less dependent on the SPR by having a more robust industry?

Secretary MONIZ. I can't—the reference EIA case in the recent report does not, does not, predict a big increase in production at all. It simply does not. And again, and second, we have a very robust

industry right now. And it again, just to repeat, it does not shield us from the global oil.

Senator HOEVEN. So you would argue that even if we are not able to get the global price, the Brent crude price, and we have to compete in the global economy, you are saying, that that would not affect the size and scope of our industry?

Secretary MONIZ. Again, if exports were allowed, you know, it certainly could lead to an increase in production. All I'm saying is the EIA reference case did not show any material impact to 2025, only in the high resource case did it show that. But whatever it——

Senator HOEVEN. But it did show an impact.

Secretary MONIZ. In the very high resource case, only.

Senator HOEVEN. And with what is going on now you would not assert that that is having a deleterious effect on our industry when—our ability to compete when our competitors purposely try to put our companies out of business? You do not think that impacts industry in this country?

Secretary MONIZ. The global oil price obviously is affecting the industry in our country and everywhere else which just reinforces the point we are exposed to the global oil price.

Senator HOEVEN. Which you would acknowledge is a function of how much OPEC and our competitors produce?

Secretary MONIZ. It's what everybody produces and consumes.

Senator HOEVEN. And they may have objectives——

Secretary MONIZ. And in fact on——

Senator HOEVEN. To maintain and expand market share at our expense. Would you acknowledge that?

Secretary MONIZ. That's the market.

Senator HOEVEN. Nature of competition.

Secretary MONIZ. That's the nature of the competition.

Senator HOEVEN. Right? You would agree with that?

Secretary MONIZ. The market, absolutely.

Senator HOEVEN. Let me shift to one other question as I have limited time here.

In your Quadrennial Energy Review you talk about the importance of having the energy infrastructure we need to truly get energy security or energy independence in our country. That is one of the key points in the Quadrennial Energy Review.

So my question to you is if somebody is going to follow all the laws, follow all the regulations and invest millions of dollars and still wait seven years for a siting decision, whether somebody is trying to produce traditional energy or renewable energy, what is the message there if they cannot make the investment and rely on the laws and regulations and still have to wait for a decision for seven years—how are we going to get people, companies, to make the investment to build the energy infrastructure to make this country energy independent, energy secure?

Secretary MONIZ. Well, again, as Senator Capito said, let's face it, we do have challenges in terms of all kinds of infrastructure. And it's not only energy infrastructure, infrastructure in construction in many parts of the country. And all we can do is we keep pushing on that to go forward. Our authorities, with regard to international energy, is on LNG exports, of course, and electricity——

Senator HOEVEN. Would you invest millions of dollars in order to build either a traditional or a renewable project if you might have to wait seven years to get a decision on whether you could site the pipeline or the transmission line to move that energy to market?

Secretary MONIZ. Successful companies make decisions under risk evaluations.

Senator HOEVEN. So whether you had to wait seven years, or 10 years, even when you spend millions of dollars, comply with all the laws and regulations that that would not deter you from making an investment?

Secretary MONIZ. I didn't, I said you—one makes decisions. That's what CEOs get paid for is to make decisions under risk and understanding the situation and then——

Senator HOEVEN. But you would——

The CHAIRMAN. Gentlemen, we're going to interrupt and then wrap it up.

Senator HOEVEN. Wouldn't you favor certainty in terms of trying to get investors in companies to make the decisions to invest in energy infrastructure?

Secretary MONIZ. I think it's a fair statement that in any of the dimensions, it's good to have certainty for a long time horizon. I would especially note that for something like carbon emissions.

Senator HOEVEN. Thanks for coming to our state. I am not going to have time, but I did want to bring up that subject since you have been to our state and you understand what we are doing in CO2.

Secretary MONIZ. I do.

Senator HOEVEN. Thank you, Mr. Secretary, for being here.

Secretary MONIZ. Thank you.

The CHAIRMAN. Mr. Secretary, thank you for being here. We got off on some other issues that clearly relate to our nation's energy security when we talk about lifting the outdated oil export ban.

As we think about our emergency stockpiles here around the country I would remind the Administration and remind colleagues that up in Alaska we have our Alaska North Slope crude that is chemically similar to the oils that we have in the Strategic Petroleum Reserve. We have stored this oil there in the past, and it is a great resource. We just need more of it.

As we are thinking about these petroleum product reserves in certain parts of the country, maybe we should consider how, for instance, in Alaska we continue to supply our West Coast refineries in the event of severe supply disruptions.

There is a lot more to talk about, and we barely even scratched the surface. I really wish that we had been able to have a little greater discussion about how we make sure that, as we are responding to a SPR release, that we are making certain that we are adding to the supply and that it is an incremental gain rather than just filling in what we have moved out.

There is an awful lot more that, I think, we need to discuss on this. I think it is imperative that we get this review so we really understand, when we are talking about modernization of the Strategic Petroleum Reserve, really what that does entail. It is my hope that we will be able to defer those that would tap into the Strategic Petroleum Reserve before we have better understanding. We have got a lot of work in front of us. We have a second panel, and we

have, unfortunately, lost Committee members to other issues. We have a vote that is beginning at one, but as a courtesy to those who have scheduled their day around this, I am certainly going to be here to hear your comments and would welcome you to come to the witness table at this time.

Mr. Secretary, we thank you for being here and we look forward to continued conversations.

Secretary MONIZ. Thank you, Madam Chair. Thank you, Ranking Member Cantwell.

The CHAIRMAN. At this time we will invite the second panel to move to the table. We have Admiral Dennis Blair, former Director of National Intelligence and Commander-in-Chief, U.S. Pacific Command, and also Co-Chair of the Commission on Energy and Geopolitics for Securing America's Future Energy. We also have Mr. Kevin Book, who is the Managing Director for ClearView Energy Partners. We have Mr. Jason Bordoff, who is a Professor of Professional Practice in International and Public Affairs. He is a Founding Director for the Center on Global Energy Policy at Columbia University. Our final panel member will be Ms. Sarah Ladislaw, who is the Director and Senior Fellow for Energy and National Security Program at the Center for Strategic and International Studies.

Thank you for your patience this morning. Hopefully you have gained good insight from the questions that were posed by the Committee members to the Secretary and his responses as well. Again, thank you for your willingness to be before the Committee. I would just remind you all that your full written statement will be incorporated as part of the records and would ask that you please keep your comments to no more than 5 minutes.

Thank you and welcome, Admiral Blair.

STATEMENT OF ADMIRAL DENNIS C. BLAIR, USN (RET.), FORMER DIRECTOR OF NATIONAL INTELLIGENCE AND COMMANDER-IN-CHIEF, U.S. PACIFIC COMMAND, AND CO-CHAIR, COMMISSION ON ENERGY AND GEOPOLITICS, SECURING AMERICA'S FUTURE ENERGY

Admiral BLAIR. Thank you very much, Madam Chair, Ranking Member Cantwell. I have the feeling that everything may have been said, but it hasn't been said by everybody, so we will try to fill in those.

The CHAIRMAN. Thank you for recognizing that. [Laughter.]

Admiral BLAIR. Those lines.

As we approach this 40th anniversary of the creation of the Strategic Petroleum Reserve a lot of the landscape, energy landscape, has changed. But there are three things that are really just the same. The oil market remains volatile, American businesses and American families are vulnerable, and the SPR is really our only short term line of defense against supply interruptions. It would be foolhardy to draw down the single immediate weapon that we have to counteract oil supply disruptions and price spikes.

Madam Chairman, you emphasized that your concern was national security and that's my background. And I certainly agree. But economic security and national security are tightly intertwined.

If geopolitical actions are causing an interruption in the global supply there's great pressure for military involvement and military action. When I was the Pacific Commander my counterparts in the Central Command knew that the free flow of oil from that swing region was one of their most important concerns. However when a crisis occurs we need time. We need time to work with allies, to apply political pressure, to negotiate before we send in troops. And the SPR is essential to a smart region of national security response.

Today's low oil prices make it easy to forget that a little more than a year ago unrest in key oil producing regions was pushing already high oil prices even higher. As ISIL advanced in the summer of 2014, it sent oil prices to $115 a barrels on fears that the three million barrels of oil per day from Iraq would be knocked offline. Had ISIL disrupted the Southern Iraqi infrastructure, prices would have soared and a significant SPR increase would have been necessary to protect the U.S. economy—and that was only a year ago.

Would any responsible American leader count on continued stability and steady petroleum supplies from Venezuela, Iraq, Russia, Libya, Iran, even Saudi Arabia?

Civil unrest, the impact of reduced revenues from current low prices, product or production manipulation, all of these are very real possibilities. In this turbulent, geopolitical landscape why are we even considering reducing our only short term means of offsetting supply interruptions?

Yes, the dramatic increase in U.S. oil production has reduced our dependence on oil imports and it has contributed to a drop in global oil prices, but as the Secretary repeatedly pointed out, it's a global market. 92 percent of our transportation sector runs on petroleum, a disruption anywhere, at fixed prices everywhere at the pump for American consumers, for American businesses. The SPR protects our economy from unpredictable violent swings in a global oil market dominated by outside actors who share neither our values nor our interests, nor are they particularly fond of us.

So policymakers should take advantage of current low prices to upgrade and modernize the SPR, as you have recommended so that it will be ready to respond when disruptions inevitably occur when price increases, when prices will inevitably rise. Just having the petroleum in the salt caverns is not enough, as discussed repeatedly by Secretary Moniz. The equipment at the SPR itself needs maintenance and modernization. The flows of both crude oil and petroleum have changed over the last 40 years since the SPR was built, and without modernization the SPR could not do its job of fully and flexibly offsetting a large supply disruption. We have to be able to deliver the oil that it holds at the right place in this extremely complex, oil refining system that we have in the country.

So I would make five recommendations.

Congress should fully fund and the Department of Energy should accelerate the completion of deferred maintenance.

The Department of Energy should construct dedicated docks and loading capacity so SPR oil can be loaded on marine vessels for delivery to the market as incremental supply without displacing privately-owned oil on the market.

Congress should update release criteria to clearly allow for release of oil from the SPR in response to a supply emergency even if it does not affect domestic production or imports if, and I think this is a criteria, if the interruption is likely to affect the price of oil and therefore posing a substantial risk of severe economic consequences. I share the sentiments that you described about doing this carefully, but I think we need that flexibility when a crisis hits.

The White House and Department of Energy should complete that study that the Secretary mentioned about the appropriate size of the SPR given the changes in the energy landscape, but my guess is that when all is said and done an appropriate size will be not far from what we have today. It feels about right to me.

After reaching a consensus on the size and the guidelines for using the SPR, then the Department of Energy should initiate a long term program to update and upgrade and update that infrastructure so that it's reliable for decades to come.

In today's uncertain and dangerous political, geopolitical, environment the SPR is our most immediate defense against oil supply disruptions and price spikes. It needs to be preserved and modernized not reduced. However, it's only one part of a comprehensive energy strategy to reduce America's dependence on oil. As has been mentioned in the previous panel, we need increased efficiency. We need fuel diversity in the transportation sector, and a strong energy policy is imperative to improving our national security. I think this Committee can play a key role in forging that comprehensive national energy security policy.

Thank you.

[The prepared statement of Admiral Blair follows:]

Testimony of Admiral Dennis C. Blair, USN (Ret.)
Co-Chair, Commission on Energy and Geopolitics
U.S. Senate Committee on Energy and Natural Resources
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THE FUTURE OF THE STRATEGIC PETROLEUM RESERVE

As we approach the 40th anniversary of the creation of the Strategic Petroleum Reserve (SPR), there is no question the energy landscape has changed since its creation. But it is equally certain that three things remain the same: The oil market remains volatile, Americans remain vulnerable, and the SPR is our only short-term line of defense. Given the current state of geopolitics around the world, it is not in the United States' best interest to draw down the most immediate protection we have in the face of potential oil supply disruptions and price shocks. It is for these reasons that I believe modernizing and fixing the SPR to continue to protect us today is a national security and economic priority.

Over the long term, the United States should implement energy policies that reduce our overall dependence on oil, especially in the transportation sector in which it powers 92 percent. By improving fuel efficiency and diversifying our fuels to take advantage of sources like electricity and natural gas, we can improve our country's economic and national security by reducing our vulnerability to an often volatile, unpredictable global oil market.

THE OIL MARKET REMANS VOLITILE

The SPR was established in 1975 in response to the 1973 -74 Arab Oil Embargo. Its purpose was to diminish U.S. vulnerability to, and offer protection against, possible future oil embargoes by absorbing some (or all) of the petroleum shortfall created by a supply interruption, and by deterring an embargo through its mere existence.

Today's low oil prices make it easy to forget that little more than one year ago, geopolitical unrest in key oil producing countries was pushing already high oil prices even higher. The rapid advance of ISIL in the summer of 2014 drove oil prices to $115 per barrel on fears that more than 3 million barrels per day of Iraqi oil exports could be knocked offline. Had ISIL disrupted key southern oil infrastructure, oil prices would have soared and a significant SPR release would have been necessary to protect the U.S. economy from harm. Without modernization, it is unlikely the SPR would be able to fully offset such a large supply disruption, with economic consequences for this country. It is no coincidence that 10 of the past 11 recessions have been preceded by a sharp increase in oil prices and the SPR remains the only tool at our disposal to combat the economic harm from supply disruptions.

The dramatic increase in U.S. oil production has reduced our dependence on oil imports and contributed to the drop in global oil prices. Because the market for oil is global, however, and because 92 percent of our transportation sector is monopolized by petroleum, disruption anywhere affects oil prices everywhere, including here at home.

Additionally, the precipitous nature of the drop in oil prices – which have fallen by more than 50 percent since last summer – carries geopolitical risks, undermining the stability of key oil producing countries.

For example, Venezuela, one of the largest exporters of oil to the United States, faces a dire economic and political situation which, while self-inflicted, is significantly exacerbated by low oil prices. In Nigeria, low oil prices are hampering the ability of the new President to fight Boko Haram and maintain stability in the oil producing Niger Delta. And in Iraq, low oil prices are complicating internal oil sharing agreements and the ability of the central government to properly fund the war against ISIL. A supply disruption in any of these countries could send prices sharply higher.

In addition to counteracting unplanned supply disruptions, the SPR continues to serve as an important deterrent to hostile states manipulating the oil market. While today's oil market makes a 1970s oil embargo unlikely, countries such as Russia, the world's largest energy exporter, continue to use energy exports as a political weapon. A large SPR with a significant distribution capacity helps protect the United States and our allies from political manipulation of the oil market.

While it is unclear what oil prices will be next year, next month, or even tomorrow, it is abundantly clear from history that oil prices operate in boom-bust cycles, and it is only a matter of time until prices rise again. The SPR is the cornerstone of American energy security and a vital asset in protecting our economy from supply disruptions that could occur any time without warning. Congress should take advantage of the current period of low oil prices to fix the SPR now, so it will be ready to respond when disruptions inevitably occur and prices inevitably rise.

AMERICANS REMAIN VULNERABLE TO FOREIGN SUPPLY DISRUPTIONS

At the time of the 1973 oil embargo, the absence of an oil market and price controls in the United States contributed to a physical oil shortage that caused long lines at gasoline stations throughout the United States.

Today, we still experience that scarcity, but due to the availability of a market, it is expressed in the form of higher prices. When supply is disrupted, market participants will bid up the price of a commodity until someone is priced out of the market. In the process, consumers are forced to deal with the strain of rising prices.

In the global oil market, an oil supply disruption anywhere in the world raises prices everywhere, including for American consumers. This is true even if the U.S. does not import oil from the disrupted source, and it is true even with falling imports. U.S. oil imports fell from 13.7 million barrels per day in 2005 to 9.2 million barrels per day in 2014, yet threats to supply around the world last summer pushed U.S. gasoline prices higher. Lower oil imports today may mean that the U.S. economy as a whole is less vulnerable to oil shocks than it has been in the

past. When foreign disruptions raise oil prices, a portion of the price impact benefits producers, and, economy-wide, that may offset some of the damage from high oil prices. However, that is little comfort to American consumers that suffer at the pump, and as a whole, we remain an oil-importing country that is on average hurt by oil market disruptions and price spikes.

That prices are low today should serve as a reminder, not that oil risks are in the past, but rather that oil prices are volatile, and it is difficult to predict what will happen.

THE SPR IS OUR ONLY SHORT-TERM RESPONSE TO OIL SUPPLY DISRUPTIONS

Bringing new oil production online takes months or years. The SPR can deliver crude to market in less than two weeks, and just the knowledge that it is on the way can immediately calm market jitters. Its existence alone serves as a deterrent to those that might seek to threaten global oil supply for geopolitical gain. In the event of a significant interruption in the supply of crude oil to the global market, especially in periods with low spare production capacity, the SPR, and other nations' strategic reserves, are the only tools available to respond in the short-term.

MODERNIZING THE SPR

Given the role that the SPR plays in protecting our energy and national security, it is critical that it be available and reliable at all times. Recent changes in U.S. oil production, however, have affected the operation of the SPR. The SPR is located in the Gulf Coast, which is also home to U.S. refining and the primary point from which much of the crude oil refined in the United States is distributed—whether the oil is produced domestically or imported. Because of changing domestic production patterns, however, the Gulf Coast region is now a destination for substantial volumes of crude oil coming from different directions. Shifting production patterns are now likely to leave full oil pipelines, which would have been left with spare capacity in the past in the event of disruptions, and through which oil from the SPR would have been delivered. This evolving use of infrastructure requires a careful assessment to ensure not only that SPR oil can be delivered to market in the event of supply disruptions, but that its delivery is incremental and that it does not displace private oil.

The age of SPR facilities, some of which are approaching the end of their design life, also dictates that the Department of Energy will need to physically upgrade SPR infrastructure in the near future. Changes in the world oil market require that we reassess the purpose and size of the SPR. As explained below, the Department of Energy and Congress should address these issues quickly to ensure the SPR's availability in the event of future oil supply emergencies.

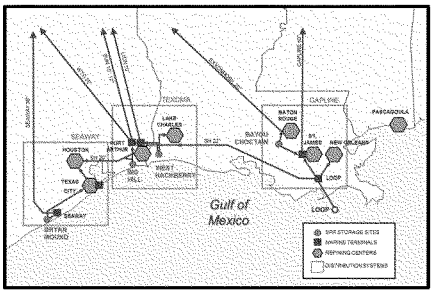
1) On-Site Maintenance: A 2014 test sale revealed the importance of maintaining critical infrastructure for use in an emergency drawdown. For example, during the test sale, the flow meter that measures the volume of oil being shipped at the Big Hill site failed, leaving the site inoperable for several days until it could be repaired. Moreover, even when it was operable, the availability of only one meter limited distribution flexibility. While there is a reluctance to

overinvest in infrastructure that is rarely, if ever, used, it remains critical that when the reserve is called on, it can function as designed.

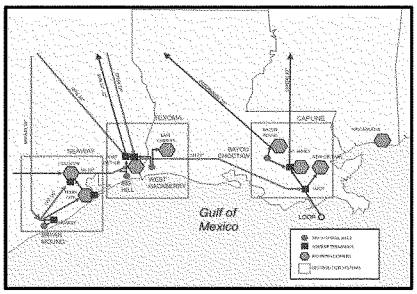
The president's FY 2016 budget included additional funding to address the backlog of deferred maintenance at the SPR. Congress should fully fund the request and the Department should accelerate completion of deferred maintenance to the extent possible.

2) Distribution in the Event of Supply Disruption: Growth in U.S. crude oil production has resulted in greater volumes of domestic crude moving into U.S. pipelines and marine terminals than in the past, often moving in different directions. As our energy landscape has changed, the Gulf Coast region has transformed from the source of much of the oil consumed in the nation to the destination of much of the oil produced in the nation. Because of these shifting patterns, a foreign supply disruption may not result in substantially less oil being delivered to the United States, and may not free up distribution capacity to move incremental barrels of SPR oil from the SPR facilities to the market. This raises the possibility that it may be difficult to use oil from the SPR to replace shortages by putting incremental barrels of crude oil on the global market in the event of a supply interruption, obviating the value of the reserve. If the SPR cannot deliver incremental barrels of oil to the market in the event of a supply emergency, it cannot mitigate the effects of a supply interruption.

SPR Distribution Systems and Major Pipelines (2011)



SPR Distribution Systems and Major Pipelines (2014)



Source: U.S. Department of Energy

It is critical that this distribution problem be addressed. Being unable to add incremental barrels of crude oil to the market in the event of a supply disruption would be akin to owing an insurance policy that does not provide any benefits. If we cannot ensure that the SPR will be able to deliver incremental barrels of oil to the market in the event of a supply emergency, there is no point in having such a reserve.

The most reliable means to assure that SPR oil can be delivered with the greatest flexibility is to build docks and loading facilities that would allow oil from the SPR to be loaded onto marine vessels in the event of a supply disruption. Marine transportation is inherently more flexible

than transport by pipeline, rail, or truck, and offers the nation the greatest assurance that SPR oil can get to market quickly when needed. In building such capacity, it is important that DOE not allow routine non-emergency use of the docks and loading infrastructure with, perhaps, contractual rights to displace private use in the event of an emergency. While using otherwise idle infrastructure to generate revenue is appealing, it could reduce the effectiveness of an SPR emergency release. Simply displacing commercial supplies with SPR supplies would not add incremental oil to the market in the event of an emergency, and for SPR oil to effectively respond to a shortage, the oil must not only be available, it must be incremental.

No matter how we address the issues of the size and use of the SPR, we cannot afford to have an emergency supply that in inaccessible when we need it the most.

3) Purpose, Size, and Life Extension: As U.S. oil imports decline, it is important that we reexamine the appropriate size of the SPR, remembering that in a global oil market, the SPR will always remain relevant. In addition to its ability to physically replace displaced oil, the mere existence of the SPR and the possibility of its use provides important value to the nation in that it deters market participants from manipulating supply in order to affect the price of oil. It is easy to imagine that without the SPR, producers might seek to use their oil as a geopolitical weapon, aware that in a world with little spare capacity and no strategic reserves, the global economy could be easily susceptible to price shocks caused by supply interruptions.

Purpose: It is important to first examine and reach agreement regarding the intended purpose of the SPR. Though the government has never clearly articulated a policy regarding its use, our past use of the SPR suggests that our policy is generally to use it when prices rise sharply in response to significant supply disruptions that affect global supply and prices, including, but not limited to physical supply interruptions that affect actual supplies of oil delivered to the United States. Two of the three emergency releases (Kuwait 1991 and Libya 2011) were in response to major international supply interruptions, while the third (Katrina 2005) was in response to a supply interruption to the United States. At the same time, the government has declined to release SPR oil at least three times in the past 15 years when supply disruptions exceeded the 1.6 million barrels per day that were taken off the market during the Libyan Civil War in 2011. Moreover, although there was already more than 3 million barrels of production off-line in 2014, when oil prices were near $115 per barrel, and there was ongoing concern about the security of Iraqi oil supplies, there was no serious discussion of using the SPR to moderate prices. The government should confirm that its policy is generally to use the SPR when prices rise sharply in response to significant supply disruptions that affect global supply and prices.

To ensure that the SPR is available to mitigate economic harm as risks arise, the government should reexamine the release criteria. In the past, we have been reluctant to use the SPR quickly because of concern that using the reserve could moderate price increases too much and undermine the price incentives to increase production elsewhere, a concern that led the first Bush administration not to release oil from the reserve in the immediate aftermath of the 1990 Iraqi invasion of Kuwait. In most instances, however, using strategic reserves promptly while reducing a release over time would give producers an opportunity to try to increase their

production in response to higher prices, while mitigating immediate economic harm from higher prices. The current criteria for a drawdown of the SPR state that the supply shortage must result in a severe increase in the price of petroleum products. Rather than waiting for the economic consequences of a price spike, the criteria should be adjusted to allow for the release of crude oil in response to supply interruptions that are likely to cause a price spike that will result in severe economic consequences.

Finally, in today's oil market, it is clear that even the disruption of supplies not affecting the physical delivery of oil to the United States can threaten our economy, because all users of crude oil are placed at risk by global price spikes, no matter the source of the interruption. This also suggests that we need to clarify the criteria for release. The governing statute currently defines a supply emergency as "a national energy supply shortage" which "is, or is likely to be, of significant scope and duration, and of an emergency nature," which "may cause major adverse impact on national safety or the national economy," and "results, or is likely to result, from (i) an interruption in the supply of imported petroleum products, (ii) an interruption in the supply of domestic petroleum products, or (iii) sabotage or an act of God." While this definition requires the interruption of either domestic supplies or imports to the United States, we should not limit the SPR's use to responding to supply disruptions that affect the delivery of oil to the United States, because our economy can be placed at risk by price spikes resulting from supply interruptions that do not affect crude oil deliveries to the United States at all. Even though language elsewhere in the statute allows a release from the SPR if "an emergency situation exists and there is a significant reduction in supply which is of significant scope and duration," the SPR should be available for use in response to any supply interruption that could cause major adverse impact on national safety or the national economy, whether it affected delivery of oil to the United States or not.

Size: The SPR was established in response to concerns about the interruption of U.S. imports in the aftermath of the 1973 embargo. The SPR also is used to meet the U.S. obligation under the International Energy Agency to maintain a petroleum stocks equal to 90 days of net petroleum imports, an obligation that other IEA members have chosen to meet by mandating the holding of private inventories in place of or in addition to public stocks. As our crude oil imports rose, SPR import cover declined below 90 days from 1993 until 2012. With the recent decline in U.S. net crude oil imports, however, the SPR is back over 90 days cover and is set to increase above that if current domestic production and efficiency trends continue.

Increased domestic production and declining U.S. imports raise questions about the optimal level of strategic reserves and the relevance of the 90 days cover requirement, a question of increased urgency given the growing pressure to sell millions of barrels of oil from the SPR to fund transportation and other priorities. As explained earlier, however, even if U.S. net imports drop to zero, the SPR would retain its utility as a national security tool to protect against global supply disruptions that could affect prices or otherwise harm our national interest or our allies. Moreover, just as domestic production has rebounded over the last few years, this positive trend could abate or even reverse in the future, pushing the United States back on a course of greater import dependence.

The White House and the Department of Energy need to quickly complete a rigorous size study to determine the appropriate size of the SPR given our changed energy landscape. Any decision to sell crude oil from the SPR for any purpose other than to fix the SPR itself in the absence of appropriated funds would be irresponsible.

Life Extension: The SPR caverns are located in salt domes that naturally shrink over time. Though they were designed with excess capacity to accommodate the "cabin creep," the shrinkage that has occurred thus far has eliminated the excess capacity initially designed into the system. Moreover, due to the age of the SPR, other infrastructure will need to be evaluated and upgraded to ensure reliability over the next several decades. Once policymakers have determined the appropriate size and configuration of the SPR, they should initiate a life-extension program for the infrastructure that will remain in use over the foreseeable future. Moreover, if there are sites or caverns that will clearly remain in use even if the SPR were to be reduced in size significantly, DOE can begin evaluating their long-term infrastructure needs immediately.

RECOMMENDATIONS

The SPR is a critical part of ensuring that there is an adequate supply of crude oil available to the U.S. economy in the event of a severe supply interruption. As it ages, and as the energy landscape changes, it is critical to ensure that the physical infrastructure and the policies that govern the use of the SPR are updated so that it can provide reliable assurance against supply interruptions. To ensure the SPR's continued reliable availability:

- Congress should fully fund and the Department of Energy should accelerate completion of deferred maintenance.
- The Department of Energy should construct dedicated docks and loading capacity to allow for the delivery of SPR oil to marine vessels in the event of a supply emergency.
- The government should clarify that it will use the SPR when prices rise sharply (or are likely to rise sharply) in response to significant supply disruptions that affect global supply and prices in the global market.
- Congress should update the release criteria to clearly allow for release of oil from the SPR in response to a supply emergency, even if it does not affect domestic production or imports into the United States, if the interruption may affect the price of oil and poses a substantial risk of severe economic consequences.
- The White House and the Department of Energy should complete a study to determine the appropriate size of the SPR given our changed energy landscape and, based on the results of the study, establish a target size for the SPR.
- *After* reaching consensus on the size of the SPR, DOE should initiate a program to update and upgrade the infrastructure as necessary to ensure its reliable operation for the next several decades.

CONCLUSION

In today's uncertain geopolitical environment, the SPR is our most immediate defense against oil supply disruptions and price spikes, and it is worthy of our protection. However, it is only one part of a comprehensive energy security strategy to reduce America's dependence on oil, including through increased efficiency and fuel diversity. A strong energy policy is imperative to improving our national security, and I urge this committee to take a strong role in forging one.

The CHAIRMAN. Thank you, Admiral Blair.

Mr. Book, welcome.

STATEMENT OF KEVIN BOOK, MANAGING DIRECTOR, CLEARVIEW ENERGY PARTNERS, LLC

Mr. BOOK. Thank you, Madam Chairman.

I appreciate the work you're doing here to look at the energy policies of the past in the context of today's fundamentals including crude oil exports and renewable fuels and the topics that have come up during the first panel, but I think there's one policy that's stood the test of time and that's the SPR. It's been an insurance policy, as you described it. It's been an asset, as you described it, and I want to make some comments about its attributes in that regard.

It seems appropriate to ask if we have the right amount of insurance, whether we're paying a fair price and whether the policy we have has the right features.

So with regard to the size of the SPR we know that the IEA obligation is for 90 days of net petroleum import cover. In June '05 the SPR had about 54 days, this June the united import cover exceeded 140. I think someone else mentioned earlier today that 41 percent of net imports this June came from Canada and only 16 percent came from Canada, a reliable supplier, in June of '05. This is good news, but it's relatively recent good news and timeframe matters.

Let me give an example from my own industry. Early last year analysts, many of them, thought oil prices would remain above $100 per barrel for years. That may seem silly now, but over the last 5 years, through August, real oil prices averaged about $100 a barrel. Of course, if you go back over the whole series of oil prices for the last 100 years, they averaged about $35 a barrel. So which perspective is correct?

It's tempting to think that the future is going to look a lot like the recent past. And in fact, it probably does look more like the recent past than the whole history. But recent oil market lessons remind us it's important to look at the longer trends.

So I did, in my testimony, a thought experiment. I'll summarize. Starting with January '85, I calculated monthly results if the nation sold crude whenever inventories got above 90 days and bought crude whenever they fell below. Now over the last 60 calendar months the average result is a win, about $1 billion of profit in real dollar terms. Over the whole time series, it's a loss of about $500 million.

So downsizing the SPR could be a losing bet and it could be for other reasons too. Today it's been mentioned OPEC producers are running flat out, so spare capacity is falling. That's not going to be there to balance the market and the demand recovery. Demand isn't likely to stay weak forever.

Spare capacity is supposed to come on within 30 days and stay on for 90. Shale hasn't worked like that, at least not yet. It didn't turn off quickly on the way down and it may not turn on quickly on the way back up because job loss, among other things, can slow it down.

Meanwhile the large SPR has other uses and can be a signal to OPEC to add supply to a tight market. In essence we can say to

them, either you can do it and you can earn the money or we'll do it and you won't earn the money.

And finally, insurance tends to be cheaper when the market perceives lower degrees of risk. If anything, as the Admiral mentioned, a period of low prices seems like it could be a better time to expand.

Now is the insurance a good deal? Well, the premium is about $200 million a year right now, $4 billion over 20. If you think about that, that's about $576 a barrel in current dollar terms.

Now what does it get you? It sounds like Oak Ridge is doing some work. The DOE is too. And you can put a lot of economists to work on that question. But I'm in the business of back of the envelope answers, so I'll give you one here today. If you take what the nation consumes through June this year on a trailing 12 month basis, 19.34 million barrels, our firm's short run, Brent model, implies that if you put a million barrels into the market today prices would drop by about $11 per barrel. That's the market today though and the market changes a lot. So I'm going to give it that kind of number a haircut, 75 percent haircut. Let's use 275. Using that number every one million barrel draw could save the nation about $53 million. Multiply it by the size of the SPR and you get about $37 billion. So $4 billion in premiums for $37 billion in coverage sounds like a pretty good deal, and I'm not using any multiplier numbers. If you were to sell it down to 90 days you could raise $12.9 billion at $50 dollars a barrel but you'd be giving up $13.7 billion in coverage by those numbers. Not sure that's a good deal.

You called it an asset, Madam Chairman, and it is an asset. It isn't usually a good idea to liquidate long-term assets for short-term financing purposes.

Another thing that doesn't work very well is buying high and selling low. I calculate nominal acquisition costs at an average of about $32 per barrel, but in real dollar terms they average about $74 per barrel. The Brent forward curve which is the monthly prices out for future delivery to the end of 2022 doesn't get above about $65 a barrel right now. So you have some questions about whether or not it's a good time to sell.

Finally in terms of the coverage we have what product should we pick for product reserve? It's not so easy. If you look at the 2013 to 2014 propane crisis, right before that crisis EIA projected that propane inventories would, I quote, "remain near the middle of the historical range during the upcoming winter." By definition surprises defy prediction even by capable agencies like the EIA.

Market forces responded, and there was no repeat of the propane crisis last year, but government emergency product stockpiles could mute price signals that inform the behaviors of market participants.

We don't know what will happen with the Northeast gasoline supply reserve. In fact, right now it has about two days of supply for New York State in the New York site and about one day of supply for Massachusetts, Maine, New Hampshire and Vermont. That's big enough to lower prices if you draw it. It's also potentially the sort of thing that if you did draw it, because drivers know it's a finite resource, they might hoard.

Finally, you could tell tankers that might be coming in to go somewhere else where the price is still higher because the reserve is there, an unintended consequence.

Looking at the New England home heating oil reserve, the inventories in PADD 1A, which is the New England part of the East Coast region the EIA tracks, fell and didn't come back up after the reserve was created even though they rose back up toward traditional five year levels in the years that followed. That's circumstantial and I wouldn't, you can't fly to the moon on that kind of statistic.

But what I would suggest is that you may have simply replaced private inventories with government inventories to no net energy security benefit, and that doesn't seem like a very good idea.

Thanks for the time to comment. I look forward to any questions.

[The prepared statement of Mr. Book follows:]

TESTIMONY OF KEVIN BOOK

MANAGING DIRECTOR
CLEARVIEW ENERGY PARTNERS, LLC

BEFORE THE
U.S. SENATE COMMITTEE
ON ENERGY AND NATURAL RESOURCES

OCTOBER 6, 2015

Chairman Murkowski, Ranking Member Cantwell and distinguished Members of this Committee, my name is Kevin Book, and I lead the research team at ClearView Energy Partners, LLC, an independent research firm that analyzes macro energy issues for institutional investors and corporate strategists. Thank you for the privilege of inviting me to contribute to your discussion regarding modernization of the Strategic Petroleum Reserve (SPR).

I am grateful for this Committee's initiative as it continuously reexamines U.S. policy to account for changing fundamentals. It is no small thing to adapt the laws and regulations of the world's largest economy to a transition from energy scarcity to adequacy and, increasingly, abundance. I appreciate the time and effort that this Committee and this Congress have devoted to revisiting the assumptions that informed earlier choices, such as the ban on crude oil exports and the 2007 expansion of the *Renewable Fuel Standard*. Resurgent production of domestic oil and gas resources may continue to provoke questions regarding some of the nation's legacy energy strategies.

That said, some decisions that date back to the *1975 Energy Policy and Conservation Act* and the legislative efforts that followed have withstood the test of time. In my view, one of those decisions is the creation of the SPR, which has durably insured our industrial economy against petroleum supply interruptions. Today, I would like to offer several observations regarding the size and composition of the Reserve.

U.S. Energy Security Has Improved

The International Energy Agency (IEA) treaty requires member countries to maintain strategic stocks equivalent to 90 days of net petroleum imports. According to Energy Information Administration (EIA) data, on a trailing, twelve-month (TTM) basis through June 2015, SPR inventories averaged 691.32 MM bbl and net petroleum imports averaged 4.81 MM bbl/d, implying approximately 143.7 days of net import "cover," or roughly 54 days in excess of treaty obligations.[1]

This fortunate circumstance is relatively recent. In June 2005, the SPR held slightly lower crude inventory levels (679.64 MM bbl on a TTM basis) and net petroleum imports were ~155% higher (12.793 MM bbl/d on a TTM basis), implying only ~54.4 days of net import cover.

Much of the difference can be linked to the well-documented growth of U.S. domestic crude production (9.23 MM bbl/d in June 2015 on a TTM basis vs. 5.43 MM bbl/d a decade earlier, a net gain of 3.8 MM bbl/d) that enabled U.S. crude to displace imported volumes. In addition, the combination of efficiency gains and structurally lower U.S. petroleum intensity of GDP appear to have reduced consumption by 1.48 MM bbl/d over the same interval (19.34 MM bbl/d on a TTM basis in June 2015 vs. 20.82 MM bbl/d a decade earlier).

Finally, a larger share of U.S. net petroleum imports now comes from a secure and reliable supplier with which our nation shares a common land border. In June 2015, according to EIA data, net imports of Canadian crude and petroleum averaged 3.15 MM bbl/d on a TTM basis, a substantial uptick from 1.99 MM bbl/d in June 2005.[2] Correspondingly, Canadian crude and petroleum made up approximately 41% of U.S. net imports on a TTM basis in June 2015, up from 16% in June 2005.

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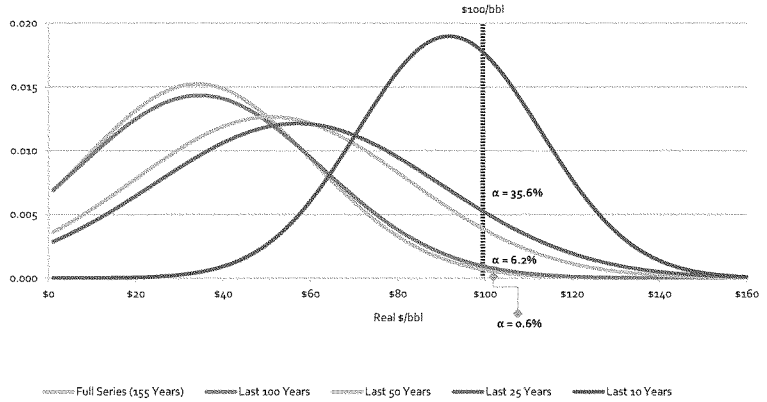
[1] For analytical purposes, our firm often uses TTM averages of macro energy data series to smooth out seasonality. For the month of June 2015, EIA data show SPR inventories of 693.89 MM bbl and 4.88 MM bbl/d of net petroleum imports, implying approximately 142 days of net import cover. Compared to a 90-day net import obligation, the difference between the raw data and the TTM average is not particularly significant.

[2] This total, which counts net petroleum exports to Canada, inadvertently diminishes the magnitude of two, remarkable dynamics in U.S.-Canada petroleum trade. On a TTM average basis, Canada exported 3.66 MM bbl/d of petroleum to the U.S. in June 2015, up from 2.14 MM bbl/d a decade earlier. U.S. petroleum exports to Canada posted an even more marked uptrend, reaching 0.51 MM bbl/d on a TTM basis in June 2015 vs. 0.15 MM bbl/d in June 2005.

Energy Security is a Long Game

From an energy security perspective, the foregoing data points offer incontrovertibly good news. At the same time, energy supply and demand tend to be "sticky," or slow to change. As a result, it may make sense to consider energy trends over longer time periods. As an example, Figure 1 presents normal distributions of real crude prices (2015 dollars) over several different intervals.

Figure 1 – Timeframe Selection Influences Analytical Perspectives Regarding "Average" Crude Oil Prices



Years in Series[1]	Mean Real Price ($/BBL)[2]	Standard Deviation ($/BBL)
155	$34.11	$26.20
100	$34.63	$27.84
50	$51.00	$31.55
25	$56.94	$32.91
20	$63.84	$33.38
15[3]	$75.62	$30.00
10	$91.77	$21.03
5[3]	$99.51	$25.19

Notes:

1. 2015 crude averages through August 2015 use data from EIA *Short Term Energy Outlook;* prior years from *BP Statistical Review of World Energy.*
2. Computed using *BP Statistical Review of World Energy*, which provides data through 2014 and inflating to 2015 dollars using CPI-U through August 2015.
3. Not pictured.

Source: ClearView Energy Partners, LLC using BP Statistical Review, EIA and St. Louis Fed data as of September 29, 2015

1H2014-vintage analyst expectations that oil prices might remain above $100/bbl for the intermediate future probably reflected some degree of statistical myopia. After all, over the (nearly) five-year series through August of 2015, real crude oil prices really *did* average almost $100/bbl. Likewise, the distribution I generated in Figure 1 from the mean and standard deviation of a ten-year real price series implies a better than one-in-three chance of a $100/bbl price. By contrast, the normal distribution I generated from the mean and standard deviation of the full, 155-year series implies less than a one percent probability of prices at or above $100/bbl, and the full series oil price averages about $34 per barrel in 2015 dollars.

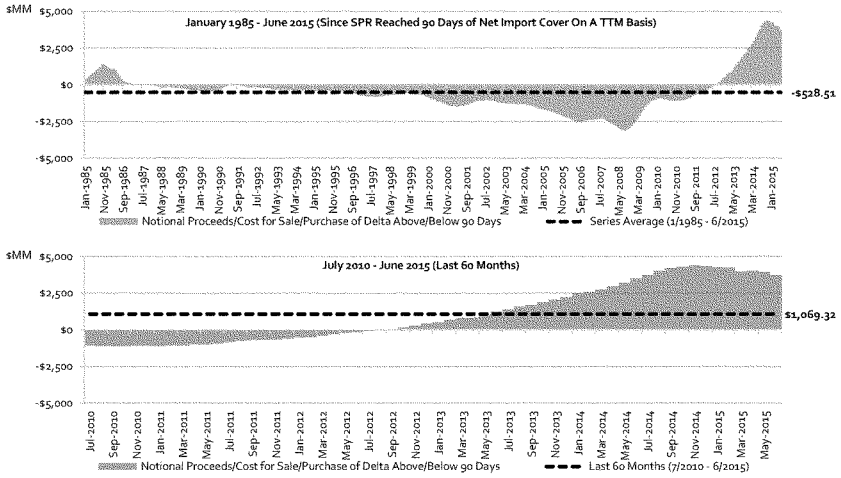
Which perspective is correct? Analysts tasked with looking ahead at commodity prices may be tempted to reason that the near future is more likely to look like the recent past than the whole of history. I would generally agree with that view, but recent oil market "lessons" reinforce the need for caution when making long-term decisions on the basis of short-term data. In that context, I think it may be worth examining long-term trends when considering an appropriate size for the SPR.

Legislative proposals to sell volumes out of the SPR to finance highway spending or pharmaceutical development appear to be predicated upon the view that the U.S. is carrying too much petroleum "insurance." Are we? I would not make too much of facile parallels between the SPR and the property and casualty insurance policies that individuals purchase, but the metaphor may apply in some respects. For example, it's generally cheaper to buy insurance at times when the market perceives lower degrees of risk. In that vein, a period of low crude prices may be a better time to expand – rather than reduce – the size of the SPR.

Likewise, it makes sense for individuals to periodically revisit their personal coverage when their life circumstances change. Should the nation downsize its SPR now that U.S. production circumstances have changed? My answer is: probably not.

Figure 2 presents the results of a simple thought experiment constructed using TTM averages of EIA monthly data series for SPR crude stockpiles, net petroleum imports and refiners' real, composite crude acquisition costs (in 2015 dollars) between January 1985 and June 2015.[3]

Figure 2 – Thought Experiment Using TTM Average SPR Stocks, Net Petroleum Imports and Composite Refiner Acquisition Costs



Source: ClearView Energy Partners, LLC using EIA and St. Louis Fed data as of September 29, 2015

The blue columns in the upper chart in Figure 2 represent the theoretical proceeds or costs associated with either (a) selling crude at refiners' real, composite acquisition costs in months when SPR stock levels exceeded 90 days of net import cover; or (b) buying crude in months when stocks fell below the 90-day level. The black dotted line represents the average result: a loss of ~$528 MM over the full series. The green columns and dotted black line in the lower chart replicate the same thought experiment for the five-year period through June 2015, with a different average result: a profit of ~$1 B.

In other words: timeframe matters. The short run can inspire spurious conclusions (i.e., real crude prices that remain above $100 forever) and unprofitable choices (i.e., selling a strategic resource only to buy it back later at a higher price). Over the long haul, the foregoing thought experiment suggests to me that tailoring the SPR down to a 90-day supply level could be a losing bet.

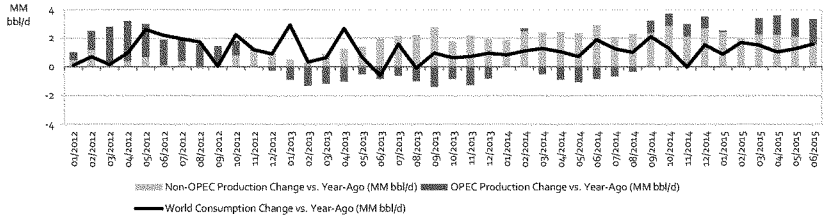
Spare Capacity and Shale

Today, instead of balancing non-OPEC production gains by cutting their volumes, OPEC producers appear to be running flat out in an effort to capture (and/or defend) their global crude market share.

Figure 3 charts monthly EIA OPEC and non-OPEC production vs. year-ago levels between January 2012 and June 2015 (note: these data are not averaged on a TTM basis).

[3] I chose January 1985 as the starting point for the series because it was the first month where the SPR net petroleum import cover was at or above 90 days on a TTM average basis.

Figure 3 – The Battle for Global Crude Market Share

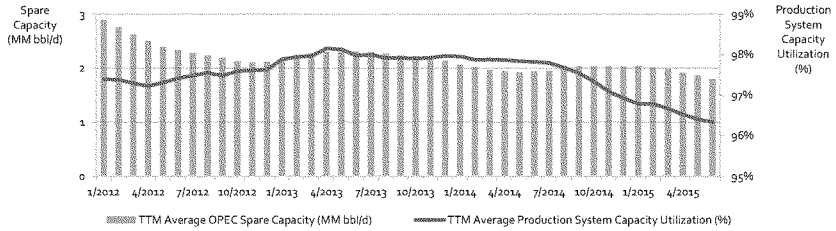


Source: ClearView Energy Partners, LLC using EIA data as of September 29, 2015

Since 4Q2014, year-on-year changes in OPEC and non-OPEC production (red and blue bars, respectively) have both trended above the x-axis, and – in the aggregate – well in excess of the year-on-year change in global consumption (black line). In addition to driving down crude prices, this notional battle for market share is probably also eroding the "spare" production capacity traditionally held in reserve by OPEC producers as a market balancing mechanism (by definition, running flat out is is the opposite of setting aside capacity), and this dynamic seems likely to continue.[4]

The pale red bars in Figure 4 trace the drop in spare capacity between January 2012 and June 2015 using EIA data on a TTM basis.

Figure 4 – OPEC Spare Capacity Is Likely To Continue Trending Down With Ongoing Contention For Market Share



Source: ClearView Energy Partners, LLC using EIA data as of September 29, 2015

Crude prices reflect consumption, production and inventory dynamics, but prices tend to be higher when the global production system is under more stress. As a result, OPEC spare capacity tends to correlate inversely with global crude prices. Accordingly, our computation of "production system capacity utilization," presented as the blue line in Figure 4, suggests that the global oil supply appears to be under less stress today than it was in previous years. In my view, this appears to result from production having risen faster than (a) spare capacity has fallen and (b) consumption has grown.[5]

Commercial crude inventories also tend to correlate inversely with crude prices. Figure 5 divides one EIA monthly data series by another: OECD commercial crude inventories divided by daily global consumption (the quotient is also known as "days of demand cover"). For perspective, I have also included EIA's forward-looking projections through December 2016 from the September 2015 *Short Term Energy Outlook* (STEO). EIA's outlook suggests a sustained inventory overhang.

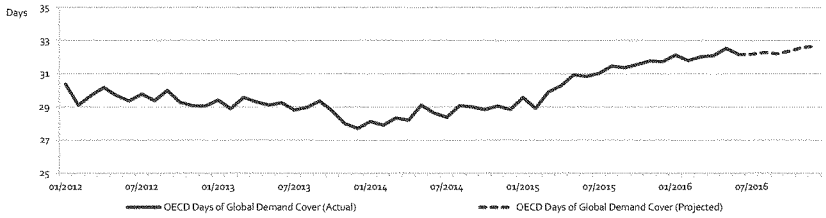
[4] The EIA defines spare capacity as "the volume of production that can be brought on within 30 days and sustained for at least 90 days."

[5] We define production system capacity utilization as

Consumption / (OPEC total liquids + Non-OPEC total liquids + OPEC spare capacity)

and our firm uses it as a simple "dashboard" of oil supply system stress. Statistically, production system capacity utilization exhibits a meaningful positive correlation with real crude prices (~0.59 on a TTM basis between January 1995 and June 2015), but values above 97% tend to be closely correlated with periods of high real crude prices.

Figure 5 – Commercial Inventories Represent a Significant Intermediate-Term Overhang for Crude Production



Source: ClearView Energy Partners, LLC using EIA data as of September 29, 2015

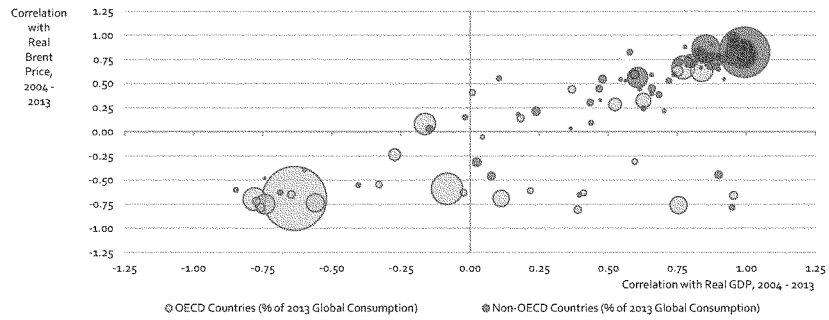
Long inventories and surging production may seem like more good energy security news, but I would be inclined to suggest otherwise. As the saying goes, "low prices are the solution to low prices." As swollen global stockpiles weigh on global markets, today's low prices have potential to stave off the resource investments the world will need tomorrow. At the same time, global supply from existing production continues to decline, and demand isn't likely to stay weak forever. By the time demand recovers, OPEC spare capacity may not be sufficient to buffer the global production system against unanticipated disruptions in a newly tight market.

This raises an important question: when is demand likely to recover? A robust answer lies outside the scope of this testimony, but my short answer is that different components of demand are likely to recover at different times. Industrialized (OECD) country consumption has been trending up this year, but this isn't likely to be the stuff of a demand recovery.[6]

Indeed, our analysis of EIA and World Bank data between 2004 and 2013 shows that non-OECD petroleum demand tends to be primarily correlated with country-level GDP, irrespective of price.[7] In other words, significant petroleum demand growth could return when the fortunes of countries like China, India and Brazil improve.

The quadrant diagram in Figure 6 contrasts the GDP-linked consumption exhibited by non-OECD countries (red bubbles, sized in proportion to 2013 global consumption) with the inverse relationship between price and consumption exhibited by OECD countries (blue bubbles).

Figure 6 – 2004-2013 Correlations between Country-Level Crude Consumption, Real Brent Price and GDP OECD and Non-OECD



Source: ClearView Energy Partners, LLC using BLS, EIA and World Bank data as of September 29, 2015

[6] Between 2004 and 2013, global petroleum consumption grew by a total of about 8.1 MM bbl/d, but this reflected a ~12.1 MM bbl/d *expansion* of non-OECD consumption and a ~4 MM bbl/d *contraction* of OECD petroleum consumption during the course of that decade.

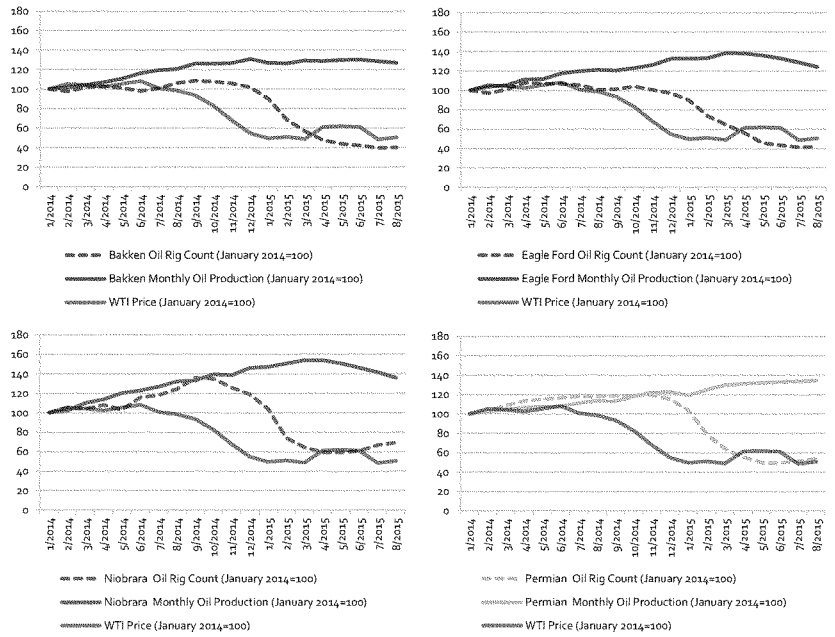
[7] Specifically, we found predominant GDP correlations (correlations that were stronger than correlations with price) in countries that comprised approximately 58% of 2013 consumption, and non-OECD countries made up ~43 percentage points of those 58%.

By the same token, the developed world in general – and the U.S. in particular – can still deliver dramatic, short-term demand spikes under the right circumstances. This year offers a good example. According to EIA data, June 2015 U.S. national gasoline prices averaged approximately 23.4% below year-ago levels. At the same time, total vehicle miles traveled (VMT) and gasoline consumption were both ~3.9% above year-ago levels, representing a gasoline consumption uptick of about 350 kbbl/d.

It is not yet clear to me whether price-responsive consumption was the primary driver of the increase or whether structural factors such as rising employment and disposable personal income levels were responsible for the result. For the purposes of this discussion, however, it may not matter. Low prices seem poised to have an enduring impact on consumption trends. According to St. Louis Fed data, during the 24 months through July 2014, new vehicle sales grew by an average of 6.5% vs. year-ago levels. Over that interval, the automobile share of light duty vehicle sales fell by 4.1%, from 49.2% to 45.1%. With Americans buying a growing number of bigger passenger vehicles, it may be too soon to conclude that U.S. petroleum consumption has peaked.

It may also be premature to conclude that U.S. shale oil production will serve as an adequate substitute for either spare capacity or strategic reserves in the event of a brisk, organic, global demand rebound. Although operators can bring some tight oil wells onstream in less than a month, U.S. shale production does not yet appear to have functioned like spare capacity in the wake of the recent price collapse. Instead, price and production data from the EIA and rig count data from Baker Hughes indicate that *drilling* responded to low prices much more promptly than *production* did, as presented in Figure 7.

Figure 7 – A Four-Basin View of Resilience in the Face of Low Prices: Bakken, Eagle Ford, Niobrara and Permian vs. January 2014



Source: ClearView Energy Partners, LLC using Baker Hughes, Bloomberg and EIA data as of September 15, 2015

Inasmuch as the timing and magnitude of the shale oil supply contraction in response to significantly lower prices was much slower than many analysts (myself included) expected, it seems reasonable to consider the possibility that a shale oil supply expansion in response to significantly higher prices might demonstrate similar latency. In particular, stark job cuts undertaken during a sustained price downturn could prevent some operators from quickly bringing substantial new capacity onstream, at least initially.

A Fair Premium

Is U.S. petroleum insurance too expensive? A robust answer to that question could require a number of heroic assumptions and complex calculations, but my back-of-the-envelope answer is "no." As a simple proxy for the notional "premium" the nation pays on the SPR, I might consider the *pro rata,* present value of SPR maintenance costs over a fixed period of time. The *FY2015 Consolidated and Further Continuing Appropriations Act* (H.R. 83) allocated $200 MM for "Strategic Petroleum Reserve facility development and operations and program management activities." Over a twenty-year period, this annual cost would total $4 B. At a 6% discount rate, the total would be worth ~$2.3 B in 2015 dollars. Holding SPR crude inventories constant at June 2015 levels of 693.89 MM bbl would therefore imply a premium of between ~$3.35/bbl (discounted) and ~$5.76/bbl (nominal) for a 20-year "policy."

What kind of coverage does this premium buy? A non-quantitative answer, given the prospect of recovering demand in a future without meaningful spare capacity, might be "the difference between having oil and not having oil," but that doesn't provide any way to assess whether $3.35 - $5.76/bbl is a good deal. Quantifying the SPR by multiplying total volumes by a given sale price doesn't really answer the question, either. For example, using $63.84/bbl – the twenty-year mean real crude price computed in Figure 1 – looks superficially like a good deal: premiums of $2.3 B provide $44.3 B of "coverage." What this calculation really says, however, is that the twenty-year *option* to sell crude currently valued at $44.3 B costs $2.3 B. Figuring out whether $2.3 B is a fair price for that option would entail making reasoned projections of future crude prices and price volatility that incorporate the odds, size and duration of potential supply disruptions. Any thorough answer should probably also consider "multiplier" effects of price mitigation across the whole of the U.S. economy. This, too, lies outside the scope of my testimony today.

For discussion purposes, I can offer a much more rudimentary, "ballpark" answer. According to EIA data, U.S. petroleum consumption through June 2015 averaged 19.34 MM bbl/d. Based on our short-run Brent model, adding 1 MM bbl/d of supply to the global oil market would correspond to an $11/bbl price decrease. Applying that ratio to TTM average consumption through June 2015 suggests that a 1 MM bbl/d SPR draw could save the nation as much as ~$212.7 MM per day in nominal petroleum costs. In reality, the ratio could be much lower, and it would vary with market conditions, the nature of the disruption in question and the size of any SPR draw(s). But even if I prorate these notional savings by 75% (to a nominal ~$53.2 MM per day), this simple calculation still values the full 693.89 MM bbl of SPR crude inventories at as much as ~$36.9 B.

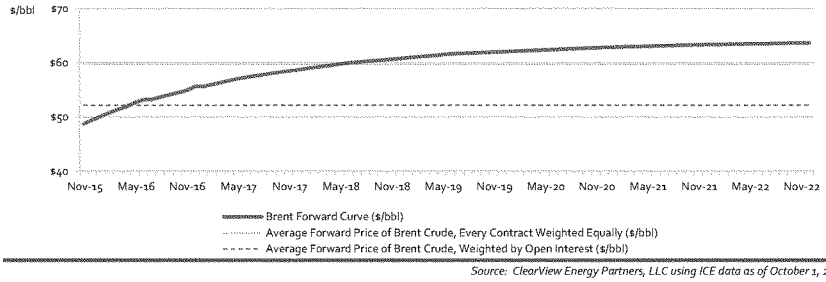
Paying premiums of $4B for twenty-year insurance coverage worth ~$36.9 B seems like a good deal, particularly as this figure does not count multiplier effects across the U.S. economy. A smaller SPR would means less coverage, however. Rationalizing SPR crude inventories at 90 days of net petroleum imports as of June 2015 (on a TTM basis) would require a sale of ~258.36 MM bbl. At $50/bbl, that sale would raise ~$12.9 B, but it would reduce the theoretical coverage value of the SPR by ~$13.7 B to ~$23.2 B. Giving up ~$13.7 B of coverage to raise ~$12.9 B may not necessarily be a good deal.

Buy Low, Sell High

Just as it may be analytically useful to think of the SPR as an insurance policy, proposals to reallocate proceeds from SPR sales to non-energy purposes indicate to me that some Members of Congress may think of the SPR as one of many assets in the portfolio the federal government manages on behalf of the American people. Extending this metaphor, financial managers usually try to match the maturities of the assets and liabilities on their balance sheets. It may not be optimal to liquidate long-term assets like SPR crude inventories for short-term financing purposes. In any case, buying high and selling low certainly seems like a bad strategy.

Figure 8 presents the Brent "forward" curve, which outlines prices for crude deliveries in accordance with the Intercontinental Exchange (ICE) Brent futures contract at monthly intervals between November 2015 and December 2022 as of October 1, 2015.

Figure 8 – Brent Forward Curve and Contract Averages as of October 1, 2015



Source: ClearView Energy Partners, LLC using ICE data as of October 1, 2015

At the time I prepared this testimony on October 1, the November 2015 contract was trading at $48.73/bbl and the December 2022 contract was trading at $63.64/bbl. An equal-weight average of every contract in the curve implied a forward price of $59.72/bbl over the next seven years. A weighted average in proportion to open interest (most of which is concentrated in the near months on the curve) implied a forward price of $52.18 over the same interval. The forward curve is far from an infallible predictor of future prices (it tends to vary with fundamentals as well as investor perceptions), but it does offer a snapshot of current market sentiment *vis-à-vis* crude prices.

Given that SPR crude inventories represent a "sunk cost," Congress may judge that selling them at any price – irrespective of their cost basis – is in the best interest of the American people. Even so, it may be worthwhile to evaluate that cost basis in both nominal and real-dollar terms. Figure 9 does so, taking into account federal appropriations for crude oil purchases and foregone revenues to the Interior Department associated with royalty-in-kind SPR fills.

Figure 9 – We Estimate Average Real Cost of SPR Crude At ~$74/bbl (vs. ~$32/bbl Average Nominal Cost)

Year[1]	Nominal Oil Account Appropriations ($MM)	Nominal Foregone DOI Revenue for Royalty-in-Kind Oil ($MM)[2]	Nominal Crude Acquisition Total ($MM)	Average CPI-U for Year[1]	Inflator (2015=1.00)	Real Crude Acquisition Total ($MM)
1976	$0		$0	56.9	4.14	$0
1977	$440		$440	60.6	3.89	$1,711
1978	$2,703		$2,703	65.2	3.61	$9,766
1979	$2,356		$2,356	72.6	3.25	$7,651
1980	($2,022)		($2,022)	82.4	2.86	($5,786)
1981	$3,205		$3,205	90.9	2.59	$8,308
1982	$3,680		$3,680	96.5	2.44	$8,986
1983	$2,074		$2,074	99.6	2.37	$4,909
1984	$650		$650	103.9	2.27	$1,474
1985	$2,050		$2,050	107.6	2.19	$4,491
1986	($13)		($13)	109.7	2.15	($28)
1987	$0		$0	113.6	2.07	$0
1988	$439		$439	118.3	1.99	$875
1989	$242		$242	123.9	1.90	$460
1990	$372		$372	130.7	1.80	$671
1991	$566		$566	136.2	1.73	$980
1992	$88		$88	140.3	1.68	$148
1993	($1)		($1)	144.5	1.63	($2)
1994	$0		$0	148.2	1.59	$0
1995	($398)		($398)	152.4	1.55	($617)
1996	($511)		($511)	156.9	1.50	($768)
1997	($220)		($220)	160.5	1.47	($323)
1998	$0		$0	163.0	1.45	$0
1999	$0		$0	166.6	1.42	$0
2000	$0	561	$561	172.2	1.37	$768
2001	$0	62	$62	177.0	1.33	$83
2002	$0	263	$263	179.9	1.31	$345
2003	$2	1,044	$1,046	184.0	1.28	$1,340
2004	$0	1,191	$1,191	188.9	1.25	$1,486
2005	$43	1,195	$1,238	195.3	1.21	$1,494
2006	($43)	0	($43)	201.6	1.17	($50)
2007	$0	306	$306	207.3	1.14	$348
2008	$0	1,600	$1,600	215.3	1.10	$1,752
2009	($22)	269	$247	214.6	1.10	$271
2010	$0	0	$0	218.1	1.08	$0
2011	$0	0	$0	224.9	1.05	$0
2012	$0	0	$0	229.6	1.03	$0
2013	$0	0	$0	233.0	1.01	$0
2014	$0	0	$0	236.7	1.00	$0
2015	$0	0	$0	235.7	1.00	$0
Total ($MM)	**$15,970**	**$6,491**	**$22,461**			**$51,195**
Average ($/bbl)[4]			**$32.37**			**$73.78**

Notes

1. Amounts appropriated reflect government fiscal years, which end September 30 (rather than December 31), so calculation represents a rough approximation.
2. Royalty-in-kind estimate based on volumes obtained by Interior Department at prevailing prices and royalty rates.
3. We estimate that Congressional reallocation of the $3.2B proceeds from the June 11 sale had the effect of raising the average acquisition cost of SPR crude by ~$4.50/bbl in nominal terms and ~$4.80/bbl in real terms.
4. Average based on June 2015 inventory levels of 693.89 MM bbl.

Source: ClearView Energy Partners, LLC using BEA, DOE, EIA and Interior Department data

The calculations in Figure 9 result in an estimated average acquisition cost of SPR crude of ~$32/bbl in nominal terms. Applying the CPI-U as an inflator implies a real average acquisition cost of ~$74/bbl, above the Brent forward curve through the end of 2022.

Diversification into Products

The current architecture of the SPR primarily relies on the nation's world-class refinery infrastructure to transform feedstock crude oil into higher value products for intermediate and end-use consumption. In my view, further diversification of the SPR into regional petroleum products reserves (RPPRs) could result in a combination of implementation challenges and unintended consequences.

Products selection presents an obvious implementation challenge. The 2013-2014 propane shortage during the "polar vortex" presented grave threats to the 37% of Midwestern households that rely on propane as their primary home heating fuel, and it was something of a surprise. EIA's 2013 *Winter Fuels Outlook* projected that propane inventories would "remain near the middle of their historical range during the upcoming winter." To my way of thinking, the propane shortage may call into question whether the Department of Energy (DOE) can have enough visibility into future, region-specific petroleum products needs to commit capital to operating segregated products storage and distribution infrastructure on a long-term basis.

Blissfully, the Midwest propane shortage also appears to have been a one-time event. In my view, this may be because market forces responded to prior-year price signals by mustering significant inventories ahead of the 2014-2015 heating season. This raises a second potential implementation challenge: can any drawdown of government-operated emergency stockpiles avoid muting the price signals that inform the behaviors of all market participants (suppliers and consumers alike)?

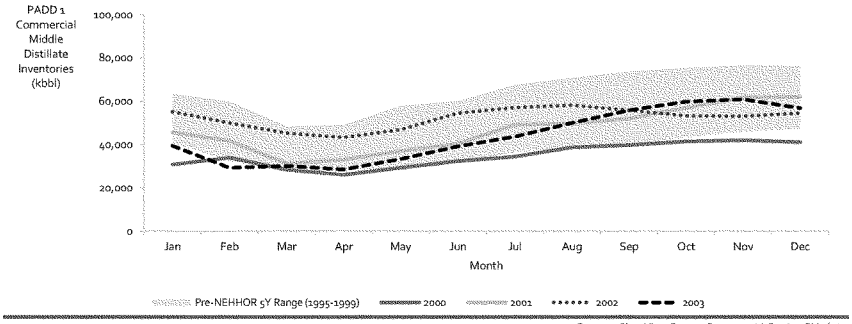
According to the DOE website, the Northeast Gasoline Supply Reserve (NGSR) that Energy Secretary Ernie Moniz created in 2014 as a response to Superstorm Sandy contains "700,000 barrels of gasoline located in the New York Harbor area, 200,000 barrels positioned in the Boston area, and 100,000 in South Portland, Maine." Based on Federal Highway Administration (FHWA) data through June 2015, I would estimate that inventories in the New York Harbor correspond to ~1.9 days of New York state gasoline demand and the combined New England stockpiles correspond to about one day of demand for Massachusetts, Maine, New Hampshire and Vermont.

It remains to be seen how – and whether – DOE might use the NGSR. The reserves are large enough relative to regional consumption that drawing them down could reduce gasoline prices during a major supply disruption, but their finite scale could also have the less desirable result of encouraging hoarding by drivers who fear that emergency fuel resources might be exhausted before commercial supplies are restored. At the same time, the NGSR is large enough to send one or several inbound products tankers to ports of call *without* RPPRs in pursuit of better spot prices, possibly delaying the replenishment of commercial stocks.

Over a longer time period, RPPRs could potentially shift investment from private operators to the federal government without meaningfully increasing energy security. The nation's first RPPR, the Northeast Home Heating Oil Reserve (NEHHOR), was created by President Clinton in July 2000 and filled in October of that year. The DOE SPR website emphasizes that NEHHOR's original, 2 MM bbl size was intended to be sufficiently large to buffer against supply shortfalls, but not so large as to undercut price signals or deter commercial operators from investing in inventories. A cursory look at historical data suggests a different outcome.

In 2000, commercial middle distillates inventories across the whole of PADD 1 fell below the pre-NEHHOR, 5Y range and remained so throughout the year before recovering to the middle of the pre-NEHHOR range in 2001, 2002 and 2003, as presented in Figure 10.[8]

Figure 10 – PADD 1 Commercial Middle Distillates Inventories, 5Y Pre-NEHHOR Range and 2000-2003

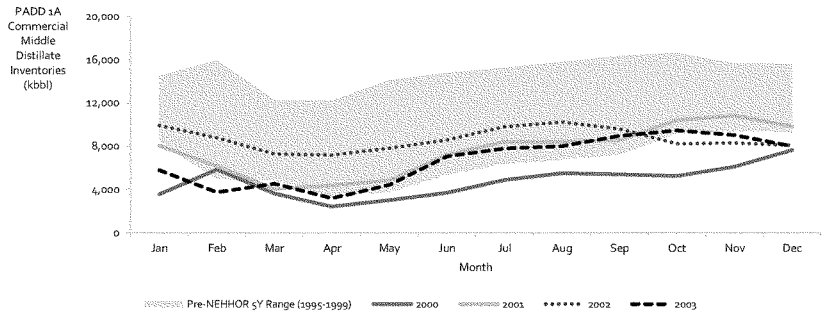


Source: ClearView Energy Partners, LLC using EIA data

[8] I confined my analysis to the immediate, post-NEHHOR years because commercial operators generally thinned inventories to manage working capital as Chinese demand growth drove oil prices beyond the $22-28/bbl OPEC "price band" in 2004 and thereafter.

In PADD 1A – the New England states where NEHHOR is located – commercial middle distillates inventories fell much further below the 1995-1999 range than they did in PADD 1 as a whole, as presented in Figure 11.

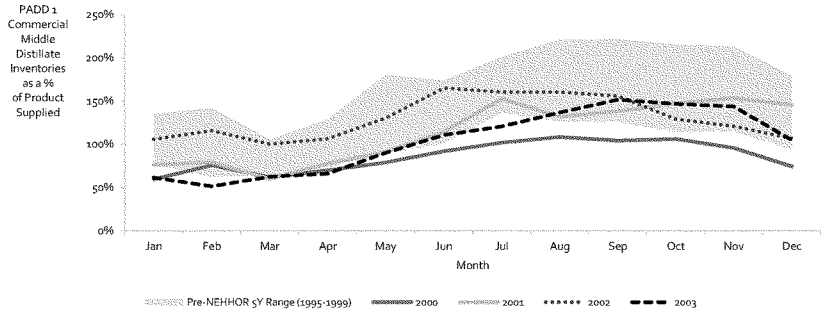
Figure 11 – PADD 1A Commercial Middle Distillates Inventories, 5Y Pre-NEHHOR Range and 2000-2003



Source: ClearView Energy Partners, LLC using EIA data

PADD 1A levels never recovered, and I would suggest that 9/11-related and recessionary pressures on middle distillates demand in general may have accounted for their modest uptick in 4Q2001. Markedly lower commercial middle distillates inventories as a percentage of monthly product supplied across the whole of PADD 1 in 2000, 2002 and 2003 would appear to reinforce this explanation, as presented in Figure 12.

Figure 12 – PADD 1 Commercial Middle Distillates Inventories as % of Product Supplied, 5Y Pre-NEHHOR Range and 2000-2003



Source: ClearView Energy Partners, LLC using EIA data

At first blush, this analysis would imply that government investment in products inventories may have deterred private investment, potentially countering some of energy security benefits of a heating oil reserve. If this conclusion is correct, I would not rule out a similar result for the NGSR in PADD 1A (although it is too soon for a comparable retrospective) and any other future RPPRs.

Madam Chairman, this concludes my prepared testimony. I will be happy to take any questions at the appropriate time.

The CHAIRMAN. Thank you.

Mr. Bordoff?

STATEMENT OF JASON BORDOFF, FOUNDING DIRECTOR, CENTER ON GLOBAL ENERGY POLICY, AND PROFESSOR OF PROFESSIONAL PRACTICE IN INTERNATIONAL AND PUBLIC AFFAIRS, COLUMBIA UNIVERSITY

Mr. BORDOFF. Thank you.

Chairman Murkowski, Ranking Member Cantwell, members of the Committee, thanks for the invitation to be here today and for your attention to this important issue. As Admiral Blair said, I think much has already been said.

So let me just make three brief points with my time.

First, it's my view that the SPR remains an important national security asset even though the U.S. is a much larger producer and a much lower importer than we've been in the past. U.S. oil imports have fallen from about 60 to 20 percent of our consumption both as a result of more supply and importantly, as a result of reduced demand. We talked about how the International Energy Agency requires 90 days of import cover, so some say that means we need less oil in the SPR.

But in today's oil market as supply disruption anywhere leads to price increases here at home whether we import or not. Such price spikes have harmful economic consequences for consumers and for the overall economy. All but one of the 11 post-war recessions, for example, were associated with oil price shocks. So the SPR today needs to cushion global supply disruptions regardless of whether U.S. refineries import from the specific countries where the disruption occurred. I think we should be especially cautious about selling the SPR as the oil market really enters unchartered territory. OPEC has not only allowed the price to collapse, it's actually boosted its production leaving almost no spare capacity, extra oil that can be brought onto the market with little short notice.

So with OPEC abandoning its market balance or role and with little spare capacity we may be in for sharper ups and downs in the future, and then any disruption to global supply can have an outsized impact on price because there's no buffer in the market left to cushion it. There's still a lot of geopolitical risk in the world and key oil producers, even more so when low prices threaten instability in some markets.

A recent study from Columbia Center of Global Energy Policy looked carefully at the increased risk of political instability in Venezuela, for example, as a result of the price collapse. So now is not a time to sell off a strategic asset we've had for 40 years.

Moreover the SPR, I think, gives us more policy flexibility. So imagine, for example, that Iran reneged on its nuclear deal and there was consensus to tighten sanctions on Iran without a buffer of either spare capacity or strategic stocks we may well impose a great deal of economic pain on ourselves at the same time that we're trying to impose it on Iran.

Second, given how the oil market has changed it, as we talked about today, absolutely makes good sense to study whether the size, composition, location or use of the SPR should be modernized. But the outcome of that analysis about whether to reduce the size

of the SPR and not an imperative to fill a budget hole, no matter how meritorious the intended use, it should determine whether we do that. I think that's especially true when the oil price is at its lowest point in six years.

Third and finally, there's an urgent need, as we've talked about, to modernize the SPR's existing infrastructure to ensure that it can remain effective in the event of an emergency. Any revenue from selling the SPR, I would argue, should be put toward that purpose, that really critical need, before any other.

Since the purpose of the SPR in today's market is to temper price shocks from global supply disruptions, barrels must add to the total world supply. So that means that when SPR crude is delivered to U.S. refineries foreign oil those refineries would have purchased is freed up to be used elsewhere, but changes in U.S. production and infrastructure have made that harder to achieve today for Midwest refineries which have been the historic destination for SPR crude.

SPR crude now needs to move from the water in the Gulf Coast to East or West Coast refineries, yet, the oil boom here in the U.S. over the last several years has left very little unused capacity at these Gulf Coast marine facilities. That means that if these docks were used in an emergency to load SPR crude other commercial stocks would just be displaced, so investments are needed in marine capacity that would allow the SPR to add incremental barrels into the global market and this was confirmed by the DOE's 2014 test sale.

To be clear, this is an issue not of stock, barrels in the SPR, it's an issue of flow. How much oil is in the SPR is important, but what's really important is can we get it out at the intended draw down rate of 4.4 million barrels per day. I don't think today we'd come anywhere close to that, so addressing that urgent need is a critical priority.

In short the SPR has served as a critical piece of our nation's infrastructure and energy security strategy since the oil crisis of the 1970's. It remains so today. And while it makes sense to consider various measures to modernize it, including reducing its size among other reforms, the first priority should be to ensure that SPR crude can reach the market and be effective in the event of a supply emergency.

Thank you again for the opportunity to testify today.

[The prepared statement of Mr. Bordoff follows:]

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Center on Global Energy Policy

October 6, 2015

Congressional Testimony of
Jason E. Bordoff
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Before the
Committee on Energy and Natural Resources
United States Senate
1st Session, 114th Congress

Chairman Murkowski, Ranking Member Cantwell and Members of the Committee, thank you for inviting me here today to discuss the potential modernization of the Strategic Petroleum Reserve (SPR) and related energy security issues.

In my testimony today, I would like to make three main points:

- First, the SPR, created in the wake of the 1970s oil crisis, remains an important national security asset, notwithstanding the sharp rise in U.S. oil production and steep drop in U.S. oil imports.
- Second, it is prudent to study whether the size, composition, location, or use of the SPR should be modified to reflect changes in the global oil market over the past four decades, but the results of that analysis, not current budget needs, should dictate whether to sell a large volume of SPR crude oil.
- Third, there is an urgent need to modernize the SPR's existing infrastructure to ensure that it can remain effective in the event of an emergency by delivering additional and incremental barrels to the market, and revenue from the SPR should be directed toward this imperative before any other.

Background

As members of the Committee know, Congress authorized the creation of the SPR in the Energy Policy and Conservation Act (EPCA) of 1975 in the wake of the 1970's Arab Oil Embargo as a way to insulate the United States from future petroleum supply disruptions.

As a member of the International Energy Agency, another byproduct of the 1970's oil crisis, the U.S. is required to hold stocks of crude oil and/or petroleum products equivalent to 90 days of net imports for use in emergency situations.[1] These stocks can be held either in private inventories or directly by the government. Currently, the SPR contains the equivalent of 142 days of net petroleum import cover.[2] That figure has risen in recent years in response to both surging oil supply and lower demand, dramatically reducing the nation's dependence on imports.

Presently, the SPR holds 694 million barrels of crude oil in salt caverns at four sites in Louisiana and Texas. It has capacity to hold 713.5 million barrels. In addition to the SPR, the U.S. government maintains emergency

[1] http://www.iea.org/ieaenergy/issue7/emergency-stocks-oil-that-limits-supply-disruptions.html.
[2] Calculated based on June 2015 monthly data from the Energy Information Administration by dividing total strategic petroleum reserve volume by net crude oil and petroleum products imports,
http://www.eia.gov/dnav/pet/PET_MOVE_NETI_A_EP00_IMN_MBBLPD_M.htm.
http://www.eia.gov/dnav/pet/pet_stoc_typ_d_nus_sas_mbbl_m.htm.

reserves of one million barrels of heating oil and one million barrels of gasoline, both located in the Northeast.[3]

EPCA defines the circumstances under which the SPR may be used. Generally, there are three possible types of drawdowns envisaged by EPCA (elaborated more fully in the Appendix)[4]:

- Full drawdown: The President can order a full drawdown of the Reserve to counter a "severe energy supply interruption."
- Limited drawdown: Up to 30 million barrels if the President finds that there is "a domestic or international energy supply shortage of significant scope or duration."
- Test sale or exchange: The Secretary of Energy is authorized to carry out test drawdowns and distribution of crude oil from the SPR not to exceed 5 million barrels.

To date, the President has only authorized three emergency drawdowns of the SPR: In 1991, during Operation Desert Storm; in 2005, during Hurricane Katrina; and in 2011 during the Libyan civil war. In addition, there have been a dozen exchanges for various reasons, including the creation of the Northeast Home Heating Oil Reserve to help respond to natural disasters and outages. There have also been three test sales to check for infrastructure and maintenance issues.[5]

Recently, several members of Congress have proposed selling crude oil from the SPR to raise revenue for other programs. For example, the reauthorization of the Highway Trust Fund proposes raising revenue for our nation's infrastructure needs by selling 101 million barrels of oil from the SPR between 2018 and 2025.

Funding our nation's infrastructure is an urgent and pressing priority, to be sure. But selling a national strategic asset that has existed for four decades and still provides a critical role in domestic energy security would be a short-sighted and unwise way to raise the needed funding.

The SPR remains an important national security asset

For 40 years, the SPR has created a deterrent against oil exporting countries threatening oil embargoes, provided a tool to respond to global oil supply disruptions, and served to prompt OPEC to release spare capacity.[6] Several arguments have been put forward to suggest that the SPR is less necessary today, including:

1. Changes in oil markets over the last 40 years mean that the risk of actual physical shortages of oil is far lower;
2. The United States is less vulnerable to supply shortages today following the surge in domestic oil production, which has dramatically reduced our dependence on foreign oil supplies;
3. The dramatic collapse in oil prices since mid-2014 has consequently decreased the potential economic harm from a supply disruption; and

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[3] Northeast Home Heating Oil Reserve background:
http://energy.gov/fe/services/petroleum-reserves/heating-oil-reserve;
Northeast Gasoline Supply Reserve background:
http://energy.gov/fe/services/petroleum-reserves/northeast-regional-refined-petroleum-product-reserve.
[4] http://legcounsel.house.gov/Comps/EPCA.pdf.
[5] U.S. Senate Committee on Energy & Natural Resources, "A Turbulent World: In Defense of the Strategic Petroleum Reserve," 2015, p.2,
http://www.energy.senate.gov/public/index.cfm/files/serve?File_id=a5d94825-02f3-4e62-9eb3-2b9f36201e65.
[6] Michelle Billig Patron and David L. Goldwyn, "Managing Strategic Reserves," in *Energy and Security: Strategies for a World in Transition (2nd edition)*, edited by Jan H. Kalicki and David L. Goldwyn, Woodrow Wilson Center Press, 2013. p. 470.

4. Improvements in technology and the growth in climate policy mean the United States will soon be able to get off oil.

While there may be some truth in these statements, none constitutes a sound basis for draining our emergency stockpile.

Today's oil market is different than the oil market of the 1970s

In the 1970s, oil price controls existed in the U.S., and most internationally traded oil was sold under long-term contracts. A disruption in contracted shipments could result in a physical shortage for the buyer because of the lack of strategic and commercial stockpiles or a large spot market where buyers could easily access alternative sources of supply. In the intervening years, the oil market has become the largest and most liquid commodity market on earth with vibrant futures markets. The vast majority of globally traded oil is bought and sold for a price indexed to benchmark crude prices and mature pricing hubs in regions including Europe (Brent), the United States (WTI), and the Middle East (Dubai).[7]

Given how the oil market has changed, the consequence of a supply disruption anywhere is a price increase everywhere. Hence, the risk against which the SPR needs to guard today is a global disruption to crude supply that causes domestic prices to spike regardless of whether U.S. refineries import from the disrupted countries. The price impact of a global oil supply disruption can be tempered by additional supply from strategic stocks though coordinated action by countries, as well as by commercial supplies and spare capacity.

Price spikes threaten the economies of consumer nations. Broadly speaking, a $10 per barrel drop in the price of oil lifts GDP by 0.1 percent.[8] Oil price spikes, on the other hand, can erode spending power and reduce consumption, worsen the current account balances and weaken currencies, and, at times, contribute to rising inflation and trigger tighter monetary policies, which temper growth and investment. Studies analyzing long-term historical data found that a 10% per barrel oil price increase would predict 0.7% slower economic growth in the U.S. four quarters after the price rise.[9] James Hamilton also noted in a 2011 study that "all but one of the 11 post-war recessions were associated with an increase in the price of oil" and all but one of the 12 post-war oil price shocks "were accompanied by U.S. recessions, the single exception being the 2003 oil price increase associated with the Venezuelan unrest and second Persian Gulf War."[10]

An increasingly important role for SPR policy may also be to manage market expectations.[11] Markets react very quickly to anticipated supply and demand changes, which can sharply impact price movements. In 2012, for example, the impact on the world oil price of sanctions to limit Iranian oil sales and other geopolitical fears was tempered, at least in part, by a perception in the market that the U.S. and perhaps other IEA

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[7] Jason Bordoff and Trevor Houser, "Navigating the U.S. Oil Export Debate," Center on Global Energy Policy, 2015, p.47, http://energypolicy.columbia.edu/sites/default/files/energy/Navigating%20the%20US%20Oil%20Export%20Debate_January%202015.pdf.

[8] Jason Bordoff and James Stock, "The Implications of Lower Oil Prices for the US Economy Amid the Shale Boom," Center on Global Energy Policy, 2014, http://energypolicy.columbia.edu/sites/default/files/energy/CGEP_economic%20impacts%20of%20oil%20price%20drop.pdf.

[9] James D. Hamilton, "Oil and the Macroeconomy," University of California, San Diego, 2005, p.8, http://econweb.ucsd.edu/~jhamilto/JDH_palgrave_oil.pdf.

[10] James D. Hamilton, "Historical Oil Shocks," University of California, San Diego, 2011, http://econweb.ucsd.edu/~jhamilton/oil_history.pdf.

[11] Michelle Billig Patron and David L. Goldwyn, "Managing Strategic Reserves," in *Energy and Security: Strategies for a World in Transition (2nd edition)*, edited by Jan H. Kalicki and David L. Goldwyn, Woodrow Wilson Center Press, 2013. p. 471.

members might release the SPR if prices rose too far.[12] In the summer of 2012, both the G-20 and G-7 issued statements intended to signal that they might tap strategic oil stocks if necessary.[13] Policymakers sent numerous other signals to this effect, as well, such as the reported conversation in March 2012 between President Obama and UK Prime Minister David Cameron about using strategic oil stocks.[14] As a result, numerous analysts cautioned that the Obama Administration might release SPR crude if oil prices rose above roughly $120 per barrel.

Net imports are only one channel by which the economy is vulnerable to oil price spikes

Since 2008, oil production in the United States has risen 80 percent, or four million barrels per day (b/d). Combined with a decline in domestic oil demand, this has led to a decline in oil imports from 60 to 20 percent of U.S. consumption, which averaged 19 million b/d in 2014. Currently, the volume of oil the United States is projected to import in 2025 is a staggering 14 million b/d lower than projections made less than a decade ago.[15] Yet the U.S. remains a net importer of oil.

It has been argued as U.S. reliance on foreign oil supplies declines, so does the need for a cushion to protect against supply shortages. Indeed, the IEA's required level of stockholding for its members is determined by each country's level of imports, as countries must maintain stocks equaling a minimum of 90 days of import cover.

As noted earlier, however, the risk to consumer countries today from oil supply disruptions is not a physical shortage of oil but price spikes that harm the economy. During the 1990 Gulf War, for example, oil prices rose from an average of $17 in July 1990 to a peak of $41 in September 1990 following Iraq's invasion of Kuwait, and gasoline prices rose sharply in both the U.S. and the UK, even though the UK at the time was a net oil exporter.

However, it is true that the impact of an oil price shock on the U.S. macroeconomy today is less than it was a decade ago because the United States is a much smaller net importer. As the White House Council of Economic Advisers recently explained, "the resilience of the economy to international supply shocks—macroeconomic energy security—is enhanced by reducing spending on net petroleum imports and by reducing oil dependence."[16] This is due both to the smaller terms of trade penalty from an oil price shock, and the fact that when prices rise, more of the increase in oil producer revenue stays within the United States. The reverse is also true: when oil prices decline sharply, as they have over the past 14 months, it provides less of a boost to the U.S. economy because oil production is now a greater part of the domestic economy.

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[12] See, e.g., Blake Clayton, "Is the White House the New Federal Reserve of Oil?," *Forbes*, October 12, 2012, http://www.forbes.com/sites/blakeclayton/2012/10/12/is-the-white-house-the-new-federal-reserve-of-oil/; Izabella Kaminska, "SPR talk as QE3 expectation management," *Financial Times*, September 3, 2012, http://ftalphaville.ft.com/2012/09/03/1142871/spr-talk-as-qe3-expectation-management/.
[13] See, e.g., www.platts.com/latest-news/oil/london/g7-urges-oil-supply-boost-says-ready-to-call-8674832; http://profit.ndtv.com/news/corporates/article-g20-says-vigilant-on-oil-ready-to-take-measures-306458.
[14] Guy Chazan et al., "Crude Tumbles as Leaders Discuss Supplies," *Financial Times*, March 15, 2012, http://www.ft.com/intl/cms/s/0/20e8687a-6ebd-11e1-afb8-00144feab49a.html#axzz3nVdtfjsk; Matt Falloon and Jeff Mason, "Obama, UK's Cameron Discussed Tapping Oil Reserves: Sources," *Reuters*, March 15, 2012, http://www.reuters.com/article/2012/03/15/us-obama-energy-spr-idUSBRE82E00P20120315.
[15] Jason Bordoff and Akos Losz, "Oil Shock," *Horizons*, Spring 2015, http://www.cirsd.org/uploads/magazines/pdf/Jason%20Bordoff%20and%20Akos%20Losz.pdf_1429732733_english.pdf.
[16] Council of Economic Advisers, "The All-Of-The-Above Energy Strategy as a Path to Sustainable Economic Growth," 2014, p.3, https://www.whitehouse.gov/sites/default/files/docs/aota_report_updated_july_2014.pdf.

A reduced impact, however, does not mean there would be no impact. There are at least two reasons that the SPR remains critical despite reduced import dependence.

First, it is important to remember that any supply disruption would still have significant distributional impacts. Gasoline price increases act like a tax on motorists and reduce their spending power for other goods and services. Energy price increases are also regressive given that low-income consumers spend a higher percentage of their income on energy than high-income consumers.[17] While in theory there are other economically efficient ways to address such distributional concerns, history suggests doing so is unlikely.

Second, it is far from clear that U.S. oil import dependence will remain this low forever. The reduction in import dependence has been driven by both increased domestic supply as well as reduced demand, but there is great uncertainty about the outlook for both.

On the supply side, the decline in global oil prices has led to a drop in U.S. oil production from 9.6 million b/d in April to 9.1 million b/d in August, and the U.S. Energy Information Administration projects to fall another 300,000 b/d next year. The decline could be even larger and steeper if prices dip lower, as industry hedges that help protect producers against lower prices come off, and if producers' access to low-cost capital becomes more constrained. Industry has demonstrated the ability to increase productivity of tight oil production remarkably, but it is unclear whether those rates of improvement can be maintained. There is still limited experience with tight oil production, and so all projections of future growth in U.S. production should be taken with a large grain of salt, and as such it would be unwise to take any large decisions on energy security until we have a better understanding.

On the demand side, there has been an even greater surprise in actual versus projected U.S. oil usage. U.S. oil consumption in 2014 was about 25% lower than the U.S. government projected it would be in 2003. And the current forecast for 2025 oil demand is 34 percent lower than the level projected in 2003.[18] This reduction in projected oil usage is due to a combination of policy drivers like higher fuel economy standards, demographic shifts, and economic weakness.

These demand projections are being thrown into question, however. U.S. oil demand for 2015 is now expected to rise by around 500,000 b/d in response to the price collapse, and SUV sales this year are up 15 percent. Moreover, the Obama Administration's doubling of fuel economy standards is scheduled for a mid-term review in 2018. Particularly if oil prices remain low, there is likely to be significant pressure from automakers that claim that those requirements are infeasible, creating a risk the requirements could be weakened. In short, while oil market forecasting has never been an easy task, we are in the midst of a period of extreme flux in which conditions being cited for selling off the SPR could change relatively quickly.

Given that the primary risk to the U.S. economy in today's market is price spikes rather than supply shortages, energy security can be enhanced not only with tools like the SPR, but even more importantly by reducing oil consumption and thus the exposure of the U.S. economy to oil price fluctuations. Policies to reduce oil demand and investments in alternative transportation fuel R&D not only increase our energy security, but reduce greenhouse gas emissions that lead to potentially severe climate change impacts.

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[17] http://www.brookings.edu/research/opinions/2012/03/06-gas-prices-sawhill.
[18] Council of Economic Advisers, "Explaining the U.S. Petroleum Consumption Surprise," 2015, p. 2, https://www.whitehouse.gov/sites/default/files/docs/explaining_us_petroleum_consumption_surprise_final.pdf.

The oil market is entering uncharted territory

While oil prices have fallen, history teaches we should not expect them to stay there. Indeed, oil prices may be even more volatile today than in the past.[19] OPEC countries have, at least for the time being, given up their historic role as a market stabilizer. In November 2014, OPEC chose not to cut production to support prices as they fell, sending them into a tailspin down to $45 per barrel by January.

Moreover, OPEC has actually increased production, leaving a very narrow margin of "spare capacity" to offset future supply disruptions—although high levels of global inventories will help for a while. For years, Saudi Arabia had been the only country that produced significantly less oil than it economically could, and was thus the only one with any meaningful level of spare capacity—the ability to quickly bring new oil supply onto the market to compensate for production losses elsewhere. From November 2014 to June 2015, Saudi Arabia boosted output by nearly 1 million b/d. Thus, the U.S. Energy Information Administration now estimates OPEC's total spare capacity at less than 1.3 million b/d, the lowest level since 2008.

In a world with very narrow spare capacity, any disruption to global supply can have an outsized impact on price because there is little buffer in the event of supply disruptions. There remain significant geopolitical risks in the world in key oil producers—even more so as low prices threaten instability in critical oil exporters. A recent Columbia University Center on Global Energy Policy study, for example, found significantly higher geopolitical risks in Venezuela following the oil price collapse.[20]

Moreover, a buffer against oil supply disruptions provides the U.S. with more flexibility to pursue policies that may reduce oil supply. Imagine, for example, that Iran reneged on its nuclear deal, and the U.S. and our European allies sought to tighten sanctions; without a buffer of spare capacity or strategic stocks, the economic costs we would impose on ourselves of curtailing Iranian oil sales might be steep.

It is important to put these oil market changes into context. For most of the modern history of oil, there has been some attempt by companies or organizations, whether the Seven Sisters, the Texas Railroad Commission, or OPEC, to control oil prices. If OPEC abandons that role, as the past year suggests may be occurring, and holds little spare capacity as a result, that may portend more volatile times for oil prices, as markets balance by prices falling low enough to curb uneconomic production and spur more usage (or high enough to incentivize more output and curb demand). A safety net such as the SPR may be particularly important in a more volatile oil market.

The U.S. economy will remain heavily dependent on petroleum

As noted earlier, projected U.S. oil demand has fallen sharply in recent years. Advanced vehicle and battery storage technologies are improving. Apple just announced plans to build its first electric car by the end of the decade. And many nations, including the United States, have announced much more aggressive policy steps to address climate change in the lead-up to December's negotiations in Paris. There is clearly strong momentum across numerous fronts that will reduce U.S. fossil fuel consumption.

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[19] Jason Bordoff, "Don't Get Used to Cheap Gas," *Wall Street Journal*, September 18, 2015, http://blogs.wsj.com/experts/2015/09/18/dont-get-used-to-cheap-gas/.

[20] Francisco Monaldi, "The Implications of the Decline in Oil Prices on the Economics, Politics and Oil Industry of Venezuela," Center on Global Energy Policy, 2015, p.3-4, http://energypolicy.columbia.edu/sites/default/files/energy/Impact%20of%20the%20Decline%20in%20Oil%20Prices.%20on%20Venezuela_September%202015.pdf.

Despite all these promising signs, it is still very likely that oil will remain the dominant transportation fuel for decades in the United States and globally. Currently, the world consumes 92 million b/d of oil.[21] The International Energy Agency projects that this will grow to 104 million b/d by 2040.[22] Even in a scenario in which we succeed in stabilizing atmospheric concentrations of greenhouse gas emissions at 450 ppm, which provides a roughly 50 percent chance of keeping warming from exceeding the 2 degree Celsius threshold, oil demand in 2040 will still be 72 million b/d.[23]

The SPR should not be used like an ATM

Given the evolving role of the SPR in today's changed oil market, there are very good reasons to undertake analysis of whether and how the SPR should be reformed. For example, if the primary risk against which it protects is not a shortage of oil imports but a global price spike in response to supply disruptions, does that mean the size of the SPR should be increased or decreased? Given the changing patterns of U.S. oil output and trade, should the composition of light versus heavy oil be changed? And, perhaps most importantly, how should the concept of "severe energy supply disruption" be understood today and what does that mean about the frequency with which government officials should consider releasing or filling the SPR?

These and others are key questions worth considering as Congress evaluates whether to take action regarding the SPR and reduce its size. Given the nature of today's oil market, the level of stocks should no longer be based solely on oil import dependence. Rather, an analysis would need to assess the impact on the macroeconomy of oil price spikes, the likelihood of supply disruptions and associated price spikes, and the impact of SPR volumes to mitigate those spikes and on the level of spare capacity; and compare those potential benefits to the carrying and opportunity costs of maintaining crude oil in strategic reserve. The decision about whether to reduce (or increase) the size of the SPR should be based on a prudent analysis, not driven by an imperative to fill a budget hole, no matter how meritorious the intended use.

We desperately need to rebuild our nation's crumbling roads and bridges. But depleting the SPR is a short-sighted way to raise those funds. That is especially true when the oil price has fallen to its lowest point in six years. Even if the sales are deferred several years into the future, there is no way to know now how quickly oil prices will recover. Prudent fiscal management argues for filling the SPR when prices are low and downsizing when prices are high.

SPR revenue should be used for SPR modernization

The SPR's outdated infrastructure needs to be modernized to ensure that it can remain effective in the event of an emergency by delivering additional and incremental barrels to the market. If there is any case to be made for selling SPR crude in today's market, it is to address this urgent need. In the Quadrennial Energy Review released this spring, the Obama Administration explained that changes in U.S. oil supply, demand, and transportation pose new challenges to the effectiveness of the SPR.

Historically, oil and refined petroleum products flowed from south to north to inland refineries. Yet with surging oil production in North Dakota moving south toward the Gulf of Mexico, as well as to refiners on the East and West Coasts, these historical patterns are being flipped. Significant volumes of oil from the Eagle Ford and Permian shale basins also are moving to Gulf Coast refineries. To accommodate these changes in the geography of U.S. crude oil supply and transportation, there have been pipeline additions and reversals, as well as sharp increases in barge, rail, and truck transport of oil and refined products.

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[21] BP Statistical Review 2014.
[22] IEA World Energy Outlook 2014, p. 96.
[23] Ibid.

These changes in U.S. oil supply, demand and "midstream" pipeline infrastructure have significantly impeded the ability of the SPR to deliver *incremental* barrels of crude oil to refineries. In order for SPR barrels sold to domestic refineries in an emergency to increase the total global supply of crude oil, foreign oil shipments that would have been processed by U.S. refineries must be freed up for use elsewhere. This is harder to do than in the past. Moving SPR oil to refineries in the Midwest, as historically has been the case, no longer frees up imported barrels because non-Canadian and Gulf Coast crude has been largely backed out of inland refineries by the unconventional oil boom. That means that SPR crude would need to be moved by ship to East and West Coast refineries. Yet, as a result of the surge in U.S. oil supply, Gulf Coast marine facilities are operating at high capacities. If those dock facilities were used to load SPR crude in an emergency, the result would thus be to crowd out commercial supplies that would have otherwise been loaded, and thus the SPR supplies would not be incremental.[24] Additionally, several SPR facilities are aging and need life extension investments.

These findings from the Quadrennial Energy Review are consistent with a March 2014 test sale from the SPR. According to a report by the Congressional Research Service, the test sale revealed several operational challenges stemming from limited pipeline capacity, crude oil terminal storage capacity, and marine terminal distribution capacity.[25]

To ensure SPR crude oil can be effectively accessed in a future supply disruption, the Quadrennial Energy Review estimated that $1.5 to $2 billion was needed "to increase the incremental distribution capacity of the SPR by adding dedicated marine loading dock capacity at the Gulf Coast terminus of the SPR distribution systems, as well as undertaking a life extension program for key SPR components."

As you yourself put it, Chairman Murkowski, "If Congress is going to sell any oil from the SPR, we should agree that the proceeds should first be used to pay for upgrading the reserve itself." It would be short-sighted to sell the SPR to meet a one-time budget need, thus reducing the size of this national strategic asset while also failing to invest in its operational needs to ensure it can continue to be effective in case of a true energy supply emergency.

Conclusion

The SPR has served as a critical piece of our nation's energy security strategy since the oil crisis of the 1970's, and it remains so today despite the sharp reduction in U.S. oil import dependence. Our ability to tap the SPR has been severely limited by recent changes in the U.S. oil outlook and infrastructure, and addressing these constraints should be a key priority to ensure the SPR can remain effective in an emergency. Dramatic changes in the global oil market over the past four decades and changed nature of the risks against which the SPR guards mean it is a very useful exercise for Congress, working with the U.S. Department of Energy, to consider whether the SPR's size, composition, location or use should be modified. That analysis should determine whether we sell off SPR crude, not immediate budget needs for priorities unrelated to energy security, no matter how meritorious.

Thank you for the opportunity to testify today.

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[24] Quadrennial Energy Review, 2015, Chapter IV, p. 6
http://energy.gov/sites/prod/files/2015/08/f25/QER%20Chapter%20IV%20Energy%20Security%20April%202015.pdf.

[25] U.S. Senate Committee on Energy & Natural Resources, "A Turbulent World: In Defense of the Strategic Petroleum Reserve," 2015, Appendix A,
http://www.energy.senate.gov/public/index.cfm/files/serve?File_id=a5d94825-02f3-4e62-9eb3-2b9f36201e65.

Appendix[26]

The circumstances that might require the use of the Strategic Petroleum Reserve are defined in the Energy Policy and Conservation Act (EPCA). Generally, there are three possible types of drawdowns envisioned in the Act:

Full drawdown: The President can order a full drawdown of the Reserve to counter a "severe energy supply interruption." EPCA defines this as "a national energy supply shortage which the President determines –

> (A) is, or is likely to be, of significant scope and duration, and of an emergency nature
> (B) may cause major adverse impact on national safety or the national economy; and
> (C) results, or is likely to result, from (i) an interruption in the supply of imported petroleum products, (ii) an interruption in the supply of domestic petroleum products, or (iii) sabotage or an act of God."

EPCA also states that a severe energy supply interruption "shall be deemed to exist if the President determines that –

> (A) an emergency situation exists and there is a significant reduction in supply which is of significant scope and duration;
> (B) a severe increase in the price of petroleum products has resulted from such emergency situation; and
> (C) such price increase is likely to cause a major adverse impact on the national economy."

Limited drawdown: If the President finds that -

> (A) a circumstance, other than those described [above] exists that constitutes, or is likely to become, a domestic or international energy supply shortage of significant scope or duration; and
> (B) action taken....would assist directly and significantly in preventing or reducing the adverse impact of such shortage" then the Secretary may drawdown and distribute the Strategic Petroleum Reserve, although in no case:
>
> > "(1) in excess of an aggregate of 30,000,000 barrels....
> > (2) for more than 60 days....
> > (3) if there are fewer than 500,000,000 barrels....stored in the Reserve."

Test Sale or Exchange: The Secretary of Energy is authorized to carry out test drawdowns and distribution of crude oil from the Reserve. If any such test drawdown includes the sale or exchange of crude oil, "then the aggregate quantity of crude oil withdrawn from the Reserve may not exceed 5,000,000 barrels during any such test drawdown or distribution."

[26] http://energy.gov/fe/services/petroleum-reserves/strategic-petroleum-reserve/spr-quick-facts-and-faqs.

The CHAIRMAN. Thank you, Mr. Bordoff, we appreciate your comments.

Ms. Ladislaw?

STATEMENT OF SARAH LADISLAW, DIRECTOR AND SENIOR FELLOW, ENERGY AND NATIONAL SECURITY PROGRAM, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES

Ms. LADISLAW. Good afternoon, Chairman Murkowski and Ranking Member Cantwell. Thank you for the opportunity to be here today. I too, will shorten my comments to make sure we've got time for discussion.

Today I'll make three points about the Strategic Petroleum Reserve as an element of U.S. and global oil supply security and offer some areas of consideration going forward for the ongoing deliberations about how to modernize this important reserve.

First, the U.S. SPR is an important pillar of U.S. and global oil supply security. The SPR is not only the world's largest government-owned and managed emergency stockpile of crude, it's also part of a much larger, globally coordinated system of emergency petroleum supplies that have been around in the oil market since the mid 1970's. These strategic stockpiles are perhaps one of the most invisible and enduring examples of shared energy security policies around the world and the world's major energy consumers. The SPR in the United States is a fundamental pillar of that system and sends an important signal.

Second, changes to the U.S. domestic production profile necessitate these changes to the SPR. Greater domestic production and new pipeline configurations potentially upend the assumptions on which the SPR logistical distribution system relies. Assuming that the SPR oil is released, increasing production of oil in Midwest and Gulf Coast systems and infrastructure changes to accommodate those production changes such as certain pipeline flow reversals, may have made it considerably more difficult to move this product to market. This in combination with ongoing maintenance needs above and below ground necessitate this conversation about the SPR modernization today.

Third, oil markets have changed and will continue to change. A great deal has changed since the global strategic stock system and the U.S. SPR were created which further make an assessment necessary and important.

Oil markets are different and so are the players.

First, oil plays a different role in the global economy than it did in 1974. Half of oil consumed today is for transportation compared to 35 percent in the 1970's. And according to the International Agency, this concentration of oil uses in transportation can accentuate the potential economic impact of a supply disruption because of low price elasticity of transportation fuel and the broad reach of transportation fuel costs into other sectors of the economy.

Second, while oil trade flows are shifting, the production surge in North America combined with growing oil demand in Asia means that oil is increasingly traveling East instead of West for major production centers. Moreover, the trend toward refining crude closer to production centers means that global trade in crude

oil is likely to decline in the coming years in favor of greater product trade flows.

Finally, OPEC now makes up a smaller share of global oil supply. OPEC produced about half the world's oil in 1974 compared to about 40 percent today. Perhaps more importantly, the strategies and capabilities of various oil exporting economies has also shifted over that timeframe.

A strategic review of the SPR should take several issues into consideration.

First, the nature of future oil supply disruptions and vulnerabilities. Since the creation of the International Energy Agency there have been a number of major supply disruptions and three coordinated strategic stock releases and a number of SPR exchanges. None of these releases were for the intended purpose as the same supply disruption in the Middle East, but arguably each provided economic insulation from geopolitical and natural disaster related supply disruptions. The severity of a supply disruption is often measured in terms of oil supply loss in duration, but the economic impact of that disruption depends on other factors such as overall market conditions at the time, the crude qualities, seasonal factors, logistics and spare production capacity. This means answering a simple question about what we were guarding against quite complex.

Second, optimal structure and composition of the U.S. SPR as part of a broader energy security strategy. The SPR is only one of several policy tools the United States has to provide resilience in the face of an oil supply disruption. Long term policies committed to greater vehicle efficiency, multimodal transportation, infrastructure protection and fuel site source diversification are also critically important. The SPR plays an important and complimentary role to these policies. Thus far the United States has chosen to pursue an almost entirely crude-based, government-managed stockpile with the notable exception of the heating oil reserve and gasoline reserve in the Northeast. This is not the approach taken by many other countries. It's important to note that many other countries have a mix of public and privately held stockpiles of both crude and petroleum products. As the United States considers modernization of the SPR, a key question to be answered is what is the most effective composition, size and quality of the U.S. SPR going forward?

And finally, the adequacy of the global strategic stock system is a valid question. The U.S. SPR does not exist in isolation and it is, in fact, used in coordination with certain members of the international community. The International Strategic Stock System plays an important role in protecting the global economy against unforeseen oil supply disruptions. When created the IEA represented the majority of oil consuming and import dependent countries. OECD economies were three quarters of the global oil demand in 1970 compared to 50 percent today. Going forward emerging markets and developing economies share of global oil demand is expected to grow even further.

China has since 2001 been in the process of creating its own strategic oil stockpiles and domestic system for deciding upon how to release those supplies in the event of a disruption. India has also signaled its intent to create oil stockpiles but is less far along.

Whether and how these future stockpiles should be coordinated with OECD strategic stock system is an important area for policy-making consideration.

In conclusion the last 40 years have proven time and again that we, as analysts, policymakers and market participants should be humble about our ability to forecast future oil market dynamics and take prudent measures to protect against unanticipated supply disruptions. If my memory serves me correctly it was about 10 years ago that the U.S. Congress voted to increase the capacity of the SPR to one billion barrels of oil.

The strategic review underway at the U.S. Department of Energy and recommended by this Committee are prudent and important courses of action. Efforts by other Committees in Congress to sell portions of the SPR before that important review is completed are shortsighted, and I recommend that you wait until the results of the final review before making any of those decisions.

Thank you very much.

[The prepared statement of Ms. Ladislaw follows:]

CSIS | CENTER FOR STRATEGIC & INTERNATIONAL STUDIES

Statement before the Senate Committee on Energy and Natural Resources

"MODERNIZATION OF THE STRATEGIC PETROLEUM RESERVE AND RELATED ENERGY SECURITY CONSIDERATIONS"

A Testimony by:

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October 6, 2015

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Good afternoon Chairman Murkowski, Ranking Member Cantwell, and members of the Committee. Thank you for the opportunity to testify today on the *potential modernization of the Strategic Petroleum Reserve and related energy security issues*. My name is Sarah Ladislaw and I direct the Energy and National Security Program at the Center for Strategic and International Studies (CSIS). CSIS is a bipartisan, nonprofit organization headquartered in Washington, D.C. The CSIS Energy and National Security Program provides strategic insights and forward-thinking policy guidance that balances economic, environmental, and security priorities against market and geopolitical uncertainties. My remarks and written testimony represent my views and not the views of my colleagues or CSIS as an institution.

The Strategic Petroleum Reserve (SPR) is not only one the world's largest government-owned and managed emergency stockpile of crude oil, it is also part of a much larger, globally coordinated system of emergency petroleum supplies that have been around since the oil market disruptions in the mid-1970s. These strategic stockpiles are perhaps one of the most visible and enduring examples of shared energy security policies among the world's major energy consumers. The SPR is a fundamental pillar of that system. At the same time, a great deal has changed since the advent of the global strategic stock system and the creation of the U.S. SPR. While the current context of oversupplied markets, low oil prices, and record levels of U.S. production may obscure the dangers of an oil supply disruption, it is important to be clear-eyed about existing threats facing global oil markets and the economic vulnerability associated with a potential disruption. The last forty years have proven time and again that we as analysts, policymakers, and market participants should be humble about our ability forecast future oil market dynamics and take prudent measures to protect against unanticipated supply disruptions.

In February 2015 the CSIS Energy and National Security Program published a report titled *Delivering the Goods: Making the Most of America's Evolving Oil Infrastructure* which describes the changes to the North American oil supply delivery system resulting from the surge in U.S. oil production and proposes five key areas of policy concern that arise from these changing market conditions. Modernization of the U.S. SPR was one of the five issues identified - along with addressing crude oil exports, rail and pipeline safety issues, Jones Act provisions, and climate and environmental policies. Much of the testimony below is taken from this report, though the opinions expressed therein are my own and not necessarily those of my co-authors.

Background on the U.S. Strategic Petroleum Reserve[1]

The United States began discussing oil stockpiles as early as World War II. Then, in 1973, the Organization of Arab Petroleum Exporting Countries imposed an oil embargo on the United States in retaliation for supporting Israel in the 1973 Yom Kippur War. The embargo caused a significant spike in oil prices and contributed to a recession in the United States, which was then heavily dependent on oil both for transportation and for electricity generation. Major oil

[1] This section of testimony is taken from the CSIS publication *Delivering the Goods: Making the Most of America's Evolving Oil Infrastructure*.

consuming nations responded to the economic disruption of the 1973 embargo by creating the International Energy Agency (IEA), a new international organization under the rubric of the Organization for Economic Cooperation and Development (OECD). The IEA is dedicated to promoting energy security by increasing market transparency, reducing demand in consuming countries, and providing an international legal framework for responding to supply disruptions through the coordinated release of strategic stocks. Consuming nations are bound by the treaty to hold emergency supplies equivalent to 90 days of net imports of petroleum.[2] It was left to individual countries to determine the composition of the stocks (crude oil versus products) and how the stocks would be held (through the government or privately held).[3]

In order to comply with the IEA treaty and to bolster U.S. energy security, Congress created the Strategic Petroleum Reserve. The SPR's primary mission is to provide an emergency response mechanism to support U.S. energy security by storing and supplying crude oil to mitigate the impact of a severe crude oil supply disruption. The SPR section of the Energy Policy and Conservation Act (EPCA) of 1974 is the domestic implementing legislation that delineates how the United States will fulfill its international obligations under the Agreement on an International Energy Program.[4] The legislation authorized the U.S. Department of Energy to manage the reserves up to a capacity of 750 million (later revised to 1 billion) barrels of crude oil (the U.S. government holds limited product stocks[5]). EPCA allows a drawdown of these stocks either due to a supply disruption or to carry out obligations under the IEA's international energy program. In order to authorize a release of SPR oil, the president must find that there is a "severe energy supply interruption" (in response to the Exxon Valdez oil spill, SPR was amended in 1990 to allow for drawdowns in the event of domestic interruption) or find that the drawdown is required by international obligations.

Currently, the SPR holds about 691 million barrels of crude oil at four sites on the U.S. Gulf Coast, with an effective capacity of 700 million barrels.[6] At the time it was conceived, it was imagined that SPR oil would replace foreign imports to the Gulf Coast. Consequently, the system was designed to move crude oil both from storage to Gulf refineries and from the Gulf Coast to

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[2] In the initial treaty, it was 60 days and was later revised upwards. In some countries, the agreement has treaty status; in the United States, though, it was not ratified by the Senate and has the legal status of an international agreement.

[3] For more on the background and history of the International Energy Agency (IEA), see IEA; "History," http://www.iea.org/aboutus/history/.

[4] The full agreement is available online. See IEA, "Agreement on an International Energy Program, as Amended 25 September 2008," https://www.iea.org/media/ieawebsite/about/iep.pdf.

[5] The United States does have a 2 million barrel privately held but government-owned home heating oil reserve in the Northeast, and it has announced plans to create a 1 million barrel privately held but government-owned gasoline reserve. However, the recent FY2015 spending bill prohibits the Department of Energy from creating any crude product reserves without appropriated funds from Congress.

[6] John Shages, *The Strategic Petroleum Reserve: Policy Challenges in Managing the Nation's Strategic Oil Stock* (Washington, DC: Energy Policy Research Foundation, July 2014), http://eprinc.org/wp-content/uploads/2014/07/EPRINC-Shages-SPR-July-11-2014.pdf.

the Midwest and East Coast via three main pipeline distribution systems in the Gulf.[7] It was also designed to move crude to port facilities, primarily the Louisiana Offshore Oil Port (LOOP), and from there to the East Coast.[8] The maximum drawdown capacity for these sites is 4.4 million barrels per day for 90 days, declining thereafter.[9]

Drivers of Change

The North American production surge and its impact on midstream infrastructure raise an immediate question about whether those changes limit the ability to move SPR oil resources to market as needed or intended in the event of a disruption. Understanding how SPR oil actually gets to market is critical to grasping the potential logistical problems that increasing oil production creates for the SPR. While the U.S. government owns and controls the oil itself, along with the four sites in which it is stored, the government does not own or control delivery systems to move SPR oil to markets. In the event of a release, the U.S. government puts the oil up for auction. Winning companies are required to make the necessary arrangements to move the oil from the point of local delivery to processing centers. In other words, SPR oil is dependent upon existing commercial infrastructure, including the existing pipeline system and waterborne loading and unloading facilities, to move oil to refineries.

Rising domestic production and new pipeline configurations potentially upend the assumptions on which the SPR logistical distribution system relies. When the SPR was conceived and over the intervening decades, it had been assumed that any disruption resulting in an SPR release would *necessarily* mean that there would be plenty of commercial availability in the U.S. pipeline distribution system. Because of the United States' growing crude oil import dependence, most of the oil flowing through the midstream system in the Gulf Coast would likely be foreign oil. In the event of a foreign supply disruption, Gulf Coast pipelines would be mostly empty, and there would be plenty of room for SPR oil in the system. However, domestic production today is increasing utilization of Gulf Coast infrastructure. The logistical concern is that SPR oil and domestic production would compete for space in the pipeline system and at the LOOP with any SPR release.

The most immediate difficulty, then, is that the infrastructure relied upon to move SPR oil to market is at capacity and might not be able to accommodate SPR oil in the event of a foreign disruption. The second difficulty is that, because of changing volume and location of U.S.

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[7] The Texoma system, the Seaway system, and the Capline system.

[8] The Louisiana Offshore Oil Port (LOOP) is the United States' deepwater terminal for handling waterborne crude oil imports, located in the Gulf of Mexico about 18 miles off the Louisiana coast. Connected through a series of crude oil pipelines to much of the U.S. refining capacity, the LOOP can import as much as 1.2 million barrels per day. See EIA, "Louisiana State Profile and Energy Estimates," last modified November 20, 2014, http://www.eia.gov/state/analysis.cfm?sid=LA.

[9] Based on current import and consumption levels, the SPR could meet U.S. demand levels for about 94 days. See U.S. Department of Energy, "SPR Quick Facts and FAQs," http://energy.gov/fe/services/petroleum-reserves/strategic-petroleum-reserve/spr-quick-facts-and-faqs.

production, the Seaway pipeline, a major pipeline in the SPR delivery system that connects the oil trading hubs in Oklahoma and Texas, was reversed in 2012 to accommodate the surge of crude oil moving from the Midwest to the Gulf Coast. In other words, even if there were space available, it would be of no use in an emergency because it is pumping oil in the wrong direction to effectively distribute SPR oil to the rest of the country in an efficient manner. In short, assuming that SPR oil is released, increasing production of oil in the Midwest and the Gulf Coast—and infrastructure changes to accommodate those production changes, such as the Seaway reversal—may have made it considerably more difficult to move it to market.[10]

In the immediate term, policymakers need to assess whether current infrastructure is capable of handling the outflow of SPR oil in the event of a foreign disruption, given current production levels, and what options exist as alternatives to ensure oil can get to market. The Department of Energy (DOE) conducted a test sale of 5 million barrels in March 2014 in order to assess capabilities in light of recent changes to pipeline infrastructure. While there were no immediate and pressing issues getting the oil to market, DOE nonetheless concluded that pipeline capacity is limited in some areas, and during the test sale purchasers had problems getting pipeline capacity for preferred deliveries and had to place oil in temporary storage until pipeline capacity became available. According to DOE officials, the issue is not simply about pipeline capacity but also about marine distribution and storage capacity. They concluded that their test sale "highlighted changes in distribution infrastructure in the Gulf Coast region. Changes in oil markets have implications for commercial infrastructure investment in the region and the entire SPR. The SPR needs to conduct follow-on analyses of potential commercial infrastructure investments and options to ensure future SPR marine distribution capability."[11] The Department of Energy's Inspector General has also concluded that the actual SPR drawdown rate, which was below the stated rate during the test sale, is at further risk due to maintenance issues in the SPR storage sites.[12]

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[10] Logistical constraints are not the only impediment to the SPR realizing its maximum drawdown rate. The DOE's inspector general recently released a report that found the SPR's drawdown readiness was compromised due to suspension and deferral of various maintenance and remediation activities. See U.S. Department of Energy, *Office of Inspector General Audit Report: The Strategic Petroleum Reserve's Drawdown Readiness* (Washington, DC: Department of Energy, July 2014), http://energy.gov/sites/prod/files/2014/07/f17/DOE-IG-0916.pdf.

[11] U.S. Department of Energy, "Strategic Petroleum Reserve Test Sale 2014: Report to Congress, November 2014," http://energy.gov/sites/prod/files/2014/11/f19/2014%20SPR%20Test%20Sale%20Final%20Report.pdf.

[12] Another recent study also suggested that there is a mismatch between the SPR's design and its use, resulting in costly maintenance issues. The report suggests that there are two alternatives: investing in the SPR or reducing its capabilities. The report suggests that the second is occurring by default with little policy debate about the SPR's utility. See Shages, *The Strategic Petroleum Reserve.*

DOE anticipates that $1.5-2 billion is need to increase the distribution capacity of the SPR by adding dedicated marine loading dock capacity on the Gulf Coast and undertaking a necessary life extension program including surface infrastructure and additional brine-drive caverns.[13]

Modernizing the SPR

While I firmly believe the maintenance of the current SPR capabilities is an important strategic imperative for U.S. energy security, the question of how best to modernize the SPR requires further exploration. The strategic review underway at the U.S. Department of Energy and recommended by the legislation passed by this committee are a prudent and important course of action. Efforts by other committees in Congress to sell portions of the SPR to fund other Congressional priorities should be mindful of the important role that the U.S. SPR plays to ensure overall U.S. and global oil security and wait until the results of this careful review before attempting to sell down portions of the reserve.

A great deal has changed since the global strategic stock system and U.S. SPR were created which further serve make an assessment necessary and important. Oil markets are different and so are the players. First, oil plays a different role in the economy than it did in 1974. Half of all oil consumed today is for transportation (closer to 60 percent in OECD) compared to 35 percent in the 1970s. According to the IEA, this concentration of oil usage in transport "accentuates the potential economic impact of a supply disruption" because of the low price elasticity of transportation fuel and the broad reach of transport fuel costs into others sectors of the economy.[14] Second, oil trade flows are shifting. The production surge in North America, combined with growing oil demand in Asia means oil increasingly travels east instead of west from major production centers. According to IEA analysis, between 2012 and 2018 crude trade flows traveling to OECD economies are expected to drop by 5.2 million barrels per day, compared to an increase of 3.7 million barrels per day heading to Non-OECD countries in the east.[15] Moreover, the trend toward refining crude closer to production centers means that global trade in crude oil is likely to decline in the coming years in favor of greater product trade flows. Finally, OPEC now makes up a smaller share of global oil supply: OPEC produced half the world's oil in 1974 compared to around 40 percent today.

Such a review should address three critical issues:

1) *Nature of future oil supply disruptions and vulnerabilities*

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[13] Statement of Christopher Smith Assistant Secretary for Fossil Energy U.S. Department of Energy Before the Subcommittee on Energy and Power Committee on Energy and Commerce U.S. House of Representatives, April 30, 2015. http://energy.gov/sites/prod/files/2015/06/f22/4-30-15_Christopher_Smith%20FT%20HEC.pdf

[14] International Energy Agency, "Energy Supply Security 2014," https://www.iea.org/media/freepublications/security/EnergySupplySecurity2014_PART1.pdf, P.19

[15] International Energy Agency, "Energy Supply Security 2014," https://www.iea.org/media/freepublications/security/EnergySupplySecurity2014_PART1.pdf, P. 18

Undertaking changes in the structure of the SPR requires new consideration of the SPR's purpose in a world in which U.S. consumption is declining and production has been increasing until recently. Since the creation of the IEA there have been a number of major oil supply disruptions and three coordinated strategic stock releases and a number of SPR exchanges. None of the releases were for large, sustained supply disruptions in the Middle East but arguably each provided economic insulation from geopolitical and natural disaster related oil supply disruption. The severity of a supply disruption is often measured in terms of oil supply loss and duration but the economic impact of the disruption depends on other factors such as the overall market conditions at the time, the crude quality, seasonal factors, logistics, and spare production capacity.

2) *Optimal structure and composition of the U.S. SPR as part of broader energy security strategy*
Along with the changing U.S. energy profile, these issues raise the need for a broad policy conversation about the threats facing global oil supply security, the most effective composition (i.e., crude oil or products or a mix of the two), size (i.e., the volume of oil stored), and quality (i.e., the type of crude oil stored) of the U.S. SPR and the overall functioning of the system of global strategic stocks.

3) *Adequacy of global strategic stock system*
The international strategic stock systems plays an important role in protecting the global economy against unforeseen oil supply disruptions. When created, the IEA represented the majority of oil consuming, import-dependent countries. OECD economies were three quarters of the global oil demand in the 1970s, compared to less than 50 percent today. Going forward, emerging market and developing economies' share of global oil demand is expected to grow even further. China has, since 2001, been in the process of creating its own strategic oil stockpiles and a domestic system for deciding upon when and how to release supplies in the event of a disruption. India has also signaled its intent to create oil stockpiles but is less far along. Whether and how these future stockpiles should be coordinated with the OECD strategic stocks system is an important area for policy consideration.

Conclusion

The rapid and unanticipated reversal in U.S. crude oil supply and demand underscores that U.S. policymakers are not omniscient when it comes to predicting shifting energy landscapes. One need not look much farther than the precarious international security environment, shaky political and economic foundation in many of the world's major oil producers, and persistent domestic and international infrastructure vulnerabilities to understand that the world oil supply security is far from guaranteed. It is not possible to rule out another rapid and unanticipated reversal in the U.S. supply-demand balance. A strategic review that takes into account the array

of possible energy supply-demand balances for the United States, changes to the global strategic stock system and oil markets, and evolving expectations and lessons about supply disruption expectations is essential to making the right decision about the future of the SPR.

The CHAIRMAN. Thank you, Ms. Ladislaw.

Thank you all for your comments here this morning. I listened to the testimony from each of you after the comments that we heard from the Secretary, and again, I am just beside myself as to why we are having this discussion in Congress right now about how much we are going to sell off from the Strategic Petroleum Reserve to fund, whether it is the Transportation bill or anything else out there. Each of you have mentioned the issue of spare capacity and how it is just not what it once was. Each of you has mentioned the issues as they relate to the volatility of the world at large right now, the geopolitical issues that we are facing.

We have some inherent geographic issues that have not changed. The fact that you have significant oil coming out of the Middle East that goes through a choke point that is inherently dangerous and seemingly more so as the world just becomes just more tense and more volatile. The fact that you have all recognized that the Strategic Petroleum Reserve really is this short term defense to offset the supply disruption.

This is what we have that we can use quickly, but we can only use this stockpile quickly if it functions as we have set it up to function. This is where, I think, we have a little breakdown in communication amongst, perhaps, your policymakers here, who think that the draw down, our ability to draw down a certain amount, is all that we need to know. The draw down needs to be able to work with our distribution ability right now.

As you have outlined, we have all kinds of changes that have come about. Whether it is the flow of oil from North to South now moving from South to North, capacity restraints, the issues or the limitations within our ports from a maritime perspective as to how we can move it, I do not think people understand that while we have got this stuff sitting in the salt caverns, down primarily in the Gulf area, our ability to move it out to respond is not what we need it to be unless we work toward the modernization that you have discussed and that the Department of Energy has discussed.

We have a situation here in the Congress where we need to be looking critically at this energy security asset, but the asset is only as good as its ability to function and this is where I am more than just a little bit worried.

If there were to be a sale, the first thing that you should do with those proceeds is to work toward the modernization. Whether it is the $800 million that needs to go to the modernization and then the $1.2 or $1 billion that the Secretary had mentioned about how we provide for the marine transport aspect of it, we have got to look critically at this. I do not think that we are having sufficient discussion on that aspect of our Strategic Petroleum Reserve, and I think it is absolutely key.

The question that I am going to ask to you, and I am going to ask you to be quick with your responses, if I may. The metric that is used here, what is happening here in Congress—I do not mean to make it sound like it is just basic math—but you have people who are looking and saying our obligation is a 90-day supply. So all we need to do is look to how many days' supply we have, back out the 90 and that is what we have available for sale. Can you please explain in plain English, very quickly, why that is not the

metric that the Congress should be using when you look at the Strategic Petroleum Reserve?

Admiral Blair?

Admiral BLAIR. Well we can go in the same order, I guess.

The CHAIRMAN. Okay.

Admiral BLAIR. My answer would be that it's not the physical supply that matters. It's the impact on the American economy and the speed and increasing the amount of time we have to solve supply interruptions.

So my prescription for the right answer is to look at a series of scenarios and really think through what we would actually want to do in each scenario and then take a step back and choose a good, prudent amount that would allow us to have that flexibility in most of the cases we can think of; therefore, when it happens we have the flexibility to work with it. We're not tied to some mechanical number that probably is not applicable when an actual event occurs.

The CHAIRMAN. Thank you.

Mr. Book?

Mr. BOOK. Madam Chairman, I think I tried to offer, sort of, a way of thinking about it which was the insurance payoff value relative to its premium. I think that would be the right way to think about it.

The size of the reserve is really a static amount at this point. That oil, unlike the insurance comparison, where if you don't pay your premium and you just walk away from the policy, it's gone. It's here. So we have, actually, a very small carrying cost. If you think about what the modernization might involve to keep it working, it's another $2 billion on top of the $4 billion I gave you over 20 years. So it's $6 billion into $37 billion in yield. That $37 billion is a really low number. I took it to be conservative. What we're talking about is the difference between having oil and not having oil.

Why would you give up this carefully amassed 700 million barrel stockpile, just try to go out into the market and buy 700 million barrels in a hurry? I was meeting with oil traders in New York yesterday, and I can tell you that they would be very, very pleased if you were to bid for that much oil in a rush.

The CHAIRMAN. Thank you.

Mr. Bordoff?

Mr. BORDOFF. I'll just briefly make three points in response to your question.

So the short answer is, in my view, days of import cover is not the right metric in today's oil market to determine how much we keep in a strategic stockpile. The market has changed quite a bit, as we heard, since oil price controls and long term contracts and oil, globally traded oil market, like we have today didn't exist 40 years ago.

The risks that we're guarding against today are adverse impacts to the macro economy, to consumers, as a result of price spikes, and that is going to exist whether we're a large importer or not. We saw during the Gulf War, for example, crude prices spike. We saw the price of gasoline go up, roughly, the same amount in the

United States and in the UK, even though the UK was a net exporter at the time and the U.S. was a very large net importer.

Secondly, I think it's important to remember we've only had this title of boom for a couple of years. While there's good reason to think that as prices recover it will continue and U.S. oil production will continue to grow, U.S. production is declining. It's down about half a million barrels per day so far, month on month, from its high point this year. Demand is up in response to the lower oil price, so there's no guarantee that our imports will remain as low as they are today. I think it's likely they, over time, will continue to decline, but you want to be careful about shedding a 40-year strategic asset in response to a trend that we've seen for a couple of years.

So the question of how to determine the size, I don't have a number. But I suspect the study the DOE is working on would look at things like assessing the impact on the macro economy of price spikes, trying to estimate the likelihood of supply disruptions and associated price spikes. And then, assessing the impact of releasing SPR volumes to mitigate those price spikes and on the level of spare capacity on the market and then you compare those benefits to the carrying and opportunity costs of continuing to hold the SPR.

That's the sort of analysis we should do to answer that question before, I think, we sell a large chunk of it.

The CHAIRMAN. Thank you.

Ms. Ladislaw?

Ms. LADISLAW. Yes, I just want to make, probably, four points.

First is, as Secretary Moniz stated, that's not the only international obligation. If we're actually to use the Strategic Petroleum Reserve, our obligation to how much we draw down and contribute to that collective draw down is actually a different number. So there you have to take that into consideration.

The other is below a certain threshold you don't have the ability or the flexibility and the authority to do the 30 million barrel a day draw down as well. So you want to be careful of that.

Then there's a, sort of, unspoken, sort of, a hard to substantiate element of this which is the size of your reserve kind of matters and it sends a signal to the global economy about what you're willing to put in reserve and how much protection you've got. And so, I think, that given the new found energy position we have in the United States and what we think about the future of that, we have to, sort of, reassess that calculus.

And then fourth is to the extent that you are going to sell down any portion of the SPR, it sort of seems like the Department of Energy has dibs. If you're going to sell it down and the rest of it doesn't work then maybe you haven't invested that money wisely because you actually shrunk the size, and it still doesn't work the way that you need it to.

Lastly, the really important part is this international context. We don't do this alone. In fact our effectiveness is eroded by the international strategic stock system if that's increasingly ineffective.

The way in which we care for, maintain and modernize our SPR actually does send signals to the rest of the international community about how we would like them to participate in that system.

I think it's really important for us to realize that ours is a shrinking share of that system, not a growing one.

So I think that all of those things should be taken into consideration.

The CHAIRMAN. All very good points, and straight to what I raised with Secretary Moniz. It just seems a little crazy that we would be urging China and India to come into this collaborative energy security network while we are thinking about eroding our own. Thank you all for your comments on this.

Senator Cantwell? This is something that we have been working on together, and I think we are certainly of like minds.

Senator CANTWELL. Thank you.

Mr. Bordoff, so you buy into the modernization of the SPR, correct? That it needs——

Mr. BORDOFF. Bottom line I guess it depends what we mean by modernization, but I think it's important.

Senator CANTWELL. Infrastructure improvement.

Mr. BORDOFF. Absolutely. Yes, I think there is an important need to upgrade infrastructure.

Senator CANTWELL. Okay, and would you use SPR sales to do that?

Mr. BORDOFF. I guess I don't have a strong view on that. I think if the money can be appropriated elsewhere that would make sense. If it were the only way to find it was to sell a relatively small amount of SPR crude, I guess would be 40, 50 million barrels, depending on the price, it is an urgent priority. I think it's important that we do it because whether there's 700 or 650, if we can't get into the market at the volume we need it's not going to be effective.

Senator CANTWELL. Okay. In general, do you think of the SPR as a surplus ever or not?

Mr. BORDOFF. Well, again, I think we need to, kind of, do the kind of analysis I just described to figure out, given how much the market has changed and the different kind of risk we're protecting against today than we were 40 years ago. Do we think it can be much smaller and/or in fact should be much bigger? But I think we need to do that work first before we decide to sell a large volume for other purposes.

Senator CANTWELL. So there could be, today, or someday in the future, someplace where you might consider that a surplus?

Mr. BORDOFF. It's certainly possible that given how the market has changed we should make a collective decision to adjust the size, up or down, but I think we should do that work first.

Senator CANTWELL. Okay, thank you.

Mr. Book, I am so glad that you mentioned these private sector efforts, and Ms. Ladislaw, you mentioned these international efforts. This has always been a curious subject for somebody who cares about an aviation industry and how much they took it on the chin with high fuel prices.

Have you seen European countries or others make jet fuel reserves work successfully for them?

Mr. Book, would you have any comment on that?

Ms. LADISLAW. I don't really know very much about jet fuel reserves, in particular, as how they're managed in the European

stock system. I do think that the more you dig away at this question, the more complicated it gets. There is a lot of analysis about the European strategic stock system and the way in which they manage theirs and their own strategic positioning of their refineries over the next several decades that will be changing as well. And so I think if you don't take that into consideration, as you think about the operations of the global strategic stock system, it's really hard to assess ours relative to theirs.

Senator CANTWELL. How do you think they are doing, juxtaposed to us, on this challenge in general? Is it your overall analysis that it is a good idea that they have had those additional reserves or not?

Ms. LADISLAW. It's really a question of how the political expediency of being able to manage it given, you know, their own circumstances. I mean, some countries in Europe actually don't even manage the stocks within their own country. They actually have them positioned in other countries.

So it really is, sort of, I think, it's a mixed bag. I think there's been some criticism about the ability to draw down on something that our private sector held stocks and the ability for those actually to be strategic stocks as opposed to just, sort of, the normal business of those refinery systems.

On the other hand I feel like there's a number of instances where the global economy has actually benefited from the release of their product reserves and the efficiency of some of those systems because they're managed differently relative to our crude releases. So it really is circumstantially——

Senator CANTWELL. So you would not give them a positive mark for having them, so this is something we have not done? We have not, well, except for the home heating oil reserve, which we are going to hear about a little more. But we have not done refined product reserves. We have not done that.

Is the European or the world market result of that a positive? Has that been a positive or has it been neutral or negative?

Ms. LADISLAW. I think in general that the global oil market has benefited from the fact that some of the global strategic stocks are, in fact, in product stocks.

Senator CANTWELL. Okay.

Ms. LADISLAW. And that's been a benefit.

Senator CANTWELL. Okay.

Mr. Book, now tell us about your view on this in general.

Mr. BOOK. No, I think that there's a reason why they have private stocks which is worth considering also which is that we have the best refineries in the world. Their refining system is in decline, and they have a lot of refinery capacity that, for them, is really going to pose a strategic question in the next 5 years. Are they going to decide to keep uneconomic facilities in place or are they going to rely, perhaps, on imported fuels from our refineries?

We're in a different position, and that enables us to make a different choice. For that reason it makes a lot more sense for them to do it than for us.

Senator CANTWELL. And your point is that even though we do have it on home heating oil it really has not helped because the market has not responded quite the way——

Mr. BOOK. Well, I don't——

Senator CANTWELL. Or it has not had an impact on the market in a way that you would like to have seen.

Mr. BOOK. Well, we want to be careful when we say it hasn't helped. Like to the extent that sending signals that there's a reassuring supply there can be useful in calming speculation and hoarding and other negative aspects when it comes to critical resources, sure.

I think sometimes having an insurance policy in place is very reassuring to people who might decide that they needed twice as much heating oil just in case there wasn't enough, but the possibility that all you have done is taken working capital that private companies previously put into inventories and gave them, essentially, a subsidy. Say here guys, go spend it on something that returns a higher value because the Federal Government is going to pick it up.

That is a horrifically uneconomic result, because it leaves you with the same energy security but at greater taxpayer expense. So that's something you would want to avoid.

Senator CANTWELL. Well, I am not sure. Are all the European models done that way, at government expense?

Mr. BOOK. Oh, not at all.

Senator CANTWELL. They are done the opposite, right?

Mr. BOOK. They actually roll into the commercial system.

Senator CANTWELL. Yes.

Mr. BOOK. They have a very different—so the strategic stocks that they have are, in many ways, commingled and reserved as part of the ongoing capacity in the European system.

Senator CANTWELL. I think it just shows a different way of looking at things.

I have always been perplexed by our dear colleagues who had to pay so much on home heating oil.

There are parts of the Northwest, Seattle, North Seattle, there is still some home heating oil. But for the most part this is not something that we deal with. When you deal with certain regions, and we have members of our Committee and have had members of our Committee, it is a very, very big issue. So you wonder what we could do to help alleviate some of that very costly challenges the consumers face on heating oil.

Madam Chair, thank you for this important hearing, and we will continue to work with you and others and try to figure out a path forward.

I certainly believe we need to make the investment here to modernize and to keep the Strategic Petroleum Reserve. I certainly believe that we need to come up with a resource, as I mentioned a number today, but I think we have to get that number and make the investment.

So thank you for the hearing.

The CHAIRMAN. Senator Cantwell, thank you.

And to each of you, thank you for being here today and for giving us a little extra time here this afternoon. We appreciate the consideration. Thank you.

We stand adjourned.

[Whereupon, at 1:05 p.m. the hearing was adjourned.]

APPENDIX MATERIAL SUBMITTED

Department of Energy
Washington, DC 20585

January 28, 2016

The Honorable Lisa Murkowski
Chairman
Committee on Energy and Natural Resources
United States Senate
Washington, DC 20510

Dear Madam Chairman:

On October 6, 2015, Secretary Ernest Moniz testified regarding the examination of the potential modernization of the Strategic Petroleum Reserve and related energy security issues.

Enclosed are answers to eight questions that were submitted by Senators Bill Cassidy, Joe Manchin III, and Mazie Hirono to complete the hearing record.

If you need any additional information or further assistance, please contact me or Lillian Owen, Office of Congressional and Intergovernmental Affairs at (202) 586-5450.

Sincerely,

Jaime Shimek
Deputy Assistant Secretary for Senate Affairs
Congressional and Intergovernmental Affairs

Enclosures

cc: The Honorable Maria Cantwell
Ranking Member

Printed with soy ink on recycled paper

QUESTIONS FROM SENATOR BILL CASSIDY

Q1. In his testimony before the House Energy and Commerce Committee, Assistant Secretary for Fossil Energy Christopher Smith stated, "Today, the impacts of an overall supply disruption of global oil markets would have the same effect on domestic petroleum product prices, regardless of U.S. oil import levels or whether or not U.S. refineries import crude oil from disrupted countries". If the SPR does not protect us from disruptions in international markets, simply what is the purpose of the SPR?

A1. The global oil market has evolved significantly since the Strategic Petroleum Reserve (SPR) was established in 1975. U.S. crude oil production has increased dramatically, our crude oil imports are declining, and oil is the most liquid traded commodity in the world. In today's global oil market, to which the U.S. is linked by our oil consumption and growing levels of product exports, the U.S. is exposed to global price volatility and price spikes. U.S. wholesale gasoline prices track international wholesale crude oil prices. When global prices spike, U.S. prices spike. A global crude oil supply disruption anywhere affects oil prices everywhere. U.S. consumers are vulnerable to the impact of foreign supply disruptions despite reduced crude oil import levels. The value of the SPR in today's global oil market is to protect the U.S. economy in the event of a global oil supply disruption.

Q2. Recent reports have highlighted how the Department of Energy (DOE) is poised to return $2.48 billion in unspent stimulus funds to the Treasury. The same reporting describes how four carbon-capture and storage (CCS), and sequestration grants account for more than half of that figure. Of the money being returned to the Treasury, $1.27 billion had been set aside for CCS projects that failed to win agency approval. One of the most prominent shortcomings in this stimulus funding of CCS technology occurred in my home state of Louisiana. The Lake Charles project was supported by DOE in 2009, and was supposed to convert petroleum coke into synthetic gas for methanol, hydrogen and other products, while also capturing carbon dioxide that would be pumped into depleted oilfields to enhance their production. The department provided $261 million of the $436 million price tag, yet its industry partner canceled its involvement with the project citing "the likely ultimate cost of completion". Given the drawdown of interest from industry to use available stimulus funds to finance CCS projects, does the administration still believe that government investment in this technology is an efficient and effective use of taxpayer money within the context of a national energy strategy?

A2. Because fossil fuels will continue to be an important part of the U.S. and international energy portfolio as we move toward a low-carbon future, carbon capture and storage (CCS) remains a vitally important clean energy and climate mitigation strategy, and thus a critical component of a national energy strategy. The International Energy Agency

(IEA) and the United Nations Framework Convention on Climate Change (UNFCCC) recognize the role CCS will play in a clean energy future and the need for continued investment and development of this important technology[1]. Deployment of any new technology is a challenge and while several projects did not go forward, many projects have been successful. In April 2015, DOE funded carbon sequestration projects that have stored over 10 million tonnes to date in deep geologic formations. The Department remains committed to advancing CCS through deployment at commercial-scale and the development of next generation technologies that help to increase efficiency and continue to further drive down cost.

Q3. Reports have indicated that European nations are diversifying their energy portfolios in preparation for Iranian oil entering the market. This diversification is an attempt to thwart Russian influence in the region through increased "energy independence". How will the influx of Iranian oil into European markets impact the ability of the international community to impose snapback sanctions against Iran, should they become necessary?

A3. The importation of Iranian oil by European countries will not limit the international community's ability to impose "snapback sanctions" against Iran. Sanctions promulgated in 2012 targeted Iran's key energy and financial sectors, forcing Iranian oil exports to fall from pre-sanctions levels of between 2.5 million and 2.6 million barrels per day (bpd) to between 1 and 1.1 bpd by mid-2013. Under the Joint Comprehensive Plan of Action (JCPOA), the United States and its partners will maintain a wide range of options to deal with any failure by Iran to fulfill its nuclear-related commitments, including the ability to reinstate both national and multilateral nuclear-related sanctions. Transactions conducted after such a snap-back occurs could be sanctionable to the extent they implicate activity for which sanctions have been re-imposed. Should snapback sanctions be imposed, European countries would likely return to importing oil from other countries with similar quality crude grades, such as Saudi Arabia, Kuwait, Nigeria, Angola, and Iraq, according to the Energy Information Administration (EIA).

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[1] See http://unfccc.int/resource/docs/2014/tp/13.pdf or http://www.iea.org/publications/freepublications/publication/TechnologyRoadmapCarbonCaptureandStorage.pdf

Q4. During the debate over highway funding, Senator Markey and I introduced and passed an amendment that would allow you and your successor greater flexibility to adjust sales based on market prices in order to maximize the financial return to taxpayers and sell less oil from the reserve. To this point of market flexibility, the federal government received $468 million from the 2014 test sale of the SPR resources, a $227 million profit after the repurchase of 4.2 million barrels of oil. Subsequently, a portion of that money was used to fund other projects within the Department of Energy, such as the creation of the Northeast Gasoline Reserve. Do you think this process of monetizing portions of the SPR in a constrained fiscal environment is an effective tool for the Department and the federal government as a whole? Do you believe the Department has the flexibility necessary to make prudent decisions on timing a drawdown to maximize the return on investment if required to do so by statute? If a drawdown of reserves is forthcoming, and we have capacity to hold more oil, wouldn't it be prudent to buy more heavy crude now at a low price and sell light sweet at later date when prices are higher?

A4. The Strategic Petroleum Reserve (SPR) is our Nation's most central Federal energy security asset, and should be treated as such. It is critically important to make investments necessary to modernize the SPR so that it can continue to support U.S. energy security in what remains a volatile oil market. As required by the Bipartisan Budget Act of 2015 (P.L. 114-74) the Department is conducting a Strategic Review of the SPR, including the appropriate size and configuration of the Reserve. The Act requires submission of this Review to Congress in May, 2016.

Emergency and test sale release authorities for the SPR are contained in the Energy Policy and Conservation Act of 1975, as amended. EPCA details how the receipts from emergency and test sales are to be used. The Bipartisan Budget Act and the Fixing America's Surface Transportation Act both recently enacted non-emergency (and non-test sale) SPR oil sales. The Department will fully comply with the requirements of all enacted legislation.

The SPR currently does not have sufficient storage capacity to purchase more crude oil. Further, there are no funds available to purchase more crude oil. Additionally, the Department conducted a study in 2010 that examined the need to store heavy oil as part of the SPR's inventory, and concluded storage of heavy oil was not necessary, and in fact would limit the SPR's ability to respond to non-heavy crude oil supply disruptions. Finally, as required by the Bipartisan Budget Act of 2015 the Department is conducting a Strategic Review of the SPR.

QUESTIONS FROM SENATOR JOE MANCHIN, III

Q1. The EIA Annual Energy Outlook forecast for net crude oil imports into the U.S. doesn't fall below 4 million barrels per day, even under the most optimistic High Resource scenario, indicating that the U.S. will be significantly dependent on such imports, primarily for transportation fuels, for at least a couple more decades.

When I spoke with former Department of Energy Secretary Chu, he agreed that coal-to liquids (CTL) technology, that incorporated biomass feedstock (CBTL), as well as carbon capture and sequestration (CCS), could offer a low carbon (or even negative carbon) liquid fuel production technology. If this technology can be proven to be technically and economically viable, the nation could consider its vast coal reserves as an enormous potential source of low carbon, liquid fuel supplies. Even establishing the breakeven point for economic viability would be extremely valuable, as it would inform the U.S. of a price ceiling beyond which it could rely on its own domestic resources, if necessary.

The 0.7 billion tons of crude oil that is held in the SPR, remains a critical, energy security asset for the U.S. that must be maintained for near-term responses to energy crises. With regard to longer-term energy security, the U.S. is estimated to have 250 billion tons of coal reserves which could be converted to low carbon, liquid fuels at roughly 2 barrels per ton. This represents nearly double the long promoted, but uncertain, Saudi Arabian crude oil reserve estimate of 260 billion barrels. Our coal reserves are well documented and widely dispersed throughout the U.S. with available transportation and distribution infrastructure. In effect, they represent an existing transportation feedstock storage facility, securely in place, without need of maintenance and 725 times larger than the SPR. What is lacking to allow this tremendous energy resource to become a genuine liquid fuels asset is the demonstrated refining technology for coal and biomass to liquids, integrated with carbon capture, utilization and storage (CBTL with CCUS).

West Virginia is in the midst of another tremendous energy opportunity opening for the U.S., with the rapid growth of unconventional natural gas production, which has helped make the U.S. the number one producer of oil and gas in the world. However, it makes little sense to use much of this new resource in zero-sum electricity market competition with another traditional energy resource, rather than allowing each resource to cumulatively contribute to the U.S. economy through higher value end uses that they are uniquely qualified for. Given the nation's ongoing energy security vulnerability for crude oil and the higher-value, coal-resource opportunity available to the nation, it would be advantageous to resolve the technical and economic uncertainties preventing deployment of CBTL with CCUS. Might the State of West Virginia, due to its unique combination of an established coal economy and infrastructure as well as applicable scientific resources for the advancement of research in the required direction, be considered for a pilot scale demonstration of CBTL with CCUS?

A1. Many of the technical components for a coal and biomass to liquids (CBTL) facility are already commercially available. The Department of Energy's (DOE) research, development,

and demonstration (RD&D) activities are focused on reducing the cost, improving the efficiency, and addressing the risk associated with CCUS. While the emphasis of these efforts are on coal-fired power plants, the technologies developed may also be integrated and have applicability to CO_2 emissions from CBTL plants.

Q2. Chairman Murkowski's OPENS Act would lift the 40-year old domestic crude oil export ban. I believe such a step could improve our national security by offering our allies a more stable source of oil, competing directly with countries like Iran who sell the same oil as the U.S., and, as EIA also recently estimated, potentially drive down the world price of oil.

However, we must also ensure that the price at the pump does not increase on American consumers. That's why I'm so thankful Chairman Murkowski added in my provision to the Act which would allow the President to cut off exports if the Commerce Department, in consultation with DOE, reports that exporting crude oil has increased the domestic price of oil or if supply changes will harm employment in the U.S.

Do you believe that the Department of Energy will be able to determine whether the export of domestic crude oil is a direct cause of sustained material supply shortages or sustained oil prices, significantly above world market levels, within the U.S.? Additionally, would DOE be able to contribute to an analysis of whether those supply shortages or price increases have caused or are likely to cause sustained material adverse employment effects in the U.S.? If so, how would you work with the Commerce Department to ensure such findings are made in a timely manner to the President?

A2. The Energy Information Administration (EIA) has examined similar impacts as part of its study "*Effects of Removing Restrictions on U.S. Crude Oil Exports, September 2015.*" Additionally, EIA's monthly *Short-term Energy Outlook* (*STEO*) provides an update on—and outlook for—the price, supply (including storage), and demand for oil and other key commodities, as well as the accompanying region-specific household expenditures on key fuels. More generally, the Department continuously monitors and analyzes the energy markets and crude oil markets in particular to assess the possible impacts on consumers and the nation's economy. These analyses and data are regularly provided to policy makers and the administrators of crude oil export regulations at the Department of Commerce so that informed policy actions can be made. The Department will continue to perform these functions in the future to ensure that data and analyses are provided in a timely manner.

QUESTIONS FROM SENATOR MAZIE HIRONO

Q1. On page 8 of your testimony, you discuss the limits of one-size-fits-all solutions for energy infrastructure security and the corresponding need for regional solutions for energy reliability and resilience. How can a non-contiguous state like Hawaii benefit from the modernization of the Strategic Petroleum Reserve and other security improvements to energy infrastructure recommended in the Quadrennial Energy Review?

A1. The U.S. remains a large oil consumer and is a large oil product exporter; this directly ties us to a global oil market where supply disruptions anywhere can increase prices and energy security concerns everywhere. While oil prices are low today, they remain volatile. Maintaining a well-functioning Strategic Petroleum Reserve (SPR) can calm oil markets, serve as a deterrent to those who would use oil as a political weapon, and provide a quick response tool to mitigate the impacts of supply disruptions on our economy and American consumers across all states, including Hawaii. However, the SPR's ability to provide strategic and economic security against oil supply disruptions that impact American consumers will remain diminished if investments to repair and replace aging infrastructure and modernize the SPR's capabilities are not made. The SPR modernization we have proposed will extend the life of the SPR and improve its ability to distribute crude by ship – especially important to Hawaii, which imports crude for its refineries from the Middle East and Asia.

Q2. The United States is producing more light oils, but a large share of our refining capacity is currently oriented toward processing heavy oils. That is due to the investment decisions made by oil and refining companies over the last couple of decades under the assumption that the United States would be relying on heavy oils imported from Venezuela, Mexico, and elsewhere. Would the energy security of the United States increase if companies were to invest in processing U.S. light oils, and to what extent would such investment be hurt if Congress removed the longstanding ban on the export of oil?

A2. As a result of the integrated nature of the global crude oil and refined product market, the energy security of the United States is unlikely to change as a result of additional investment in processing light oils. Increased domestic production of light oils over the past several years has been absorbed, in part, by reducing oil imports of similar grades. In addition, many U.S. refineries have made investments to process a greater share of lighter crudes to take advantage of the greater availability of these crudes. Going

forward, the market's ability to absorb any changes in U.S. production will depend on a variety of factors including oil supply and demand and changes to U.S. refinery capacity. U.S. refiners are well adapted to weighing the risks of making capital investments against uncertainty. Given that the outlook for future U.S. light oil production growth is much lower than it has been in past years due to current low world oil prices and an oversupplied world oil market, refiners will not likely be faced with a rapidly changing U.S. crude slate. At current production levels, and production levels expected in EIA's Reference oil production scenario, the U.S. refining system can absorb domestic oil production.

Question from Senator Mazie K. Hirono
Answer Provided by Admiral Dennis C. Blair, U.S. Navy (Ret.)
Former Director of National Intelligence and Commander in Chief, U.S. Pacific Command

Question: Your testimony mentions how important it is to ensure that we invest in docks and loading capacity to allow marine access for oil released from the SPR. Drawing on your experience as Commander of the U.S. Pacific Command, could you elaborate on whether expanded marine access for the SPR could help Hawaii and other parts of the Pacific in the event of an oil supply disruption?

Answer: Yes. Investing in marine loading capacity at SPR facilities will help Hawaii and other parts of the Pacific in the event of an oil supply disruption.

At the time of the 1973 oil embargo, the absence of an oil market and price controls in the United States contributed to a physical oil shortage that caused long lines at gasoline stations throughout the United States. Today, we still experience can experience scarcity, but due to the presence of a liquid market for crude oil, scarcity is expressed in the form of higher prices and not actual supply shortages. When supply is disrupted, market participants will bid up the price of a commodity until someone is priced out of the market. Consumers are then forced to deal with the strain of rising prices.

Hawaii's two refineries are supplied with oil that primarily comes from the Indonesia, Malaysia and elsewhere in the Pacific Rim, but often includes oil from the Middle East, and West Africa. But even though Hawaii does not get much crude oil from the continental United States, in the global oil market, an oil supply disruption in the Gulf of Hormuz, Venezuela, Nigeria, or anywhere else in the world, raises prices everywhere, including Hawaii. And even growing U.S. oil production cannot change this; the limits of increased domestic production can be seen by the fact that although U.S. oil imports fell from 13.7 million barrels per day in 2005 to 9.2 million barrels per day in 2014, threats to supply around the world last summer pushed U.S. gasoline prices higher. Lower oil imports today may mean that the U.S. economy as a whole is less vulnerable to oil shocks than it has been in the past. When foreign disruptions raise oil prices, a portion of the price impact benefits producers, and, economy-wide, that may offset some of the damage from high oil prices. However, that is little comfort to American consumers, including those in Hawaii, who suffer at the pump.

Bringing new oil production online takes months or years. But the SPR can deliver crude to market in less than two weeks, and just the knowledge that it is on the way can immediately calm market jitters around the globe, including Hawaii, not just wherever the oil is being delivered. Its existence alone serves as a deterrent to those that might seek to threaten global oil supply for geopolitical gain. In the event of a significant interruption in the supply of crude oil to the global market, especially in periods with low spare production capacity, the SPR, and other nations' strategic reserves, are the only tools available to respond, and mitigate higher prices, in the short-term.

Given the role that the SPR plays in protecting our energy and national security, it is critical that it be available and reliable at all times. Recent changes in U.S. oil production, however, have affected the operation of the SPR. The SPR is located in the Gulf Coast, which is also home to U.S. refining and the primary point from which much of the crude oil refined in the United States is distributed—whether the oil is produced domestically or imported. Because of changing domestic production patterns, however, the Gulf Coast region is now a destination for substantial volumes of crude oil coming from different directions. Shifting production patterns are now likely to leave full oil pipelines, which would have been left with spare capacity in the past in the event of disruptions, and through which oil from the SPR would have been delivered. This evolving use of infrastructure requires a careful assessment to ensure not only that SPR oil can be delivered to market in the event of supply disruptions, but that its delivery is incremental and that it does not displace private oil.

Specifically, growth in U.S. crude oil production has resulted in greater volumes of domestic crude moving into U.S. pipelines and marine terminals than in the past, often moving in different directions. As our energy landscape has changed, the Gulf Coast region has transformed from the source of much of the oil consumed in the nation to the destination of much of the oil produced in the nation. Because of these shifting patterns, a foreign supply disruption may not result in substantially less oil being delivered to the United States, and may not free up distribution capacity to move incremental barrels of SPR oil from the SPR facilities to the market. This raises the possibility that it may be difficult to use oil from the SPR to replace shortages by putting incremental barrels of crude oil on the global market in the event of a supply interruption, obviating the value of the reserve. If the SPR cannot deliver incremental barrels of oil to the market in the event of a supply emergency, it cannot mitigate the price effects of a supply interruption.

It is critical that this distribution problem be addressed. Being unable to add incremental barrels of crude oil to the market in the event of a supply disruption would be akin to owing an insurance policy that does not provide any benefits. If we cannot ensure that the SPR will be able to deliver incremental barrels of oil to the market in the event of a supply emergency, there is no point in having such a reserve.

The most reliable means to assure that SPR oil can be delivered with the greatest flexibility is to build docks and loading facilities that would allow oil from the SPR to be loaded onto marine vessels in the event of a supply disruption. Marine transportation is inherently more flexible than transport by pipeline, rail, or truck, and offers the nation – and in fact the entire oil consuming world -- the greatest assurance that SPR oil can get to market quickly when needed.

No matter how we address the issues of the size and use of the SPR, we cannot afford to have an emergency supply that in inaccessible when we need it the most. Ensuring that the SPR can work when needed protects all American consumers, whether they live on the Gulf Coast near the SPR or in Hawaii, thousands of miles away.

U.S. Senate Committee on Energy and Natural Resources
October 6, 2015 Hearing: The Strategic Petroleum Reserve
Question for the Record Submitted to Mr. Kevin Book

Question from Senator Joe Manchin III

Question: You indicate that "it may be analytically useful to think of the SPR as an insurance policy."

One form of domestic transportation fuel reserves, that is often neglected, is the nation's vast coal reserves. Considering estimated U.S. coal reserves of 250 billion tons and that two barrels of oil can be produced for each ton of coal, this translates to larger reserves than Saudi Arabia and 725 times the amount of crude currently stored in the SPR. The only obstacle is that a different type of refinery is required for coal to liquids technology with carbon capture and storage (CCS), and it needs to be demonstrated domestically.

Considering the scale of the energy security and economic benefit involved, wouldn't the insurance value of the cost of demonstrating and deploying modern coal-to-liquids refineries with CCS be worth analyzing?

Response:

Senator Manchin, coal-to-liquids (CTL) conversions can produce transportation fuels that serve as viable supplements to, or substitutes for, petroleum products refined from crude oil. Unlike fuel alcohols (ethanol, methanol, etc.), many alternative fuels derived from coal have energy densities and blending properties equivalent to those of petroleum fuels, reducing or eliminating the energy penalties and stability limitations associated with some biofuels.

In addition, the Fischer-Tropsch process and its derivatives can enable the capture of carbon dioxide from coal-based synthesis gas streams. As a result, it is theoretically possible that a properly configured coal-to-liquids refinery could produce transportation fuels with lower lifecycle greenhouse gas (GHG) emissions profiles than those of conventional fuels and first-generation biofuels alike. Furthermore, a Fischer-Trospch plant with carbon capture and storage (CCS) that commingles biomass into its input stream (B+CTL+CCS) could theoretically produce carbon-neutral or carbon-negative transportation fuels.

As you note, the United States has been blessed by an abundance of economically recoverable coal. Accordingly, I agree that CTL, CTL+CCS and B+CTL+CCS technologies merit consideration as an energy security measure. Unfortunately, current market circumstances and macroeconomic fundamentals weaken the private-sector business case for research into, and development of, CTL (and related) technologies.

For example, the U.S. has also been blessed by an abundance of economically recoverable

natural gas, another potential feedstock for alternative transportation fuels. In addition, global crude oil production growth currently outstrips demand growth by somewhere between 750 kbbl/d and 1 MM bbl/d. This mismatch between production system output and global consumption – to say nothing of record-high levels of petroleum stocks as a result – have driven benchmark crude prices down between 50% and 66% from their 2Q2014 highs.

According to our models, CTL refineries could cost between three and four times as much per barrel per day of output capacity as conventional petroleum refineries, exclusive of associated pipeline and carbon dioxide storage infrastructure. Using bituminous or sub-bituminous coal as a feedstock, we estimate that all-in costs could range between $115,000/bbl/d and $125,000/bbl/d, compared to about $30,000 bbl/d to $35,000 bbl/d for a conventional refinery. Adding a "sidecar" gasifier to separately gasify biomass could increase these all-in costs by between 25% and 30%.

Using fundamental assumptions on the generous side of current circumstances ($50/bbl crude oil price; 10% distillate crack; 12.5% gasoline crack; $80/ton sulfur; $55/MWh in export power sales price) and assuming (lowball) 20-year average acquisition costs of coal of between $20/ton (sub-bituminous) and $30/ton (bituminous), our models project negative internal rates of return (IRR) at prevailing weighted average costs of capital (WACC, assuming 7.8%).

Our models project positive IRRs in scenarios where average oil prices rise above $57.50/bbl over 20 years, but not if environmental regulations require biomass co-firing (in which case positive IRRs would begin at $65/bbl). Sales of plant CO_2 streams to industrial users at a net price of $20/Mt$CO_2$ or more could also result in a positive project IRR even given the assumption of a $50/bbl long-term crude price, but that presumes no penalty borne by the plant for the 35% of CO_2 that would go uncaptured in our model (a frail assumption, in my view).

In any case, most companies look for much more than a "positive" (greater than zero) IRR when sanctioning multi-billion-dollar, multi-year projects. Generating a 15% IRR could require a 20-year average crude price of $102.50/bbl (holding other conditions constant, and not counting a biomass co-firing obligation). Even dropping coal acquisition costs to zero (i.e., assuming stranded inventories without a variable production cost) could leave a theoretical project uncompetitive at a $50/bbl long-term price assumption.

Will oil prices go up? As I mentioned in my testimony, the mean real price of oil since 1859 is about $35/bbl, but the mean real price over the last 20 years was about $64/bbl. It seems reasonable to expect prices to converge back towards the more recent average than the lifetime average, but the standard deviation of that 20-year average was about $34/bbl, implying a 66%

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Question for the Record Submitted to Mr. Kevin Book

confidence interval that reaches from about $98/bbl (which would put CTL in the money) to about $30/bbl (which would probably bankrupt even a highly efficient CTL project). In short, Senator Manchin, any investigation of the security potential of CTL, CTL+CCS and B+CTL+CCS would seem likely to require fairly substantial government incentives given the present market and fundamental environment.

Statement for the Record

U.S. Senator Ron Wyden

Hearing of the Senate Energy and Natural Resources Committee
to examine the potential modernization of the Strategic Petroleum Reserve and related energy security issues

Tuesday, October 6, 2015
10:30 a.m.

Statement

The Strategic Petroleum Reserve, or "SPR", plays an important role for national security, however a number of facts indicate that it may be eligible for downsizing. The Energy Department estimates that the SPR holds about 700 million barrels of oil as of October 2nd. That's about 250 million barrels more than current law requires, when considering current oil production and net import trends here in the US – and this comes at a cost to taxpayers.

Meanwhile, there are natural resource-dependent communities in Oregon and across the country that fear having to choose between funding rural education, fixing roads or hiring much-needed safety officers. More than 700 counties and 42 states across the country depend on the lifeline that Secure Rural Schools (SRS) provides, and Payments in Lieu of Taxes (PILT) is vital to more than 2,000 counties in 49 states. And virtually every county in the U.S. has benefited from either the federal or state sides of the Land and Water Conservation Fund (LWCF) program. Without certainty or stability of SRS and PILT, counties will be forced to make cuts to essential services, leaving residents and communities reeling. Without the LWCF, counties lose an economic engine based on healthy open spaces that add to local quality of life.

Congress needs to pass further legislation to provide long-term certainty and predictability for these natural resource dependent counties, and I've been looking for ways to do so. One thought is for Congress to consider using funds from out-sized programs like the SPR, which is related to natural resource extraction, to keep these natural resource dependent communities healthy and strong.