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THE CAUSES, OUTLOOK, AND IMPLICATIONS OF DOMESTIC AND INTERNATIONAL ENERGY PRICE TRENDS

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

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CONTENTS

OPENING STATEMENTS

WITNESSES

ALPHABETICAL LISTING AND APPENDIX MATERIAL SUBMITTED

THE CAUSES, OUTLOOK, AND IMPLICATIONS OF DOMESTIC AND INTERNATIONAL ENERGY PRICE TRENDS

TUESDAY, NOVEMBER 16, 2021

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

The Committee met, pursuant to notice, at 10:02 a.m. in Room SD–366, Dirksen Senate Office Building, Hon. Joe Manchin III, Chairman of the Committee, presiding.

OPENING STATEMENT OF HON. JOE MANCHIN III, U.S. SENATOR FROM WEST VIRGINIA

The CHAIRMAN. The Committee is meeting today to hold both a business meeting to vote on two nominations and a hearing on energy price trends. The purpose of the business meeting is to vote on two nominations that were on the agenda of our November 2 business meeting but were postponed because not all of the Senators we needed for the vote were present. The two nominations are Ms. Laura Daniel-Davis, to be an Assistant Secretary of the Interior for Land and Minerals Management and Ms. Sara Bronin, to be the Chair of the Advisory Council on Historic Preservation. Since we still do not have all of the Senators we need, I propose to recess the business meeting, subject to the Call of the Chair.

We will then proceed to the hearing and reconvene the business meeting to consider the two nominations on Thursday morning at 10:00 as part of the legislative business meeting already scheduled for that time. We will consider the two nominations on today's agenda along with the bills on Thursday's legislative agenda.

Is there any objection to proceeding in that fashion?

[No response.]

The CHAIRMAN. If not, that will be in order.

Now I will turn to the hearing that brings us together today. The topic of this hearing is very timely with the rising energy prices. They are rising on all commodities in the American market. We are seeing right now across the country and around the globe prices that are rapidly rising for gasoline, diesel, heating oil, natural gas, electricity, and even coal and everything else in between whether it be food and appliances and cars and clothing. We are not on those subjects, so we are not in charge of that.

This is in the stark contrast of the prices that bottomed out during the pandemic as economies around the globe slowed. But now, as our economies are rebounding, we are seeing soaring gasoline

prices and heating bills are expected to go up to 10, 20, and 30 or even 40 percent in the coming months, according to the Energy Information Administration's Winter Outlook. This is impacting all of our constituents. In fact, the consumer price index for energy has increased by 30 percent over the last 12 months. Affordable, reliable, and dependable energy is part of what made us a superpower, and it is critical that we maintain that and keep these prices under control. Internationally, the worst crunch is in Europe and Asia. This fall, we have seen the demand for natural gas, coal and crude oil surge across global markets leading to high electricity prices in Europe and Asia. This has led to curbs on electricity use in China, protests in Spain, and bankruptcies of some small power companies and shuttering of power-intensive factories in the UK. In China, it has been recently reported that coal production was rapidly expanded in an attempt to meet electricity needs with a new slogan of "guarantee the supply". The energy supply crunch and high prices are of concern since global economies are increasingly dependent on our U.S. supplies—primarily natural gas—and we are not as insulated from global prices as we once were. We have seen our natural gas prices increased over $5 per million BTU, their highest level in seven years. That is a fraction of what they are paying in Europe, but it is still a big increase for us in the U.S.

I understand that there are a number of factors contributing to the situation, but a primary cause in the demand is generated from a rapidly recovering economy that is outpacing primary energy production, especially with respect to natural gas. I hope we will have ample discussion on how long we can expect this imbalance to last and what policies are key to ensuring that we do not see energy prices as high as those in Europe and Asia. The recent price trends show how global energy markets are becoming increasingly interconnected, correlating domestic prices with global demand to a higher degree than we have seen in the past. Fuels for dispatchable power in Europe and Asia have been in high demand, resulting in record exports of U.S. coal and natural gas. In particular, high natural gas prices of over $30 per million BTU in Europe have made it a lucrative market for U.S. producers. Our LNG exports in October increased to about 9.8 billion cubic feet per day—about nine percent of domestic production, and it is expected that exports are said to increase even further this winter.

U.S. coal exports to serve Asian markets—in particular, China—have followed a similar trend and I can tell you, the coal market in West Virginia has never been hotter. They cannot produce enough coal for the demand in the world. U.S. coal exports in the second quarter of this year jumped to 20.6 million tons, a more than 50 percent increase from the same time frame last year. These record numbers are positive for American producers and for our economy but come with negative implications for the global climate and for consumers paying higher prices to stay warm this winter.

Another huge concern is the 60 percent increase from last year that American consumers are paying at the pump for gasoline. Each one of us hears about it every day. Crude oil prices, which are the main driver of gasoline prices, have rebounded significantly following their collapse in the midst of the pandemic from −$36

per barrel in April of last year to over $80. Oil producers ramped down their operations following the collapse in oil prices and production levels still aren't matching rebounding demand. Domestic refiners continue to be dependent on imported heavy crude oil, keeping our prices linked to organizations like OPEC, who do not always have our best interests in mind. This raises reliability and geopolitical concerns and underscores the need for pipelines that can bring crude oil and related products to our domestic refiners from all allies like Canada.

In closing, I think this Committee has a responsibility to tackle these complex issues that will inform the solutions we produce to promote energy security, independence, ensure energy affordability and reliability for customers, while also achieving our decarbonization goals. I look forward to hearing from each of you on the outlook of energy markets and prices that we will use to inform our policy decisions going forward.

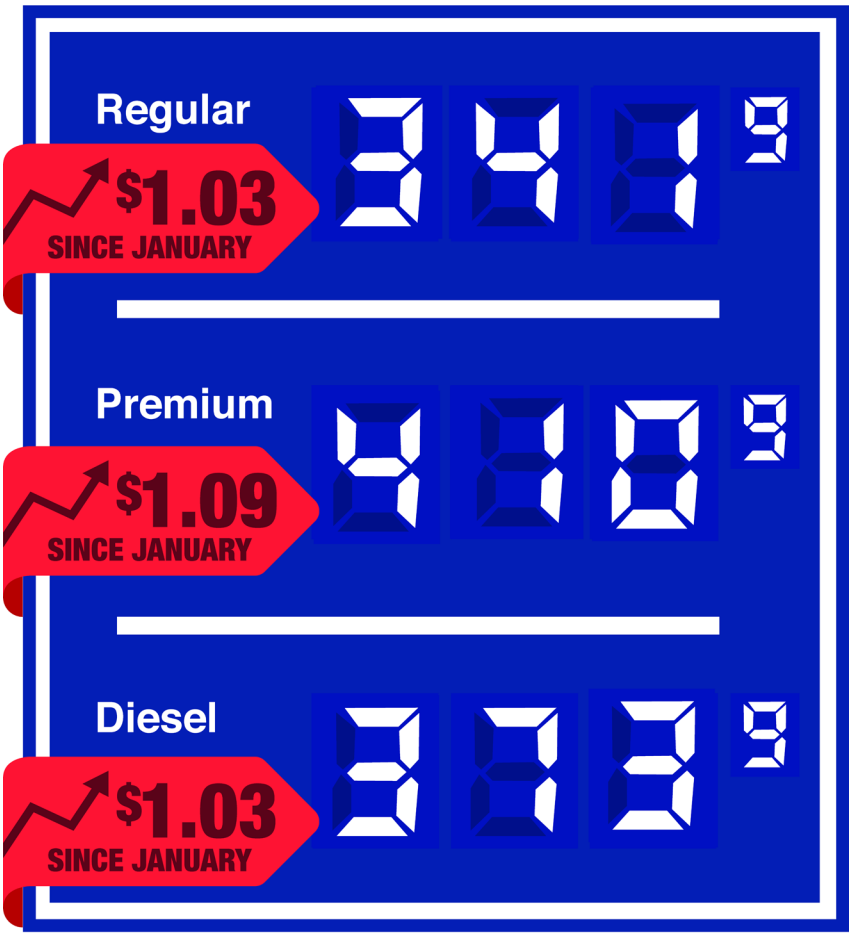
With that, I am going to turn it over to Senator Barrasso for his opening statement.

STATEMENT OF HON. JOHN BARRASSO, U.S. SENATOR FROM WYOMING

Senator BARRASSO. Thanks so much, Mr. Chairman. Thank you for holding today's very important hearing. It comes at a critically important time for our nation. American families are facing the highest inflation rate in over 30 years.

This is the Wall Street Journal, last Thursday, "Inflation Rate of 6.2 Percent Marks a 31-Year High." So not to be outdone by the Wall Street Journal, the New York Times, today, "Who's to Blame for Rising Prices?" President Joe Biden. Right there, the New York Times today is saying it. That means Americans, through no fault of their own, have significantly less spending power than they did last year. It also means that American families must work harder to stretch the value of their dollar. While inflation hurts all of us, it hits low-, middle-, and fixed-income Americans the hardest. Americans are also facing significantly higher energy prices. Since January, the average price of a gallon of gasoline has increased by over $1. Here is the chart.

[The chart referred to follows:]



*USEIA National Average Gas Prices

Senator BARRASSO. Since January, since President Biden took office, gasoline prices are up over $1 a gallon. That is about 43 percent higher since the President took office. In addition, Americans are expected to have dramatically higher bills to pay to heat and power their homes this winter. According to the Department of Energy, American families, depending on where they live, will pay between 22 and 94 percent more for natural gas, for propane, and for home heating oil this winter. Higher energy prices hurt low-, middle- and fixed-income Americans the most.

In response to this, President Biden and House Democrats threaten to make inflation even worse. President Biden and House Democrats want to ram through partisan legislation that is estimated to cost over $4 trillion. It is almost as much in today's dollars that the U.S. spent in World War II, and it is the exact opposite of what Congress should be doing to fight inflation. To make matters worse, the House Democrats' bill will increase energy prices. It will impose a natural gas tax on American families. Almost half of all American households heat their homes with natural gas. And at a time of skyrocketing energy prices, House Democrats want to make it even more expensive for families to heat their homes. It is outrageous. The House Democrats' bill will also effectively end new oil, natural gas, and coal production on Federal lands and waters. This bill surrenders American hard-won energy independence and it makes our country dependent on the OPEC cartel and Russia.

Mark my words, Mr. Chairman, this winter we will see photos of Russian oil tankers in Boston Harbor delivering to the United States. The people of America will pay dearly for the energy that we are not producing in the United States, because what Joe Biden did in Glasgow was beg OPEC Plus which is plus Russia to sell more energy and produce more oil for the United States to buy. This is going to bring Europe's energy shortages to the United States. And as you talked about in your opening remarks, it is going to make it worse for us. Historically, Americans have benefited from some of the lowest energy prices in the industrialized world. In 2020, households in Europe and Japan paid between 85 and 215 percent more for electricity than families in the United States. For natural gas, households in Europe paid between 49 and 177 percent more than families in the United States. If the House Democrats get their way, many American families will have to decide whether they can pay their utility bills or put food on the table. One or the other, heat or eat. People will have to decide where their money goes.

American businesses have also benefited from some of the lowest energy prices in the industrialized world. European businesses paid as much as 160 percent more for electricity than businesses in the United States. The same year, European businesses paid much more for natural gas than businesses in the United States. If House Democrats get their way, America's competitive advantage will end. Not all Americans are going to suffer, though, under the House Democrats' legislation. This bill gives wealthy residents of New York, New Jersey, Connecticut, California, and Maryland tens of thousands of dollars in new tax breaks. It also gives couples earning a half million dollars a year up to $12,500 to purchase an

$80,000 luxury electric vehicle. Now $4,500 of this $12,500 of this tax break is only available for electric vehicles made at unionized factories. Union-made vehicles are no better for the environment than vehicles made in other factories. This is a direct gift and payoff to union bosses.

For the vast majority of Americans, the House Democrats' bill means more inflation, higher energy costs, and fewer jobs. It is why this reckless tax and spending bill must be defeated.

Thank you, Mr. Chairman, for holding this very important hearing.

The CHAIRMAN. Thank you, Senator.

Now I would like to turn to our panel of witnesses who will help shed some light on this situation and inform what we should be considering as we head into the winter months. Today's panel includes experts that bring domestic as well as global perspectives.

We have with us Mr. Stephen Nalley, Acting Administrator of the U.S. Energy Information Administration (EIA). It is good to have you here. Mr. Tim Gould, Chief Energy Economist of the International Energy Agency (IEA), who is joining us from Paris. Thank you, Mr. Gould. And Mr. Robert Bryce, author, journalist, podcaster, and film producer.

I want to thank you all for joining us today, and we are going to start with Mr. Nalley for his opening remarks.

Mr. Nalley.

STATEMENT OF STEPHEN NALLEY, ACTING ADMINISTRATOR, U.S. ENERGY INFORMATION ADMINISTRATION

Mr. NALLEY. Good morning Chairman Manchin, Ranking Member Barrasso, and members of the Committee. I appreciate the opportunity to testify today about the U.S. Energy Information Administration's assessment of energy prices and how they reflect current world and domestic energy conditions.

When I last spoke to the Committee in June 2020, the United States faced a very different energy situation. For example, last month, the price of Brent International benchmark for crude oil averaged over twice what it had been in June 2020. The U.S. retail gasoline prices average more than $1 per gallon higher and wholesale natural gas prices at Henry Hub were more than three times their June 2020 average. Now, looking ahead toward winter, we forecast that heating bills for U.S. residents are likely to increase for all heating fuels and they could increase even more if we have a colder than expected winter. Although these price increases are a direct result of the fact that global economies have begun recovering from the severe pandemic-related economic contraction, serious challenges remain before we will see a full recovery in the energy sector. I would like to spend just a few minutes reviewing these issues with a focus on crude oil, petroleum, and natural gas, addressing them from an international and domestic perspective.

World consumption of petroleum is recovering faster than production, which is resulting in steady draws on global oil inventories and upward pressure on prices. We expect global oil prices to remain near current levels for the rest of this year, but to drop by about $10 per barrel next year as production increases in the United States, OPEC, and other countries. As world economies re-

cover, we expect global oil consumption to increase by 5.5 percent this year and eventually catch up to the 2019 level in 2022. Global oil production on the other hand is growing more slowly than consumption. We expect world oil production to increase by less than two percent this year, still almost five percent below the 2019 level before the pandemic. We forecast that world oil production will grow significantly next year and will exceed the 2019 level by the end of 2022.

In the United States, consumption of crude oil and other liquids is quickly returning to pre-pandemic levels and we expect that overall domestic oil consumption will return to the 2019 level by the end of 2022. We expect crude oil production to actually decrease slightly this year despite growing consumption due to causes such as the Hurricane Ida impact on Gulf of Mexico production and the fact that drilling for oil remains at fairly low historical levels. We forecast that U.S. production will grow significantly in 2022, but still not quite reach the record level of 2019. This month, U.S. gasoline and diesel pump prices are the highest we have seen since mid-2014, driven primarily by high crude oil prices. As oil prices begin to decrease, we expect that the gasoline price will drop to closer to $3 per gallon at the end of this year and to continue to gradually decline throughout 2022. Diesel prices should follow a similar trend.

Natural gas markets are working through a similar return to pre-pandemic conditions. We expect that prices will remain at current levels through the winter and then begin dropping in 2022. Anxiety about cold winter weather is likely to be the major contributing factor to high and volatile wholesale natural gas prices throughout the winter. Tight Asian and European natural gas markets are resulting in the maximum possible U.S. LNG exports. International LNG prices are close to record highs in Northern Asia and Europe and we forecast that U.S. LNG exports will increase 50 percent in 2021 and that they will continue to increase throughout the winter months, effectively filling LNG capacity. U.S. consumption of natural gas set an annual record in 2019 just before the pandemic. We see essentially flat natural gas consumption in 2020 and 2021, as reduced use for natural gas for electric power generation offsets steady growth in residential, commercial, and industrial use.

U.S. gas inventories began the summer at low levels but ended October only three percent below the previous five-year average, which was a favorable development going into the winter. U.S. natural gas production decreased slightly in 2020 after reaching record levels in 2019. We expect to see production growth by more than two percent this year and another four percent in 2022. Both would establish annual records. We forecast that 36 percent of electricity in the United States will be generated using natural gas during 2021—down from its peak of 39 percent in 2020. Of course, higher natural gas prices will directly influence wholesale electricity prices. Though we have seen a shift in the United States from natural gas to coal for electric generation, it was not as pronounced as we had expected based upon past market behavior.

It is worth noting that the winter weather could play a significant role in regional issues, energy prices, and energy use. New

England and Southern California, for example, could face regional natural gas delivery challenges and associated effects on other fuels and electricity. As you can see, there are many moving parts in both the domestic and international markets. Much of what I have presented here today comes from our short-term energy outlook which was the November outlook and it is updated each month to represent our latest thinking about current energy issues.

Chairman Manchin, Ranking Member Barrasso and members of the Committee, thank you for the opportunity to present this information. This concludes my testimony.

[The prepared statement of Mr. Nalley follows:]

Statement of Stephen Nalley
Acting Administrator
U.S. Energy Information Administration
U.S. Department of Energy
Before the
Energy and Natural Resources Committee
United States Senate
November 16, 2021

Chairman Manchin, Ranking Member Barrasso, and Members of the Committee, I appreciate the opportunity to testify about the U.S. Energy Information Administration's assessment of energy prices and how they reflect the current world and domestic energy situation.

When I last spoke to the Committee in June of 2020, a few months after the initial onset of the COVID-19 pandemic, the United States faced a very different energy situation than we face today. Last month, the crude oil international benchmark, Brent, averaged a little over $83.50 per barrel, though it had averaged less than half that in June 2020. In October, U.S. gasoline prices averaged almost $3.30 per gallon, but in June 2020 they averaged less than two-thirds of that amount. Last month, wholesale natural gas prices at U.S. benchmark, Henry Hub, averaged a little more than $5.50 per million British thermal units or MMBtus, but they averaged less than one-third of that in June 2020.

These increases are having, and we anticipate will continue to have, direct effects on energy consumers. Gasoline prices are much higher now than consumers have paid in recent years. The November update of our *Winter Fuels Outlook* forecasts that heating bills for U.S. residences are likely to increase between 6% and 46% this winter, depending on the fuel used for home heating. We forecast these costs will increase much more if the winter is colder than expected.

In many ways, these energy price increases are a direct result of the very good news that, globally, economies have begun to recover after the severe economic contraction most of the world experienced in the first months of the COVID-19 pandemic. However, serious challenges still remain before full recovery in energy industries is achieved. I would like to review these issues with a focus on crude oil, petroleum, and natural gas, first looking at the international context for each, then the domestic context, and finally, at the associated effects on electricity and coal.

World consumption of petroleum is recovering faster than production, which has resulted in steady draws on global oil inventories and upward pressure on prices. We expect global oil prices to remain near current levels for the rest of the year but to drop about $10 per barrel next year as production increases in the United States, the Organization of Petroleum Exporting Countries, or OPEC, and other countries.

Global consumption of oil and other liquids is growing quickly. Global demand for oil and associated petroleum products is driven by economic activity, travel, shipping, and weather. As world economies recover, we expect global oil consumption to increase by 5.5% this year, which will still be 3% less than in 2019, before the pandemic. We forecast that world oil consumption will catch up to the 2019 level in 2022.

A little less than half of our forecast growth in oil consumption this year comes from the developed countries of the Organization for Economic Co-operation and Development, or OECD. The majority of growth in oil consumption will occur outside of the OECD in countries with developing and generally faster-growing economies. In general, oil demand is being driven by all economies coming back from severe contraction. However, next year, we expect the non-OECD share of oil consumption growth to account for almost two-thirds of the growth in oil demand because we expect the economies in those nations to continue to grow faster than in OECD countries.

Global production of oil is growing more slowly than consumption. We expect world oil production to increase by less than 2% this year, bringing it to a level that is still almost 5% below 2019, before the pandemic. We forecast that world oil production will grow significantly in 2022, by almost 6%, which will exceed the 2019 level by the end of 2022. Currently, voluntary restrictions among OPEC producers and partner countries are limiting global production by more than twice its average over the past 10 years. In addition to the voluntary restrictions, production limited by unplanned outages and sanctions have been slightly above the five-year average. As some of these limitations on production are resolved, we expect production will rise to meet consumption.

OPEC and its partner countries cut their oil production by 8% in 2020. To maintain price discipline, in July, OPEC and its partners adopted a schedule of crude oil production with monthly increases of 400,000 barrels per day until the production cuts they made in 2020 are reversed. OPEC and its partners confirmed this strategy at their November 4th meeting. Ultimately, we don't assume in our forecasts that all of the initial cuts will be reversed because, as global production begins to exceed consumption during 2022, continued production increases would reduce prices.

Nevertheless, we project that more than half of the growth in world oil production in 2021 has come from OPEC countries, and they will account for about 40% of the production growth in 2022. We expect Canada will be the next largest contributor in 2021, contributing just short of 19% of the world's oil production growth. However, Canada accounts for a much smaller share of global production growth in 2022. In both 2021 and 2022, OPEC partner Russia will account for around 15% of global growth. U.S production, which I will explore in more detail, accounts for less than 10% of the growth in 2021, but over one-quarter of the growth in 2022 as production responds more fully to prices.

On the demand side, world crude oil consumption started exceeding world crude oil production in the second half of 2020. We forecast that consumption will continue to exceed production through the end of the year, resulting in additional inventory reductions and in supporting current price levels through December. However, we forecast that global oil inventories will begin building next year, driven by the combination of slowing growth in global oil demand and rising production.

Consumption of crude oil and other liquids is quickly returning to pre-pandemic levels in the United States. We believe that domestic gasoline and diesel consumption for on-road travel has returned to close to pre-pandemic levels, though air travel still lags its 2019 level by more than one-quarter. Industrial use of petroleum for fuel and feedstock, excluding refining, appears to have returned to 2019 levels to meet demand for products.

Overall, we expect domestic oil consumption to increase by 8% this year to a level that is still 4% less than in 2019, before the pandemic. We forecast that domestic oil consumption will return to the 2019 level by the end of 2022.

The United States currently produces around one-fifth of the world's oil. We expect domestic oil production to actually decrease by a little more than 1% this year to a level that is 10% less than it was in 2019, before the pandemic. U.S. oil production decreased for many reasons this year, despite growing consumption. One significant factor was the disruptive effects of Hurricane Ida on production in the Gulf of Mexico in late August. In addition, drilling for oil has not rebounded as quickly as consumption; drilling remains at fairly low historical levels. At its lowest point since the beginning of the pandemic, 172 oil-directed drilling rigs were operating in the United States in mid-August 2020, compared with 450 rigs at the start of 2019, as reported by Baker Hughes.

Analysts have speculated about the speed of U.S. oil drilling, particularly in the context of the rapid rise in oil prices that started mid-year. Many producers have indicated that they are focused on improving their financial position by using stronger cash flows to increase dividends to investors and to strengthen balance sheets. Although we see these corporate actions taking place over the short term, we believe a supply response will come if prices remain as strong as they are now through 2022. As a result, we forecast that U.S. oil production will grow significantly in 2022, by almost 7%, but still not quite reach the same level of production as the record set in 2019.

The U.S. market for crude oil and refined petroleum products is tightly integrated with world markets. In 2020, the United States exported about 28% of its crude oil production, up from less than 1% a decade ago; however, overall we imported more oil than we exported. At the same time, we export much more refined petroleum products than we import. Combined, when counted in barrels, we expect to export about as much combined oil and petroleum products as we import in 2021.

This pattern has emerged over the past decade. The significant increases in U.S. oil production over this period were driven by drilling practices that tend to produce lighter oil from shale resources, including horizontal and directional drilling and hydraulic fracturing. However, our refineries have historically been designed to work well with the heavy oil available in international markets. So, instead of displacing imports, our increased production has tended to be exported. We don't expect that pattern to change any time soon.

The average price of U.S. regular gasoline at the beginning of November 2021 was $3.39 per gallon, and average diesel prices were almost $3.73 per gallon. In both cases, these prices were the highest average pump prices we've seen since mid-2014. Crude oil prices are the primary driver of gasoline prices, but refinery margins and taxes also contribute. Currently, U.S. inventories of gasoline and diesel are at recent historical lows, which may be supporting what appears to be stronger refinery margins. Rising gasoline demand contributed to increased U.S. refinery operations throughout the summer, and seasonal refinery maintenance may be contributing to the higher prices and low inventories.

As oil prices begin to decrease, and as these refinery and inventory issues are resolved, we expect gasoline prices will drop closer to $3.00 per gallon by the end of year, and continue to gradually decline throughout 2022 to an annual average below $3.00 per gallon. Diesel prices should decrease similarly.

Natural gas markets are working through a similar return to pre-pandemic conditions. In the decade prior to the pandemic, U.S. wholesale natural gas prices averaged in the mid-$3.00/ per MMBtu range. They had averaged in the mid-$5.00 range during the previous 10 years. With the pandemic-related contraction of the economy and associated drop in natural gas consumption, average natural gas prices dropped to closer to $2.00 per MMBtu in 2020. Near mid-year, after a brief price increase in February as a result of extreme cold weather, prices started moving back to their levels of the early 2000s. We expect prices will remain at current levels through the winter and then begin to drop in 2022 to average roughly $4.00 per MMBtu for the year.

Tight Asian and European natural gas markets are resulting in the maximum possible U.S. exports of liquefied natural gas, or LNG, which effectively means that the domestic market has to balance itself on the remaining production, keeping inventories tight and maintaining upward pressure on prices. Domestic consumption of natural gas is strongly affected by winter weather, so prices are likely to remain volatile as we learn more about winter weather patterns.

International LNG prices are close to record highs in northern Asia and Europe. These prices are roughly six times higher than current wholesale natural gas prices in the United States and about 20 times higher than their record lows during the summer of 2020. We expect these very high prices to continue into the winter.

Natural gas demand has grown significantly in Asia along with the region's economic recovery. A shortage of coal supplies in China, stronger demand by the electric power and industrial sectors in Japan, and less output by nuclear power plants in South Korea are all contributing to significant increases in LNG imports into Asia. Interestingly, high LNG prices have led to some switching from natural gas to oil to generate electricity in Asia and the Middle East, and we have included this increase in global oil consumption in our forecasts.

Europe's natural gas storage inventories have begun the winter at low levels, about 75% full, compared with the average of 90% full at this time of year. Inventories are low for a variety of reasons, including very cold weather at the beginning of the injection season, maintenance issues affecting supply from Norway, reduced generation from other sources such as wind power, competition for LNG with Asia, and other issues. Many European countries are looking to imports from Russia to meet their natural gas demand.

We forecast that U.S. LNG exports will increase 50% in 2021, and that they will continue to increase through the winter months, effectively filling LNG export capacity from November through March. High levels of LNG exports should continue into 2022, increasing another 17% by the end of next year as additional liquefaction capacity comes online. We believe that global natural gas demand will remain strong, and as export terminals add several new natural gas liquefaction trains, they will contribute to meeting international demand. Although LNG exports accounted for about 5% of U.S. production in 2019, and almost 7% in 2020, we believe it will be close to 10% in 2021 and almost 11% in 2022.

In addition, natural gas exports to Mexico by pipeline have been growing substantially, and Mexico has been the top destination for U.S. natural gas exports since 2015. U.S. exports to Mexico have more than offset declines in Mexico's domestic natural gas production and imports of LNG. Mexico now imports about two-thirds of its natural gas supply from the United States.

Consumption of natural gas within the United States set an annual record in 2019, just before the pandemic began. For some time, use of natural gas to generate electricity had been growing, displacing coal-fired generation, and driving much of the growth in natural gas consumption. Last year, U.S. consumption of natural gas dropped about 2.5%; commercial and industrial demand fell in response to economic contraction, and electric generation increased because of the very low natural gas prices. Residential consumption also fell, largely due to mild weather.

We see essentially flat U.S. natural gas consumption in 2020 and 2021 as reduced use of natural gas for electricity generation offsets steady growth in residential, commercial, and industrial use. Forecasts of U.S. consumption of natural gas into the winter are inherently very uncertain because of the overwhelming importance of weather. Our forecast is based on the assumption of an average winter. Last winter, with the notable exception of February, was actually warmer than normal.

U.S. natural gas production decreased by about 1% in 2020, despite a severe contraction in the middle of the year. U.S. production had been at record levels in 2019. This year we expect to see production grow by more than 2% and establish a new annual record. In 2022, we see natural gas production growing by another 4%.

Appalachia is the largest natural gas-producing region in the United States, providing 36% of U.S. production in 2021, but we do not expect natural gas production to grow further in Appalachia unless additional pipeline capacity is built that can move natural gas outside of the region. The majority of U.S. natural gas production growth will occur in the Permian Basin of Texas and New Mexico and in the Haynesville shale in Arkansas, Louisiana, and Texas. Both regions are close to LNG export terminals and pipelines to Mexico.

U.S. natural gas inventories began the summer at low levels after the February cold spell, but they ended October only 3% below their previous five-year average. Less natural gas has been injected into storage this summer, largely as a result of high electricity consumption due to hot weather and increased exports. We expect natural gas storage to end the winter about 11% below the five-year average.

Anxiety about cold weather is likely to be the biggest factor in high and volatile wholesale natural gas prices as we go through the winter. A very warm winter would almost certainly end with lower prices and relatively full inventories in 2022, and a very cold winter would almost certainly end with higher prices and lower inventories.

We forecast that 36% of the electricity in the United States will be generated using natural gas during 2021, down from its peak of 39% in 2020. As a result, natural gas prices directly influence wholesale electricity prices.

After contracting by about 4% in 2020, we expect domestic consumption of electricity to increase by a little over 3% this year and an additional 0.5% in 2022 but not quite reach 2019 levels through 2022. Industrial consumption of electricity fell about 8% in 2020 as a direct result of reduced activity caused by the pandemic, but we expect it to fully return to pre-pandemic levels by 2022. Commercial consumption fell more than 6% in 2020, and we do not expect it to fully return to pre-pandemic levels by 2022 as a result of changes in behavioral patterns, with more people working from home. Over this period, we expect residential consumption will vary less than 2% annually, largely because of weather.

Notably, renewable generation has continued to grow in the United States, and we expect that growth to continue. Renewable electricity, excluding hydropower, reached 10% of U.S. generation in 2019, and we expect that share to steadily grow to 15% in 2022. Wind generation grew about 14% in 2020 and now makes up over two thirds of renewable energy, excluding hydropower, in the United States. It should grow a little less quickly this year and next. Solar

power, which makes up about one fifth of non-hydro renewables, grew 26% in 2020, and we believe that growth is accelerating.

We have seen less switching from natural gas to coal for electricity generation in the United States than we anticipated this year. Though a shift to coal did happen, it was not as pronounced as we thought it would be, based on past market behaviors. The difference was likely the result of constraints on coal supply and low coal stocks coming out of 2020, when coal use was reduced significantly.

Our forecast share of electricity generation from coal rises from 20% in 2020 to about 23% in 2021 and declines to 22% in 2022. As a result, we believe U.S. coal production, which fell almost 25% in 2020, will grow almost 9% this year and 5% in 2022 but will not return to pre-pandemic levels.

I'd like to finish by discussing regional weather issues which can always have an effect on energy reliability and prices. Weather patterns can have significant regional effects on energy, as we saw with the extremely cold weather affecting the middle of the country and down into Texas this past February, and in energy-producing sections of the Gulf Coast with Hurricane Ida in August.

New England and Southern California could face regional natural gas delivery challenges and associated effects on other fuels and electricity for the upcoming winter. In New England, pipeline constraints have historically led to elevated natural gas prices. Pipeline load factors into New England are already close to capacity and will increase with greater cold-weather demand. Imports of electric power are an important source of electric supply for New England and account for nearly 20% of the region's annual electric supply, but electricity transmission links delivering power from outside the region are also essentially at peak capacity.

Southern California relies on some of the same sources of natural gas supply as other regions, including western Wyoming, West Texas, and Western Canada. Maintenance on natural gas distribution systems and key interstate pipelines has reduced flexibility in meeting regional needs. Drought has reduced in-state hydroelectric availability this year, requiring more generation from other fuel sources, including natural gas. A regulatory decision to make greater use of natural gas storage and recent precipitation may have reduced some of the energy delivery concerns in Southern California this winter. We provide information about each of these regions through our automated dashboards that provide weather, demand, fuels, and other contextual information for people who are interested in energy balances there.

As you can see, there are a lot of moving parts involved in both the world and domestic energy markets, which means more opportunities for issues to arise and more opportunities for energy users and producers to react and work through and around them. Much of what I have presented today is from work we revise and update monthly in our *Short-Term Energy Outlook*. In that

publication, we look out one to two years, with a focus on the United States. By revising monthly, we can continually adjust our forecasts based on new information. I encourage you and your staff to look to our updated forecasts for our latest thinking about how energy issues are likely to play out in the near future.

Chairman Manchin, Ranking Member Barrasso, and Members of the Committee, thank you for the opportunity to present this information, and this concludes my testimony.

The CHAIRMAN. Thank you, sir.

Now we are going to go to Mr. Gould for his opening statement.

STATEMENT OF TIM GOULD, CHIEF ENERGY ECONOMIST, INTERNATIONAL ENERGY AGENCY

Mr. GOULD. Thank you very much, Chairman Manchin, Ranking Member Barrasso, distinguished members of the Committee. I very much appreciate the chance to provide a perspective from the International Energy Agency on these important issues. I'd like to start with some sincere thanks to you, Senator Manchin, for your participation in the IEA's Global Commission on People-Centered Clean Energy Transitions. Your thoughts and ideas on preserving and creating new opportunities for coal miner communities and coal communities were very valuable to us in our findings and recommendations that we released a few weeks ago.

Today's energy prices, as you say, present an important reminder of the importance of energy security and affordability as the world seeks to accelerate clean energy transitions. This remains a central focus for the work of the International Energy Agency and we look forward very much to continuing our close collaboration with the United States and other members of the IEA family to this end. In these brief opening remarks, just three points from my written testimony. The first is to say there are multiple courses of the recent run-up in energy prices which have affected different commodities in different ways. The main factor, as you have said, the rapid economic recovery from the downturn caused by the pandemic. There have also been various weather-related events, including droughts in Brazil, lower-than-average wind generation in Europe, and various planned and unplanned outages to supply. At the IEA, we do not consider that climate policies or clean energy transitions have played a significant role. Some analysts looking at today's oil and gas markets also see signs of what you might call artificial tightness in markets. If you look at the example of the low levels of gas storage stored in Gazprom's storage facilities in Europe, you can see why some might hold that view.

My second point relates to our outlook. Our overall assessment is that the world remains in a period of economic recovery, which is resulting in some unsustainable patterns of energy use, but some of the recent extreme pressures on prices may be lessening. And the very rapid rebound in energy demand in the first half of the year is slowing. It has been tempered further by the effects of higher prices and economic uncertainties and by the continuing shadow in many countries of the public health crisis caused by COVID–19.

However, my final point relates to some risks that we see for the future, the risk of further turbulence ahead in global energy markets. In our new IEA World Energy Outlook, we say this quite bluntly. The world is not investing enough to meet its future needs in a sustainable and orderly way. Investment in oil and gas has come down quite sharply in recent years as a result of two price falls in 2014–2015 and again last year. But worldwide investment in clean energy transitions has not risen fast enough to pick up the slack and to put us on a safer and cleaner pathway. So stepping up investment in a wide range of clean energy technologies and infrastructure is essential in our view if we are to meet tomorrow's

energy demand while also bringing down emissions. This will bring enormous opportunities for growth and employment for countries that are well-positioned in this new energy economy, and we consider that the United States is exceptionally well-positioned, both because of its industrial potential but also the huge scientific innovation that the United States brings to the picture. So there are these enormous opportunities for growth in employment. However, our message today is that this acceleration in energy transitions needs to happen quickly or we see a looming risk of renewed volatility in the coming years.

Mr. Chairman, thank you for the opportunity to make these opening remarks. Of course I look forward very much to answering any questions that you might have or the distinguished members of the Committee. Thank you very much again.

[The prepared statement of Mr. Gould follows:]

Written Testimony
Hearing of the U.S. Senate Energy and Natural Resources Committee
Causes, outlook, and implications of domestic and international energy price trends

Tim Gould
Chief Energy Economist
International Energy Agency

16 November 2021

Senator Manchin, Senator Barrasso and distinguished Members of the Committee, thank you for the opportunity to appear before you today and to present latest data and analysis from the International Energy Agency (IEA) on energy price trends.

Senator Manchin, it is an honour to be here, and at the IEA we remain ready and willing to do everything we can to support the work you and all of your colleagues in the Committee are doing. I take this opportunity to express our gratitude for your personal participation in the work of the IEA's Global Commission on People-Centred Clean Energy Transitions, which presented its findings and recommendations just a few weeks ago.

Sincere thanks also to Senator Barrasso and Members of the Committee for your leadership on crucial issues of energy and natural resources, and the work that you do in favour of a safer and more sustainable energy system for the American people and the world.

At the IEA, we commend your initiative to hold this hearing to examine the causes, outlook and implications of today's energy price trends. The affordability of energy is a major concern to households and businesses across the United States and worldwide. If we lose sight of this, we will not achieve the orderly and rapid clean energy transition that is urgently required to address climate change.

A brief overview of the IEA

Since the founding of the IEA almost 50 years ago, the United States has been a crucial pillar for the Agency. U.S. leadership and support has come from across the government, including the Senate, the House of Representatives, the White House, the Department of State, the Department of Energy and the National Labs. We are delighted that U.S. Secretary of Energy Granholm will be the Chair of our next IEA Ministerial Meeting in the first quarter of 2022.

The IEA was founded in 1974 with a strong mandate to promote energy security, cooperation and well-functioning markets. We have remained true to this original mission but have also evolved since then and expanded to become the world's leading authority on global energy issues. We now provide data, analysis and advice to governments, industry and the public with the aim of shaping a secure and sustainable energy future. Today, the IEA has 30 Member countries as well as partnerships with key Association countries, including the world's largest emerging economies: Brazil, China, India, Indonesia and South Africa. Our IEA family reflects the global nature of energy, accounting for almost 75% of the world's energy consumption.

Recent energy price trends

The historic plunge in global energy consumption in the early months of the Covid-19 crisis in 2020 drove the prices of many fuels to their lowest levels in decades. However, since then, they have rebounded strongly. The starkest example has been Europe's TTF month-ahead price for natural gas, which rose from €3.6/MWh ($1/MMBtu) in 2020 to reach a record of €116/MWh (or $39/MMBtu) in

early October 2021; spot LNG prices in Asia followed a similar trajectory. International coal prices also reached a high point in October, at around five times their level from a year earlier. As of early November, the oil price (Brent Dated) is above $80 per barrel, double the average of $41 per barrel in 2020 and well above the $57 per barrel average for 2015-2019. Higher prices for natural gas and coal have put upward pressure on electricity prices in many markets. The IEA continues to monitor market developments very closely.

Causes of recent energy price trends

There is no single cause behind recent energy price trends. Multiple factors have contributed to the tightening of markets, chief among them being:

- **The rapid economic recovery from the pandemic-induced recession**: This has strained many elements of global supply chains, including those in the energy sector. The global economy is set to grow by around 6% in 2021, its fastest post-recession recovery in 80 years, according to the World Bank. In the first half of 2021, we estimate that global gas demand was growing year-on-year by around 5%, oil demand by 7%, and coal demand by 11%.

- **Weather-related events:** Demand trends have been abetted by a number of weather-related factors. These include a cold winter in the Northern Hemisphere, droughts that curtailed hydropower output in Brazil and elsewhere (resulting in a six-fold year-on-year increase in LNG imports to Brazil), and lower-than-average wind generation in Europe. Hurricane Ida in late August also interrupted U.S. offshore production and damaged platforms and onshore facilities.

- **Outages to supply**: Covid-19 lockdowns in 2020 pushed some maintenance work into 2021, which weighed on supply just at a time when demand was recovering. In the case of natural gas, there were unplanned outages at LNG liquefaction plants, some upstream issues, unforeseen repair works, and project delays that further tightened global markets.

- **Stances of some major suppliers**: In natural gas markets, Russia's Gazprom has been fulfilling its long-term contracts with European counterparts, but it has also reduced its exposure to short-term sales and has not replenished its own storage sites in Europe to the levels seen in previous years. The IEA believes that Russia could do more to increase gas availability to Europe. In oil markets, some 5.8 million barrels per day of spare production capacity is held by major producers in the OPEC+ grouping, a figure that excludes 1.3 million barrels per day of Iranian crude shut in by sanctions.

- **Underlying investment dynamics**: Investments in oil and natural gas have declined in recent years as a result of two commodity price collapses – in 2014-15 and in 2020. This has made supply more vulnerable to the sorts of exceptional circumstances that we see today. At the same time, governments have not been pursuing strong enough policies to scale up deployment of clean energy sources and technologies.

The IEA does not consider that climate policies have played a significant role in the recent run-up in prices. In practice, we believe that more rapid deployment of clean energy sources and technologies could have mitigated some of the upward pressure on fuel prices.

Outlook

The IEA does not have a price forecast for the short or the longer term, but we do provide closely watched assessments of market dynamics across all parts of the energy sector, backed up by the latest available data, as well as longer-term scenario projections for how the energy sector could evolve.

Our overall assessment is that the world remains in a period of unsustainable economic recovery from the crisis triggered by the Covid-19 pandemic, but that some of the extreme recent pressures on prices may be lessening. The very rapid rebound in energy demand in the first half of the year is slowing and is being tempered further by the effects of higher prices and economic uncertainties and by the continuing shadow of the public health crisis caused by Covid-19.

The latest data show, for example, that strong growth in European natural gas demand in the first part of 2021 has reversed since July, while year-on-year natural gas demand growth in China slowed from an average of 15% in July and August down to around 5% in September and October. Slower growth in Chinese economic activity is easing pressure on coal markets, after Chinese coal demand rose more than 10% year-on-year in the first half of 2021. The rise in global oil consumption has been buoyed by strong pent-up demand for travel and from consumers switching away from high-priced coal and natural gas in some sectors, but it is also set to moderate in the fourth quarter of 2021 and into 2022. Higher prices are also providing incentives for producers to bring new supplies to market, although in some cases, the responsiveness to higher prices – including in the U.S. shale sector – may be lower than observed in the past.

Significant near-term vulnerabilities remain, particularly in natural gas markets in the Northern Hemisphere that enter the winter heating season with lower than average storage levels. Temperatures will be an important determining factor for short-term demand, and a cold winter would push up European gas imports and potentially renew acute pressure on international prices.

Looking further ahead, the policies pursued by governments remain a crucial determinant of how supply-demand balances evolve. The IEA's latest World Energy Outlook describes different possible pathways for the future of global energy, differentiated primarily by the strength of the global policy response to the threat of a changing climate.

Our assessment of today's energy investment trends against the requirements of these different scenarios reveals a looming risk of more turbulence ahead for energy markets. Following price collapses in 2014-15 and again in 2020, the amount being invested today in upstream oil and gas is half of what it was seven years ago, and is geared toward a world of stagnant or even falling demand for these fuels. This is one of the very few areas of energy sector investment that is reasonably well aligned with the levels described in the IEA's landmark Net Zero Emissions by 2050 Scenario, which was published in May 2021 and charts a narrow but achievable pathway for the global energy sector that is consistent with a 1.5 °C stabilisation in global temperatures.

Global spending on clean energy technologies and infrastructure has been much more resilient in recent years than spending on fossil fuels and is expected to pick up again in 2021. However, it remains far short of what is required to meet rising demand for energy services in a sustainable way. From around $1 trillion today, worldwide annual investment in a range of clean energy projects and infrastructure would need to more than triple over the coming decade in order to get the world on track for a 1.5 °C future.

Such a surge in spending to boost deployment of clean energy technologies and infrastructure provides the way out of the current impasse, while also bringing down emissions. Accelerating the emergence of a new energy economy will also bring enormous opportunities for growth and employment. However, this change needs to happen quickly or global energy markets will face the risk of further market volatility ahead.

Implications

Today's situation provides an important reminder, especially as the world seeks to accelerate clean energy transitions after the COP26 meeting in Glasgow, of the importance of secure and affordable

energy supplies. This remains a core focus for the IEA, and we look forward to continuing our close collaboration with the United States and other members of the IEA family to this end.

Recent price increases are being reflected in the energy bills being paid by many households and companies around the world. They present broader risks to economic activity, especially for sectors that are directly exposed to the price rises, and contribute to inflationary pressures. Rising power prices have affected the operations of electricity-intensive industries. Several companies have temporarily curtailed ammonia and fertilizer production, citing deteriorating margins due to the sharp increase in natural gas prices.

Price increases have created incentives for fuel switching in some markets, including from gas to coal. For example, despite high carbon prices, gas-fired power generation in Europe fell by 9% year-on-year during the period from July to October, while coal-based generation rose by 11%. However, not all consumers have the opportunity to switch fuels or patterns of consumption quickly in response to changes in relative prices. Choices available to households and many businesses are typically much more limited, underlining that prices are a blunt instrument to generate changes in energy use.

Well-managed policies provide a way to cushion consumers from the effects of commodity price shocks. In rapid energy transitions, households are less reliant on oil and gas to meet their energy needs, thanks to efficiency improvements, switching to electricity for mobility, and moving away from fossil fuel-fired boilers for heating. Reaching this point will require policies that assist households, particularly more vulnerable ones, with the associated upfront costs of efficiency upgrades and low-emissions equipment such as electric vehicles and heat pumps.

Recent developments have also highlighted the importance of flexibility in electricity markets as more solar PV and wind power are added to the generation mix. Thanks to policy and technology progress, as well as low-cost financing, solar PV is now consistently cheaper than new coal- or gas-fired power plants in most countries, and solar projects now offer some of the lowest-cost electricity ever seen. Wind power – onshore and increasingly offshore – is a similar success story.

As the shares of solar PV and wind rise, the rest of the system cannot stand still, and I commend the high priority that this Committee gives to ensuring the security of electricity supply. Low emissions generation from dispatchable sources can play a vital role, providing an opening for technologies like Small Modular Reactors that can ensure the continued support of nuclear power to a low-carbon transition. Adequate investment in robust and smart electricity grids, demand-side responses, and a variety of storage technologies will likewise be essential to ensure a smooth match between electricity supply and demand.

Recent price volatility underlines the strong links between electricity and natural gas markets, as natural gas remains an important means to balance electricity markets in many regions. As clean energy transitions advance on a path towards net zero emissions, global gas demand will start to decline, but it will remain an important component of electricity security. This is especially the case in countries with large seasonal variations in electricity demand.

More broadly, the rapid deployment of clean energy technologies also brings important new resource and security issues into focus, especially the reliable supplies of critical minerals and metals that are vital to energy transitions. Under more ambitious climate scenarios, the energy sector will become a major force in driving demand growth for copper, lithium, nickel, cobalt and rare earth elements. Higher or more volatile prices for critical minerals such as lithium, cobalt, nickel, copper and rare earth elements could slow global progress towards a clean energy future or make it more costly. Price rallies for key minerals in the first half of 2021 have generated upward pressure on the costs of solar modules, wind turbines, electric vehicle batteries and power lines by 5-15%. The leadership of the United States

will be essential to promote timely, diversified investment in these new supply chains, high environmental and social standards, as well as technology innovation and recycling.

Secure and affordable energy transitions will require action across all parts of the energy sector, including heavy industrial sectors and long-distance transport. Finding cost-effective solutions to reduce emissions from sectors like steel, cement, chemicals, freight, shipping and aviation is an enormous opportunity for the United States – with its world-leading research and development expertise – to fill the remaining technology gaps. Innovation remains vital to smooth the pathway to net zero emissions via technologies to enhance the electrification of end uses, such as advanced battery chemistries; or to capture, utilise and store carbon emissions; or to produce and use low-carbon fuels such as advanced biofuels and clean hydrogen.

Finally, the recent price shocks provide a reminder of the deeply interconnected nature of today's energy system, in which no country is an energy island. In that spirit, the IEA remains deeply committed to working closely with the United States and other members of the IEA family to ensure that the much-needed process of change in the energy sector is orderly and rapid – and puts people at its centre.

Senator Manchin, Senator Barrasso and distinguished Members of the Committee, thank you again for the opportunity to appear before you today. And thank you above all for your continued strong partnership and support for the IEA.

The CHAIRMAN. Thank you, Mr. Gould.
Now we are going to hear from Mr. Bryce.

STATEMENT OF ROBERT BRYCE, AUTHOR, JOURNALIST, PODCASTER, AND FILM PRODUCER

Mr. BRYCE. Good morning. Thank you, Mr. Chairman. I am grateful for the opportunity to testify again before this Committee.

Respectfully, legislators and policymakers in Washington need a big dose of energy realism. And they need an even bigger dose of energy humanism. The causes and implications of soaring global energy prices are clear. Europe provides a case study for what not to do. Millions of Europeans are facing the prospect of a cold winter without enough affordable energy to heat their homes. Fertilizer plants and steel mills are closing because of high energy prices. Europe's price hikes are being caused by underinvestment in hydrocarbons due to aggressive decarbonization and ESG policies.

Second, they are being caused by overinvestment in weather-dependent renewables, which has left the continent vulnerable to wind droughts. Just yesterday in Britain, spot prices for electricity exceeded $4,000 per megawatt-hour due to low wind speeds. Third, Europe is prematurely shuttering its coal and nuclear plants. And finally, it is relying too heavily on imported energy and, in particular, Russian natural gas. The implications of Europe's price spikes include soaring inflation, deindustrialization, and increased burdens on consumers, especially the working poor. The knock-on effects could last for months or even years. Fertilizer made from hydrocarbons is the food of food. Numerous fertilizer plants in Europe and around the world are shutting down because of high natural gas prices. This will mean less food production and therefore higher food prices which will lead to additional inflation.

The United States must not emulate Europe's disastrous energy blueprint. We need energy realism. Energy is the economy. Energy nourishes human potential. Hydrocarbons now provide 82 percent of our total energy and 62, or about 60, percent of our electricity supplies. The U.S. today gets 18 times more energy from hydrocarbons as it does from wind and solar combined. The myriad claims being made by climate activists, politicians, and elite academics that we can run our economy solely on wind and solar and a few drops of hydropower have no basis in physics, math, or history. Furthermore, wherever renewables have been ramped up, as in Europe, energy prices have soared. Senators, look at California, where electricity prices are absolutely exploding. That in a state with the highest poverty rate and the largest Latino population in America. Wood Mackenzie estimates that converting our grid to renewables could cost $4.5 trillion or roughly $35,000 for every family in America. How could such a staggering cost result in the just energy transition that we hear so much about?

Energy realism: Since 2015, more than 300 communities across the country from Maine to Hawaii have rejected wind projects. Over the past six months alone, large, massive solar projects in Nevada, Pennsylvania, and Montana have been rejected by local communities. More realism: Trying to convert our energy and power systems to renewables will make the U.S. reliant on China for critical minerals like neodymium, dysprosium, and cobalt. Why is this

okay? Relying on renewables would also require building hundreds of thousands of miles of new high-voltage transmission lines. But the November 2nd referendum in Maine showed very clearly, again, that rural Americans do not want high-voltage transmission lines slashing through their neighborhoods. Garroting America's hydrocarbon sector by killing pipelines, banning natural gas, halting drilling on federal lands, electrifying everything, and never-ending tax breaks for big wind and big solar will not solve global climate change. Instead, those moves will turbocharge inflation, imperil our energy security, and impose regressive taxes on the poor and the working class.

Our economy runs on hydrocarbons and that will be true for decades to come. Staking our economy as Europe has done on weather-dependent renewables amounts to unilateral energy disarmament that will hurt us and benefit Russia, China, and OPEC. Who will stand up for rural America and against the landscape-destroying sprawl of wind and solar? Who will speak against the federally subsidized slaughter of our birds and bats by the wind industry? Expensive energy is the enemy of the poor. Who in this Senate will stand up for them? Who in Congress will stand up for the affordability, reliability, and resilience of our electric grid, which is being undermined by this senseless rush to renewables and the premature retirement of our nuclear reactors? Where are the pro-nuclear, pro-energy realists? Where, I must ask you, are the energy humanists?

Thank you.

[The prepared statement of Mr. Bryce follows:]

Written Testimony of Robert Bryce[1]
Before the Committee on Energy and Natural Resources
United States Senate
"To examine the causes, outlook, and implications of domestic and international energy price trends."
November 16, 2021

Good morning. Thank you, Mr. Chairman. I am grateful for the opportunity to testify again before this committee.

With all due respect, legislators and policymakers in Washington need a big dose of energy realism and an even bigger dose of energy humanism.

The causes and implications of soaring global energy prices are clear.

Europe provides a case study for what not to do. Millions of Europeans are facing the prospect of a cold winter without enough affordable energy to heat their homes. In September, a study done by the European Trade Union Confederation, which represents 45 million members, found that "15% of the EU's working poor – the equivalent of 2,713,578 people – lacks enough money to turn on the heating."[2] In addition, fertilizer plants and steel mills are closing their doors because of high energy prices.[3]

These price spikes are the result of several factors. The first and most important is underinvestment in hydrocarbon production, which is largely a consequence of aggressive decarbonization and "Environmental, Social, and Governance" or ESG policies.

Second, Europe has overinvested in weather-dependent renewables which left it vulnerable to a prolonged wind drought that has crippled the region's electric and gas utilities.[4]

Third, Europe has reduced its energy security because it is shuttering its coal and nuclear power plants.[5]

Finally, the region's over-reliance on imported energy – and Russian gas, in particular – has made it vulnerable to dramatic prices swings and potentially long-term supply shortages.[6]

The implications of Europe's price spikes include soaring inflation, deindustrialization, and increasing energy burdens on consumers, especially the working poor.[7] The knock-on effects could last for months, or even years.

Nitrogen-based fertilizer made from hydrocarbons is, as author Alex Epstein has aptly put it, the "food of food."[8]

But fertilizer plants across Europe – in the U.K., Netherlands, Germany, Italy, Belgium, France Spain, Lithuania, and Ukraine – are shutting down because of high natural gas prices.[9] Similar fertilizer and urea shortages and price spikes are occurring across Asia, which is threatening both the agriculture and transportation sectors.[10] These shortages and price increases will mean less food production, and therefore, higher food prices, which will spark more inflation.[11]

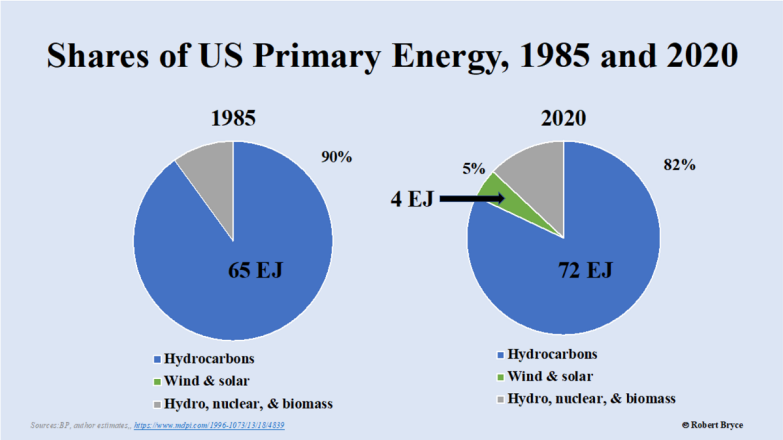
Let me be clear: The United States must not emulate Europe's disastrous blueprint.

Copying Europe's energy policies would reduce economic growth and impose regressive energy taxes on America's poor and middle class at the very same time that millions of American households are having trouble paying their utility bills. According to the Energy Information Administration, nearly one-third of U.S. households, "reported facing a challenge in paying energy bills or sustaining adequate heating and cooling in their homes in 2015."[12]

We desperately need *energy realism.*

Energy analyst Art Berman is correct: Energy is the economy.[13] Hydrocarbons now provide 82% of our energy and about 60% of our electricity.[14] As shown in Figure 1, the U.S. now gets 18 times as much primary energy from hydrocarbons as it does from wind and solar *combined.*[15]

Figure 1



The myriad claims being made by climate activists, politicians, and elite academics that we can run our economy solely on wind, solar, and a few dollops of hydro have no basis in physics, history, or math. Indeed, the scenarios put forward by leading academics who have made such claims have been roundly debunked.[16]

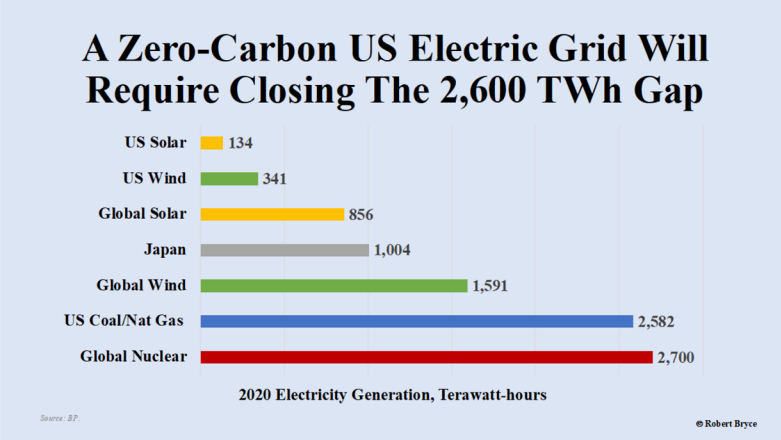
Furthermore, claims that we can convert our energy and power systems quickly are not supported by the facts. As energy analyst Vaclav Smil has noted, "energy transitions are protracted affairs: large-scale energy conversions are still dominated by prime movers and processes invented during the 1880s...or during the 1930s...and no techniques currently under development can rival any of those conversions during the coming two or three decades."[17]

Energy realism requires that legislators and policymakers understand the staggering scale of the decarbonization challenge. In April, the White House said that President Biden's goal is to "create a carbon pollution-free power sector by 2035."[18]

But there is no evidence that such a goal can be achieved, particularly in such a short amount of time. In 2020, about 2,600 terawatt-hours of electricity was generated from coal and natural gas in the U.S.[19] For comparison, that is nearly

equal to the output of *all of the nuclear power plants on the planet*. Put another way, it is roughly equal to three times the output of all global solar or nearly two times the output of all of the wind turbines in the world. It is simply not credible to claim that the United States could build that much new nuclear, or solar, or wind capacity, and do so in just 14 years.

Figure 2



Wherever renewables have been ramped up, as in Europe and California, energy prices have soared. Proof of that can be found in Germany, which now has some of the world's highest electricity prices.

Between 2000 and 2017, Germany spent about $222 billion on renewable energy subsidies as part of its efforts to slash its greenhouse-gas emissions. Germany has pledged to slash those emissions by 40% compared to 1990 levels, by 2020, and by 95% by 2050.[20] The total cost of the *Energiewende* could total more than $500 billion by 2025, and that figure only accounts for the investment needed in the electricity sector.[21] Despite the massive costs, in 2017, Germany's greenhouse gas emissions were at roughly the same level as they were in 2009. In 2018, the German government was forced to admit that it would not meet its 2020 emission-reduction targets.[22]

A 2020 report found that electricity in Germany was "on average 163% more expensive than in other countries, according to the analysis which included 135 countries...The electricity price for consumers in Germany was 32.10 Euro cents per kilowatt-hour, while average international prices were only 12.22 Euro cents."[23] This winter, Germany's electricity prices are expected to go even higher.[24]

Energy realism requires that legislators and policymakers look at California's disastrous energy policies. In the words of energy analyst, Mark Nelson, California's electricity prices are "absolutely exploding" – this in a state that has the highest poverty rate, and largest Latino population, in America.[25]

Between 2011 and 2020, the state's electricity prices jumped by about 39%, which was roughly seven times as fast as the increases in the rest of the country.[26] Last year, alone electricity prices in the state jumped by 7.5%.[27] Making matters worse, California's electricity rates will go even higher over the next few years. In a report issued in May, the California Public Utility Commission warned that the state's energy costs are growing far faster than the rate of inflation, and that "energy bills will become less affordable over time."[28]

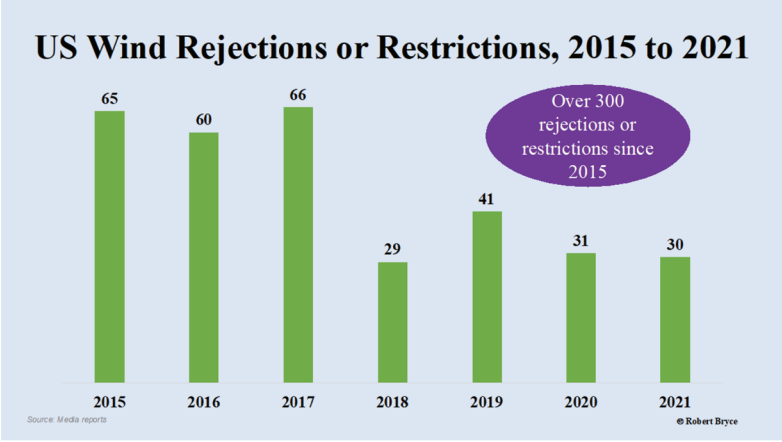
What's driving up prices? The CPUC says that "electrification goals and wildlife mitigation plans are among the near-term needs...that place upward pressure on rates and bills." The report projected that residents living in hotter regions (that is, those who can't afford to live close to the coast) and get their electricity from San Diego Gas & Electric, could see their monthly power bills increase by 47% between now and 2030. When future gasoline-price increases are included, overall energy costs for that same consumer are projected to increase by 60%. Furthermore, the CPUC expects residential ratepayers in SDG&E's service territory will be paying close to 45 cents per kilowatt-hour by 2030. For reference, that is more than three times the 2020 nationwide average residential price of 13.2 cents per kilowatt-hour.

The report also makes clear that soaring energy prices in the state are creating social equity and energy justice concerns. It notes that to avoid paying more for electricity, residents will need to make big investments in all-electric homes and electric vehicles. But "in order to avoid large increases in energy bills, customers will need to adopt technologies that require large up-front investments. In the absence of subsidies and low-cost financing options, *this could create equity concerns for low- to moderate-income households and exacerbate existing disparities in electricity affordability.*" (Emphasis added.)[29]

More realism: all across the country, communities are rejecting renewable projects. Since 2015, more than 300 communities from Maine to Hawaii have rejected wind projects. In Democratic states such as New York, California, and Vermont, local opposition makes building new wind projects nearly impossible. Figure 3 shows the number of wind energy rejections by year since 2015. For more on this, see my recent *Forbes* article: "Here's The List Of 317 Wind Energy Rejections The Sierra Club Doesn't Want You to See."[30] As John Riggi, a town councilman in Yates, NY – who has been fighting a proposed 200-megawatt wind project for seven years – told me, his community and others "are fighting to keep our lands free from environmentally destructive, culture killing and unwanted industrial renewable energy projects."

Riggi and other rural Americans are fighting wind projects because they don't want to see the red-blinking lights atop those 50- or 60-story-high wind turbines, all night, every night, for the rest of their lives. They are also concerned – and rightly so – about ruined viewsheds, the deleterious health effects of noise from the enormous turbines, sleep disturbance, and potential decrease in their property values.[31]

Figure 3



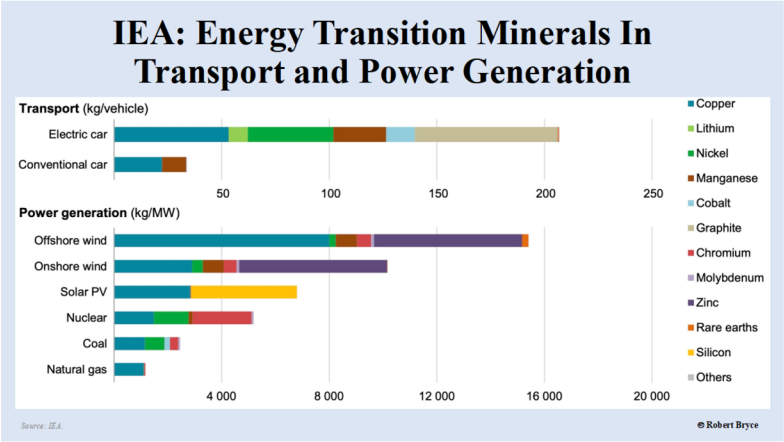
More realism: converting our energy and power systems to renewables will cost American taxpayers trillions of dollars. In 2019, consulting firm Wood Mackenzie

estimated that converting the U.S. grid to run solely on renewables *would cost a staggering $4.5 trillion.* In its analysis, Wood Mackenzie noted that that sum is "nearly as much as what the country has spent, since 2001, on the war on terror. From a budgetary perspective, the cost is staggering at US$35,000 per household – nearly US$2,000 per year if assuming a 20-year plan."[32]

Those numbers make a mockery of the claims made by climate activists about their desire for energy justice and a "just energy transition."[33]

In addition to the stratospheric – and highly regressive – costs of such an effort, attempting to convert our energy and power systems to renewables will also make the US reliant on China, which has a stranglehold on the critical minerals market. China controls the supply of neodymium, dysprosium, and other rare earth elements that are needed in electric vehicles and other "green" technologies. Figures 4 and 5 below include screenshots from a recent report by the International Energy Agency which show the resource intensity of alternative energy technologies as well as China's dominance of the critical minerals processing sector.[34]

Figure 4

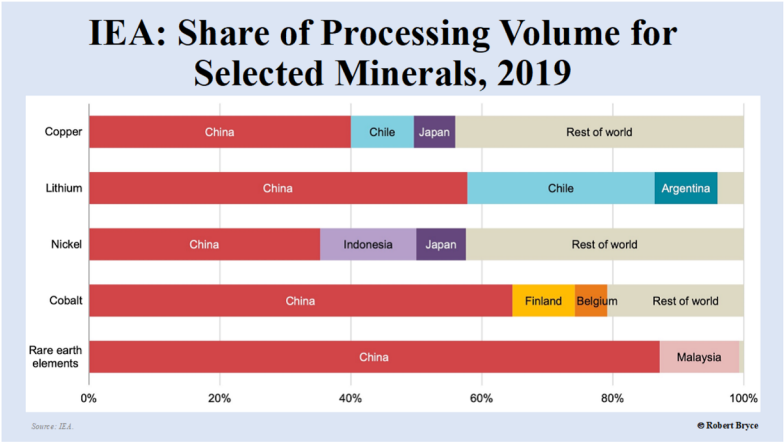


In the report, the IEA notes that over 90% of all EVs sold use permanent management synchronous motors thanks to their efficiency, compactness, and

power density. But those motors need for "neodymium, praseodymium, dysprosium, and terbium – upwards of 1 kilogram per motor – raises concerns given the geographical concentration of raw material and processing in China."[35]

Figure 5 shows China's near-total dominance of the market for cobalt and rare earth elements. The IEA also reports that the production of lithium, a key ingredient in batteries, "is highly concentrated in a small number of regions, with China accounting for 60% of global production."[36]

Figure 5



In addition to the need to ramp up the production of cobalt and rare earths, a push to increase the use of renewables will require staggering increases in global mining to produce megatons of copper, zinc, lithium, and other elements. In turn, all of that mining will require enormous amounts of diesel fuel and other hydrocarbons.

Energy realism requires policymakers to acknowledge the land-use conflicts that are limiting the expansion of the bulk power transmission system that would be needed to move renewable energy from rural regions to distant cities. The National Renewable Energy Laboratory has estimated that achieving a 90% penetration of renewables on the grid would require the construction of hundreds of thousands of miles of new high-voltage transmission lines. But the November 2 referendum in

Maine showed, yet again, that Americans don't want those massive overhead cables cutting through their neighborhoods and forests.[37]

Energy realism requires policymakers to understand the deadly impact that large-scale renewable projects are having on American wildlife. A 2013 study published in *Wildlife Society Bulletin* estimated that in 2012 alone wind turbines killed about 888,000 bats and 573,000 birds, including 83,000 raptors. When that study was done, the U.S. had about 60,000 megawatts of wind capacity. Today, the industry has more than twice that amount. Therefore, the wind industry's impact has undoubtedly become even more deadly on our avian populations and could be killing as many as 1 million birds, including tens of thousands of raptors per year.

Among the avian casualties are Bald and Golden Eagles. In 2013, the U.S. Fish and Wildlife Service issued a report which found that the confirmed number of eagles killed by wind turbines had killed 85 eagles over the previous six years and that figure was "an absolute minimum." That same year, the Fish and Wildlife Service has also determined that "there are no conservation measures that have been scientifically shown to reduce eagle disturbance and blade-strike mortality at wind projects."[38]

Bats are important pollinators and insectivores. In 2016, two scientists from the U.S. Geological Survey, Thomas J. O'Shea and Paul M. Cryan, published a paper that found wind turbines are the largest cause of mass bat mortality, and exceed the toll taken by white-nose syndrome, a fungal disease that afflicts bats.[39] In a discussion of the paper, Cryan said that the wind industry's toll on bat populations could have long-term negative effects. "Bats are long-lived and very slow reproducers," he said. "Their populations rely on very high adult survival rates. That means their populations recover from big losses very slowly."[40]

Given the negative impact that wind turbines have on our wildlife, American taxpayers should not be subsidizing the slaughter.[41]

According to data from the U.S. Treasury, the wind industry will collect some $3.1 billion this year in the form of the production tax credit and a total of some $33.7 billion between 2020 and 2029. Furthermore, the tax incentives given to the wind industry are larger than those given to any other segment of the energy business.[42]

In summary, garroting the domestic hydrocarbon sector by killing pipelines, imposing taxes on methane, banning natural gas, halting drilling on federal lands and waters, attempting to "electrify everything," subsidizing electric vehicles for

the rich, and never-ending, multi-billion-dollar tax breaks for Big Wind and Big Solar, will not solve global climate change.[43]

Instead, it will turbocharge inflation, which is already at a 31-year high, imperil America's energy security, and impose regressive taxes on the working poor and middle class.[44]

Our economy runs on coal, natural gas, propane, diesel, jet fuel, and gasoline, and that will be true for decades to come.

Staking the future of the United States economy, as Europe has done, on weather-dependent renewables and imported energy amounts to *unilateral energy disarmament* that will hurt the American working class and benefit Russia, China, and OPEC.[45]

Who will stand up for rural America and against the landscape-destroying sprawl of wind and solar projects?

Who will speak against the federally subsidized slaughter of our birds and bats by the wind industry?

Expensive energy is the enemy of the poor. Who in the Senate will stand up for the poor?

Who in Congress will stand up for the affordability, resilience, and reliability of our electric grid, which is being undermined by the senseless rush to renewables?[46]

Where are the pro-nuclear, pro-energy realists?[47]

Where I must ask, are the energy humanists?

Thank you.

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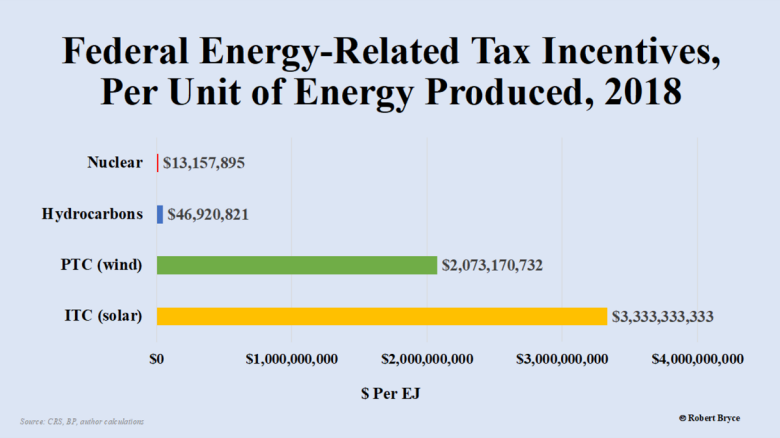
[1] Author, journalist, film producer, and host of the Power Hungry Podcast. Bryce's latest book is *A Question of Power: Electricity and the Wealth of Nations*. His new documentary is *Juice: How Electricity Explains the World.* See: RobertBryce.com and on Twitter, @pwrhungry

[2] https://apnews.com/article/europe-business-european-union-9c05bbfdb8074262e1e10cb62da24560
[3] https://www.reuters.com/article/cf-inds-operations/cf-industries-halts-operations-at-uk-facilities-on-higher-gas-prices-idUSKBN2GB2CO
[4] https://www.wsj.com/articles/energy-prices-in-europe-hit-records-after-wind-stops-blowing-11631528258
[5] https://www.wsj.com/articles/the-u-k-ditched-coal-and-left-itself-with-a-new-set-of-challenges-11635073201
[6] Russian exports of natural gas to Europe have been sporadic. On October 30, flows of Russian gas on the Yamal-Europe pipeline fell to zero, a move that resulted in gas flowing east, from Germany to Poland. See: https://oilprice.com/Energy/Natural-Gas/Europes-Gas-Prices-Soar-Again-On-Lower-Russian-Supply.html
As *Oil Price* reported, "consumers and industries are left at the mercy of the weather, hoping for a mild winter to avoid further tightening of the already tight European gas market." See: https://oilprice.com/Energy/Natural-Gas/Natural-Gas-Prices-Could-Soar-Even-Higher-As-Europe-Braces-For-A-Cold-Winter.html
On November 6, according to Reuters, "Gas flows through the Yamal-Europe pipeline westbound into Germany have stopped again and are flowing in the opposite direction back towards Russia... In the past week benchmark European gas futures rose as much as 23% due to the halting of westward flows." See: https://www.reuters.com/business/energy/russian-gas-flows-via-yamal-europe-pipeline-germany-halted-again-2021-11-06/
See also: https://www.forbes.com/sites/arielcohen/2021/10/14/europes-self-inflicted-energy-crisis/?sh=558fa442af3a
[7] In September, the European Trade Union Confederation estimated that due to soaring energy prices, some 15% of the EU's working poor - the equivalent of 2,713,578 people - lacks enough money to turn on the heating." See: https://apnews.com/article/europe-business-european-union-9c05bbfdb8074262e1e10cb62da24560
[8] https://industrialprogress.com/fossil-fuels-are-the-food-of-food/
[9] https://www.thenationalnews.com/world/uk-news/2021/09/17/running-out-of-energy-supply-fears-grow-as-uk-fertiliser-plants-close/
See also:
https://www.gasworld.com/basf-becomes-latest-to-curtail-fertiliser-production/2021817.article
Note in the last article, the report states: "In almost all of these instances, either an end-of-year timeline or no estimate at all has been given for the resumption of these plants."
[10] https://www.wsj.com/articles/chinas-coal-shortage-threatens-farmers-in-india-and-truckers-in-south-korea-11636635601
[11] https://im-reg.onecount.net/onecount/redirects/index.php?action=get-tokens&js=1&sid=&return=https%3A%2F%2Fwww.farmprogress.com%2Ffertilizer%2Fglobal-fertilizer-crisis-may-push-food-prices-higher&sid=cbs976g6oli951pt8d8ffd5t04
[12] https://www.eia.gov/todayinenergy/detail.php?id=37072
[13] https://www.artberman.com/2020/09/03/stop-expecting-oil-and-the-economy-to-recover/
[14] The primary energy share data is from the BP Statistical Review of World Energy 2021. Electricity data is EIA: https://www.eia.gov/tools/faqs/faq.php?id=427&t=3
[15] BP Statistical Review of World Energy 2021.
[16] https://www.nationalreview.com/2017/06/renewable-energy-national-academy-sciences-christopher-t-m-clack-refutes-mark-jacobson/

[17] https://home.cc.umanitoba.ca/~vsmil/pdf_pubs/oecd.pdf
[18] https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/
[19] BP Statistical Review of World Energy 2021.
[20] https://www.nytimes.com/2017/10/07/business/energy-environment/german-renewable-energy.html
[21] https://www.cleanenergywire.org/factsheets/how-much-does-germanys-energy-transition-cost
[22] https://www.reuters.com/article/us-germany-politics/german-coalition-negotiators-agree-to-scrap-2020-climate-target-sources-idUSKBN1EX0OU
[23] http://www.xinhuanet.com/english/2020-09/21/c_139385790.htm
[24] https://www.bloomberg.com/news/articles/2021-08-25/german-power-market-set-for-highest-winter-prices-in-20-years
[25] https://www.realclearenergy.org/articles/2021/06/24/blackouts_loom_in_california_as_electricity_prices_are_absolutely_exploding_782903.html
[26] https://environmentalprogress.org/california
[27] https://www.realclearenergy.org/articles/2021/06/24/blackouts_loom_in_california_as_electricity_prices_are_absolutely_exploding_782903.html
[28] https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/office-of-governmental-affairs-division/reports/2021/senate-bill-695-report-2021-and-en-banc-whitepaper_final_04302021.pdf, 5.
[29] https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/office-of-governmental-affairs-division/reports/2021/senate-bill-695-report-2021-and-en-banc-whitepaper_final_04302021.pdf, 8.
[30] https://www.forbes.com/sites/robertbryce/2021/09/26/heres-the-list-of-317-wind-energy-rejections-the-sierra-club-doesnt-want-you-to-see/?sh=2f92e1115bad
[31] For an in-depth discussion of these issues, see my April 2021 report, "Not In Our Backyard," https://files.americanexperiment.org/wp-content/uploads/2021/04/Not-in-Our-Backyard-Robert-Bryce.pdf
For property values, see: https://blogs.lse.ac.uk/politicsandpolicy/gone-with-the-wind/
[32] https://www.woodmac.com/news/feature/deep-decarbonisation-the-multi-trillion-dollar-question/
[33] https://rmi.org/spotlight-a-just-energy-transition/
[34] https://iea.blob.core.windows.net/assets/24d5dfbb-a77a-4647-abcc-667867207f74/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf
[35] Ibid., 108.
[36] Ibid, 133.
[37] https://www.forbes.com/sites/robertbryce/2021/11/05/maine-voters-rejection-of-transmission-line-shows-again-how--land-use-conflicts-are-halting--renewable-expansion/?sh=6db6183768e8
[38] https://www.wsj.com/articles/SB10001424052702303342104579099060830782406
[39] https://www.researchgate.net/publication/291184714_Multiple_mortality_events_in_bats_A_global_review
[40] https://www.scientificamerican.com/article/bat-killings-by-wind-energy-turbines-continue/

[41] https://www.forbes.com/sites/robertbryce/2020/05/15/subsidizing-the-slaughter-big-wind-kills-another-bald-eagle-gets-more-federal-subsidies/?sh=5d3b648b25e2
[42] https://home.treasury.gov/system/files/131/Tax-Expenditures-2021.xlsx
[43] The tax incentives for wind and solar are far greater on a per-unit of energy produced basis than what is given to hydrocarbons and nuclear. As I reported last year in *Forbes*, federal tax incentives for solar are about 250 times as great per unit of energy as what is given to nuclear. See: https://www.forbes.com/sites/robertbryce/2021/12/27/why-is-solar-energy-getting-250-times-more-in-federal-tax-credits-than-nuclear/?sh=4f161f5e21cf
The graphic below illustrates the enormous disparity in tax incentives.



[44] https://www.wsj.com/articles/us-inflation-consumer-price-index-october-2021-11636491959
[45] https://www.zerohedge.com/energy/green-energy-bubble-unrealistic-expectations
[46] Please see my October 27, 2021 testimony in front of the Senate Subcommittee on Government Operations & Border Management for more on this: https://www.hsgac.senate.gov/imo/media/doc/TESTIMONY%20-%20GOVOPS%20-%20OCT27%20-%20BRYCE.pdf
[47] This is the sixth time I have testified before Congress. I will reiterate here the same points I have been making for more than a decade about the need to increase our use of nuclear energy. When I testified before this committee in 2019, I said: "there is no reasonable or affordable pathway to decarbonization of the global electricity business that does not include large-scale deployment of nuclear energy. If the US wants to foster the innovation needed to sustain growth in nuclear-energy technology, Republicans and Democrats will have to forge significant, long-term commitments toward that goal." See: https://www.energy.senate.gov/services/files/78AC03A6-098A-45EE-84AF-A075670B62E6

I made a similar point earlier this year in testimony before the House Select Committee on the Climate Crisis. At that June 30 hearing, I said: "if this committee is serious about reducing greenhouse gas emissions while assuring societal resilience and the reliability of the electric grid,

it should be laser-focused on keeping all of our existing nuclear plants open and operating for as long as possible...If policymakers want to decarbonize our transportation system while enhancing the resilience of our society, the best option would be to have a grid that is heavily reliant on nuclear energy." See: https://docs.house.gov/meetings/CN/CN00/20210630/112853/HHRG-117-CN00-Wstate-BryceR-20210630.pdf

The CHAIRMAN. Thank you, Mr. Bryce.

Now we will start with our questions, and I will begin with Mr. Nalley. I am interested in the impact increasing U.S. LNG has on the natural gas prices in the U.S. I think it is critically important to remain energy independent. We have spoken about that and we talked about that and we had an unbelievable find as a result of horizontal drilling in the Marcellus and Utica Shales in my home area of West Virginia. It is an ocean of gas. We found so much more oil and things that we are able to produce. That development made us energy independent for the first time.

So I am curious to learn from EIA if the data is changing and whether high LNG export prices, because the attraction of the high prices, have caused us to export more natural gas to the detriment of the American consumer. Are we going to pay a higher price here so that companies that we allow to export their products can make a higher profit overseas?

Mr. NALLEY. It's a great question. Of course, a lot of attention on LNG exports and natural gas in the U.S.

The CHAIRMAN. You can also put that for oil too because we allowed oil exports too, but I think there is a provision in both of the bills that allows the President to put a halt on exports if it is going to damage the consumer market here in America or raise prices.

Mr. NALLEY. The U.S. has an enormous resource base of natural gas and there are, you know, tight connections between the U.S. and the international market. We do show continued exports at record levels—a maximum level of 50 percent this year and 17 percent projected next year with new LNG capacity coming online. Right now we see that the fundamentals in the U.S. market are probably still primarily at play to, you know, what's going on with the U.S. prices, but clearly, the high prices in Europe and Asia are affecting——

The CHAIRMAN. They are attractive. I understand. I understand the market.

Mr. NALLEY. Right.

The CHAIRMAN. I am just saying do you believe it is making the prices in America spike because we are allowing more exports to leave our country and not protecting the American consumer? I have seen the coal markets. I cannot believe what I am seeing today. I have never seen it. But also, you know, in the natural gas markets and gasoline prices at the pump.

Mr. NALLEY. Clearly, there's a connection there that we're seeing higher prices. We are undertaking a study. We've modeled this, the relationship in the past in 2012 and 2014, and we currently have a study underway that we hope to have finished in the spring, looking at these relationships so we better understand the long-term implications.

The CHAIRMAN. Mr. Bryce, do you have any comments on that?

Mr. BRYCE. Well, certainly, sir. When you add more demand for domestic supply of anything, whether it's corn or soybeans or LNG, you're going to see higher prices.

The CHAIRMAN. Would you recommend that we would curtail our exports to take care of the American consumer?

Mr. BRYCE. No sir.

The CHAIRMAN. Do you think the American consumer is getting gouged by the higher percentage of export?

Mr. BRYCE. I believe in free markets and free trade, sir.

The CHAIRMAN. Okay.

Mr. BRYCE. I mean, if we're going to limit sales of our oil or our gas are we going to do the same for corn or soybeans or pork bellies? I mean, where does that stop?

The CHAIRMAN. Gotcha.

Mr. Gould, can you give me, from the international level, give it to me.

Mr. GOULD. I would concur with what's just been said. The U.S. has been a major beneficiary of open international markets, and I continue to believe that over the medium- and long-term that would be the case.

The CHAIRMAN. So all three of you are saying that the export policies that we have had help stabilize the international market and do not put extra burden on the American consumer. Or do you recognize that we are putting an extra burden on the American consumer?

Mr. BRYCE. My response, sir, was we live in a global marketplace.

The CHAIRMAN. Gotcha.

Mr. BRYCE. And that U.S. LNG exports are helping reduce carbon emissions in other countries, and I think that's a good thing.

The CHAIRMAN. Okay.

Mr. Nalley.

Mr. NALLEY. No, I mean, clearly, the prices are higher right now than they have been for a long time. So it's clearly putting pressure on residents, industry, as well at home with the higher prices. We see that. So clearly, it's putting a burden on U.S. businesses and homeowners.

The CHAIRMAN. Mr. Gould, if you can tell me on an international basis, do you see any countries that you think are really doing a great job as far as their portfolio of energy and how they produce energy and how they distribute energy to stabilize and keep it reliable, dependable, affordable, and reliable? Which country do you think is doing the best job?

Mr. GOULD. I think there's some interesting analysis that was released yesterday of which countries in Europe—I completely agree that Europe has been at the center of this storm, but there was interesting analysis done of which countries in Europe have seen the highest increase in electricity prices in recent months and which countries had lesser increases in electricity prices. And interestingly, the countries that had the lowest increase in electricity prices over the last few months, it was looking in particular at September, were countries that had invested heavily in renewables in the Nordic states of Europe. The other country that saw a lower-than-average rise in electricity prices was Poland and that's despite the carbon prices and this was due to the relatively high share of coal.

The countries, by contrast, that saw the highest increase in gas prices and the highest increase in electricity prices were those that had a large share of natural gas in the electricity mix and also is those that are relatively poorly interconnected with their neigh-

bors. So I think that gives important clues as to the policy measures that have been successful, at least in Europe, in recent months.

The CHAIRMAN. Thank you all very much.

Now I will turn to Senator Barrasso.

Senator BARRASSO. Thanks.

Mr. Bryce, you mentioned a need for energy realism. Could you share with the Committee here Europe's problems, right now a growing problem, to me, of energy poverty and energy insecurity?

Mr. BRYCE. Certainly. What we're seeing now with natural gas prices in Britain, they are about five times what they are here in the U.S. on the wholesale market. What we saw was a warning just a few weeks ago from one of the largest trade unions in Europe, estimating that about three million of their members will be in energy poverty this winter, that they will not be able to pay their utility bills to stay warm this winter. So I think time will tell, but the prospects of a cold winter and potentially mortality—people dying from the cold this winter in Europe is a very real possibility.

Senator BARRASSO. So what should this Administration, what should this Congress learn from Europe's energy crisis?

Mr. BRYCE. Do not do what Europe is doing.

Senator BARRASSO. So should Congress pass legislation imposing even additional new taxes and fees on oil and natural gas produced here in the United States which is now being proposed in the House of Representatives?

Mr. BRYCE. Sir, I've thought about this a lot in the last few days and in my latest book I write about the history of electricity in the United States. And it's remarkable to come to Capitol Hill and remember that 86 years ago Senator Burton Wheeler from Montana and Senator George Norris from Nebraska, along with Representative Sam Rayburn from Texas, pushed through the Public Utility Holding Company Act of 1935 and the Rural Electrification Act of 1936. They did it because they were concerned about high energy prices throughout the U.S. and particularly for rural Americans. And to see today the Democratic Party pushing for higher energy prices, I just don't understand it, sir.

Senator BARRASSO. I am going to have a question for all three of the witnesses today. President Biden recently nominated, to be the Controller of the Currency, Saule Omarova. This is one of the nation's most powerful banking regulators. In February, while President Biden was in office, Ms. Omarova gave a presentation where she discussed small players in oil, natural gas, and the coal industry. During her presentation she said, "We want them . . . " (the small players in oil, natural gas, and coal) " . . . to go bankrupt if we want to tackle climate change." That is her statement. It is not mine. She has now been nominated to be the Controller of the Currency.

Do any of you believe it is in the best interest of the United States if these small oil, gas, and coal producers go bankrupt? Raise your hands if any of you do. Any of you think they ought to go bankrupt?

Okay, so none of the witnesses today agree with the nominee of the President to be Controller of the Currency that these companies should all go bankrupt. It is remarkable that anybody would

agree with such a statement and certainly it is surprising that President Biden continues to support this nominee.

Mr. Bryce, I want to ask about New England and the pipelines. We have already seen the referendum in Maine where people voted against the transmission lines. And it was hydropower coming from Canada to the United States. So it was renewable energy and they still blocked it, as you had mentioned. One of the worst-hit areas of the nation right now in terms of higher natural gas prices for this winter is New England. The people are already paying very high natural gas prices because of issues. The cruel irony is that New England is not far from some of our nation's cheapest natural gas—Pennsylvania, West Virginia. But for years environmental activists and Democrats who do not really want to focus on energy realism, they have successfully killed new pipelines which would have shipped natural gas to the Northeast.

[The information referred to follows:]

Notable Cancellations in Recent Years of Eastern Natural Gas Pipeline Projects

Constitution Pipeline	NY & PA
Northern Access Pipeline	NY & PA
Valley Lateral Pipeline	NY
Atlantic Coast Pipeline	WV, VA, & NC
PennEast Pipeline	PA & NJ
Access NorthEast	NJ, NY, CT, RI, MA, & ME
Northeast Energy Direct	NY & MA

Sources: Global Energy Institute, U.S. Chamber of Commerce; Conservation Law Foundation

Senator BARRASSO. Now, is it fair to say that if politicians had not blocked new natural gas pipelines to the people of New England that they would be better off today?

Mr. BRYCE. Absolutely, sir. And it's not just on home heating. It's also involving electricity. What I saw in New England has repeatedly said is that the availability of natural gas has resulted in less reliability for the electricity grid in ISO New England. So I think this is clearly a problem and that it is one that's been ongoing for years. And I would point particularly to the State of New York under Governor Cuomo repeatedly blocking pipelines across New York State that could have taken natural gas north.

Senator BARRASSO. So is it fair to say that the problem, really, with New England is insufficient pipeline capacity, not LNG exports from other locations, the reason that the people in New England pay much more for natural gas?

Mr. BRYCE. I think that's a fair statement, and I think that it's all about supply and demand. If there's not sufficient supply, prices go up.

Senator BARRASSO. Last week in Glasgow, Scotland, John Kerry, U.S. Special Presidential Envoy for Climate, stated, and this is to you, Mr. Bryce. "By 2030," he said, "In the United States, we won't have coal. We will not have coal plants." You know, EIA's most recent annual energy outlook predicts that the United States is still going to use coal to generate electricity in 2030, as will the rest of the world.

Mr. Bryce, what will be the impact to electric reliability if the United States shuts down all of its coal plants?

Mr. BRYCE. Well, sir, I can't answer that, but I live in Texas. I live in Austin and I was blacked out for 45 hours in February. And in looking at the postmortem of the ERCOT blackouts, it's clear that the power plants that had onsite fuel were the ones that delivered electricity most reliably. So I understand the urge for decarbonization, but I'm for affordable, reliable, and resilient electric grid and reducing or eliminating coal in our electricity system, I think, will lead to higher prices and a less resilient system and that's a bad thing for consumers.

Senator BARRASSO. Thank you. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Heinrich.

Senator HEINRICH. Mr. Bryce, since you're from Texas, I want to ask you a little bit about Texas and specifically, the current interconnection applications for the ERCOT grid.

Mr. BRYCE. Sure.

Senator HEINRICH. I was looking at those and I noticed that right now it seems there are about 100 gigawatts of solar projects seeking interconnection, about 42 gigawatts of battery storage, over 22 gigawatts of wind. So if you look at the entirety of the queue in Texas, about 93 percent of it is solar, wind, and battery storage. You mentioned, sort of, an upwelling of, I don't know, an uprising against wind and solar. So why is Texas hell-bent on becoming the biggest solar and renewables market in the U.S.?

Mr. BRYCE. The answer, sir, is very clear: excessive subsidies for solar and wind. I reported in Forbes a few months ago, the subsidy via the investment tax credit——

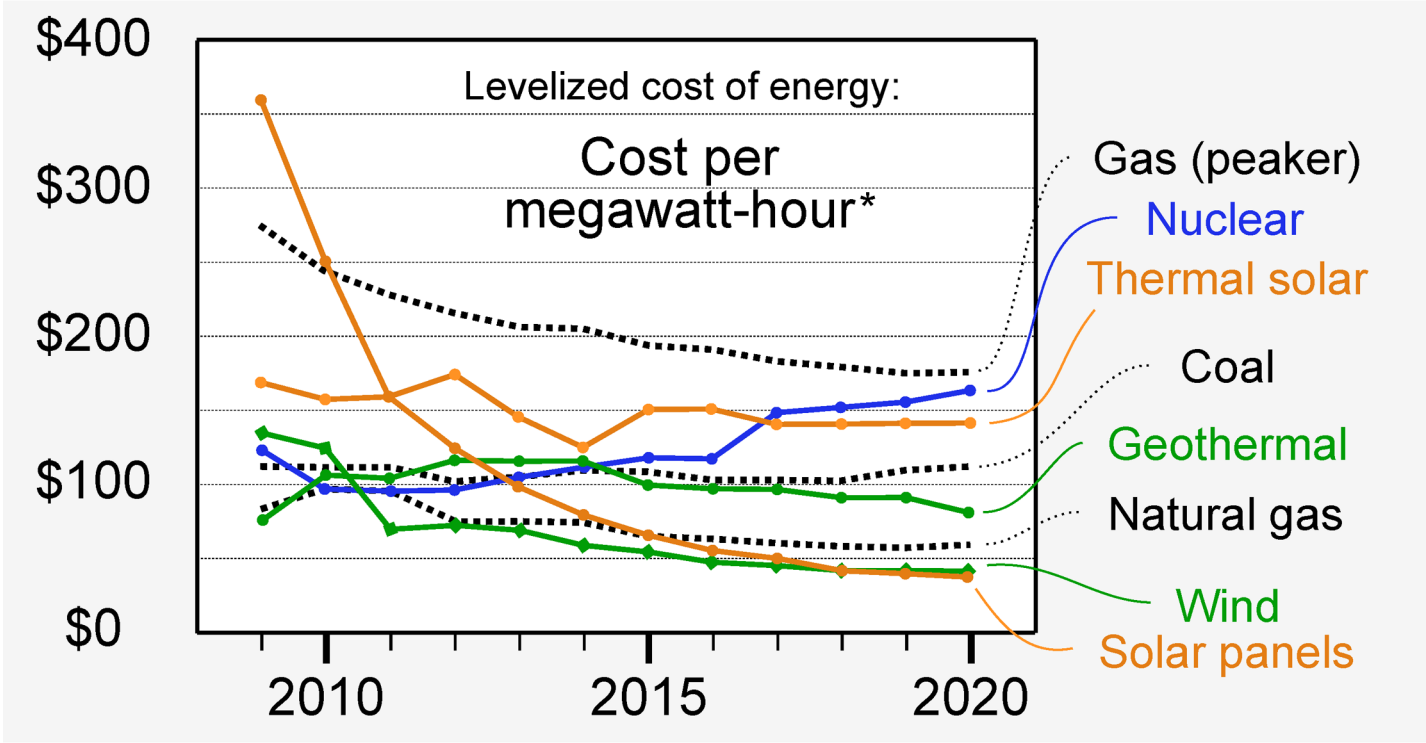
Senator HEINRICH. Okay.

Mr. BRYCE [continuing]. For solar is 250 times what is given to nuclear and it's 160 times greater for wind as it is for nuclear. The Texas market and the investment in the Texas market is being driven by subsidies, full stop.

Senator HEINRICH. I think we can all agree that there are massive subsidies throughout the energy markets. There are subsidies for oil and gas. There are certainly subsidies with respect to insurance for nuclear. And there are subsidies for renewables.

But let's look at, real quick, just at the levelized costs because I think what's happening in Texas is more an indication of where price trends have gone over time. So if you look at electric generation today and you take all the subsidies out, you just look at the levelized cost, you see how incredibly expensive nuclear has become. You see how expensive coal is today. You see how expensive natural gas, particularly peaker plants, and even combined-cycle natural gas plants have become more expensive than wind and solar on a levelized basis. So I think what we are seeing in Texas is a reflection of the free market and the fact that people do want cheap energy and they want reliable energy and Texas has moved in the direction they have because of these costs in particular. You know, when you have nuclear at a price that is over three times what you can get for wind and solar generation, you are going to see migration in the market.

[The information referred to follows:]



*Derived from data in "Lazard's Levelized Cost of Energy Version 14.0" (PDF). Lazard.com. Lazard. 19 October 2020

Senator HEINRICH. Mr. Gould, I want to ask you, obviously we are seeing, you know, escalating prices in volatile commodities, gasoline, diesel, natural gas. You talk a little bit about the role of heat pumps in cushioning customers away from some of those price shocks. But more broadly, isn't it electrification and, specifically, electrification reliant on low-cost sources like we have seen in those Nordic countries that is cushioning some Europeans and not others?

Mr. GOULD. I would concur with that, certainly with the part to say that as a result of policy support, a sort of virtuous circle of policy support and deployment, key renewable technologies in the power sector are now the least-cost options for new generation. That is why they are now the preferred source of technologies for new investment. And that plays through into this notion of cleaner electrification of parts of the economy, notably for mobility and for heating in some instances.

In our view, some analysis we did in the World Energy Outlook shows that if you are able to make the upfront investments in more efficient appliances and in electrification of mobility and electrification, in some cases, of heat, that is a very effective strategy for cushioning the effects of commodity price shocks on consumers.

Senator HEINRICH. So Mr. Gould, walk us through just a couple of examples. If you look at Europe, obviously, some of these countries have gotten it right and some have gotten it wrong. What should we learn from the countries that have done a better job and what should we avoid in some of the countries that have seen the most extreme price shocks?

Mr. GOULD. I think part of the change that's taking place in Europe is away from a system that is heavily dependent on operational costs, on fuel costs, more toward a system that is reliant on technologies that may have higher up-front costs, but then have much lower operating expenditures. And the further you move down that road, the less vulnerable you are to fluctuations in the prices of those fuels. And I would point, indeed, to some of the Nordic countries who seemed to have weathered the price storm better than others in Europe, as good examples of what can be achieved.

Senator HEINRICH. Thank you.

The CHAIRMAN. Now we have Senator Lankford.

Senator LANKFORD. Mr. Chairman, thank you.

This hearing is dealing with the price that we have seen increases on in gas and natural gas and other fuel sources. Coal has skyrocketed in price. In fact, I would say, under this President, the coal industry has done much better under this President based on the dramatic price increase for coal that is actually happening under this Administration, the amount of exports and things that are actually happening.

So my question is on the cost. I know that, Mr. Nalley, you talked specifically about increased consumption worldwide and how the production is not keeping up. Typically, in our market system, if consumption increases, production starts accelerating as well. Why is American production not increasing at the rate to be able to keep up with American consumption as well? With the prices like $80 on West Texas Intermediate and $5 a unit for natural gas,

you would think that the production would have continued to accelerate. Why is it not accelerating?

Mr. NALLEY. Just to clarify, you mean on crude oil, correct?

Senator LANKFORD. That is correct.

Mr. NALLEY. Well, I think it's a great question. We are pretty early in the recovery, but we're about 93 percent of where we were in oil production relative to 2019. I think one of the major contributing factors is the economic downturn. A lot of those P and E company investors were hit pretty hard financially. I think they are trying to reposition themselves for the long-term.

There's been a lot of written speculation about, sort of, why they are not coming back into the market quite as quickly.

Senator LANKFORD. Is the access to capital the same now for companies that deal with fossil fuels as it was in 2019 or is it harder for them to get access to capital now for investment?

Mr. NALLEY. I don't think it's harder necessarily, to my knowledge, I think it's just that they're trying to rebalance their bank balance sheets, pay off some debt and then, you know, they've got some investment they've got to make in equipment and rigs to bring them back online. I think we are starting to see some increase in production in the Permian in particular. We do forecast that production in the U.S. will dip a little bit this year, down one percent and it will increase in 2022, but in the U.S., we will not get back to the 2019 level next year.

Senator LANKFORD. There's been some conversation from the Administration about releasing oil from the Strategic Petroleum Reserve. What affect would that have on prices in America? Short-term and long-term? For at the pump? What would consumers feel?

Mr. NALLEY. Well, we've done some analysis in the past. We've done some analysis recently. I think a release of SPRO, it can be complicated. We have to know some specifics about how much or when and what the market conditions were, when it would occur and so forth. Our analysis generally shows that it's pretty short-lived, a couple months and that typically, the other dynamics in the market would overtake any decrease in price. But ultimately, the amount of impact would be relatively short-lived. It would depend on how much was released.

Senator LANKFORD. Senator Barrasso brought up a quote from John Kerry, who is the Special Envoy for Climate for President Biden, in a statement that he made to Bloomberg, in that interview, and what he said in this, "by 2030, the United States, we won't have coal. We will not have coal plants." Your administration at your agency is trying to be able to look for the future of energy and try to provide energy in the United States. By 2031, do you expect us to not have coal plants in America?

Mr. NALLEY. No. We show, if we look at our AEO 2020—last year's AEO that we put out—we show coal reducing about one percent per year out through 2050. I think in 2050, we show it being roughly 75 percent of what it is currently.

Senator LANKFORD. There was some conversation earlier about the export of natural gas. So I was interested by that dialogue that if we just cut off the export of natural gas then will that solve price issues in the United States? Looking at the total market and the investment that is happening, you have different pipelines, you

have different companies that are coming into place, you have drilling operations that are going after natural gas to provide to the domestic market or the international market. The infrastructure itself is being built up to be able to provide for the international market. If all of that investment went away, that we weren't investing for the international market and for the domestic market, what would happen to domestic prices?

Mr. NALLEY. Well, if you stopped exporting LNG, we'd certainly put a surplus in, or extra supply in the U.S. market. Prices would drop in the U.S. market. I think internationally they would skyrocket and I think lower prices in the U.S. would probably discourage more production.

Senator LANKFORD. I think that would discourage more investment in the future. I think it should have less capital going into developing for the future. My perception of the markets are, as we are developing more and more facilities to be able to export, we are also developing more and more access here. If that went away with an extremely low price that we have seen in natural gas for years now, none of that investment would have occurred and we would not be well-positioned to be able to continue to provide for our own needs.

Mr. NALLEY. I think that's correct.

Senator LANKFORD. Okay.

Mr. Chairman.

The CHAIRMAN. Senator King.

Senator KING. Thank you, Mr. Chairman. A very interesting and important hearing. I appreciate it.

Before I begin my questioning, I want to acknowledge the young lady sitting behind me, Caroline Colan, who has been my staff member on this Committee for a number of years, who is abandoning—oh, I'm sorry—leaving me——

[Laughter.]

Senator KING [continuing]. For the Energy Office of the Governor of Maine. This will be her last hearing, and I wanted to acknowledge Caroline's good work.

The CHAIRMAN. Raise your hand.

Senator KING. Caroline, raise your hand.

The CHAIRMAN. Which one is Caroline?

Senator KING. There you go. Thank you.

A couple of issues. Mr. Nalley, gasoline prices follow oil prices, isn't that correct?

Mr. NALLEY. Yes sir.

Senator KING. And oil prices have basically tripled per barrel. Last time I looked, in September 2020, it was $25 a barrel. Now, it is close to $80.

Mr. NALLEY. Mid-$80's, yes.

Senator KING. Correct.

So that means gasoline prices are going to increase. That is just the reality. Why has oil gone up so much?

Mr. NALLEY. Well, I think it's coming out of the pandemic.

Senator KING. It is the recovery, right? Increased demand.

Mr. NALLEY. Yes.

Senator KING. There is one law that this Congress cannot repeal—the law of supply and demand.

Mr. NALLEY. Demand is outpacing production.

Senator KING. And therefore, gasoline prices are up. I would like to introduce for the record a recent article from Forbes about the blame for gas prices. I once woke up on a beautiful Maine morning and said to my wife, "I brought us this beautiful day." This was when I was Governor. And my wife said, "What are you talking about?" And I said, "Well, I get blamed for things that aren't my fault. I may as well take credit for them every now and then."

[Laughter.]

Senator KING. I think often politicians, and particularly presidents, get blamed for gas prices which, in fact, fluctuate substantially as we know based upon oil prices and fluctuations in the market, rarely from executive action. So I would like to submit this article.

The CHAIRMAN. Without objection.

Senator KING. It goes into it in some detail.

[Forbes article regarding the blame for gas prices follows:]

https://www.forbes.com/sites/rrapier/2021/09/26/revisiting-the-blame-for-high-gas-prices/?sh=19deb398e31e

Sep 26, 2021, 02:29pm EDT

Revisiting The Blame For High Gas Prices

Robert Rapier Senior Contributor
Energy

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No article of mine has generated more views and more reader feedback than my piece in March of this year: Who Is To Blame For Rising Gasoline Prices? At present, there are nearly 900,000 views, and I continue to get reader feedback over this article on a weekly basis.

The feedback is invariably from men who are angry that Joe Biden is in the White House and it is along the lines of "I bet you feel stupid now" or "Even an idiot can see that Biden is the one who drove up gasoline prices."

Let's address the obvious fact first. Gasoline prices are indeed higher this year. In fact, the average retail gasoline price is now $1.02/gallon higher than it was a year ago. The price is higher than at any time since 2014. I think the magnitude of the change, more than anything, has convinced people that Biden must be responsible for this.

Initially, I would engage the hostile feedback. I have this perhaps naïve belief that if people merely understand what I am actually saying they will come around to my point of view. And invariably that would happen. After a couple of exchanges, they would say "OK, I agree with what you are saying." I engaged half a dozen readers, and in every case they backed away from their initial angry reaction.

But it's not a productive use of my time to convince readers one by one that they are operating under misconceptions. I ultimately decided to write this article to address some of the most common misconceptions.

MORE FOR YOU

Who Is To Blame For Rising Gasoline Prices?

The gist of the article is that there are few actions a president can take to impact gasoline prices in the short term. Those few actions historically have been 1). Release oil from the Strategic Petroleum Reserve; 2). Increase gasoline taxes; or 3). Engage in a war in the Middle East.

President Biden did none of those, but he did take actions that were hostile to the oil and gas industry, thus driving the belief that this drove up gasoline prices.

President Biden's Energy Policies

First, immediately upon assuming office, President Biden cancelled the Keystone XL pipeline permit. The project had been rejected by President Obama in late 2015,

fast-tracked by President Trump in 2017, and now once more rejected by President Biden in 2021.

Then, Biden suspended new oil and gas leasing and drilling permits for federal land and water.

Those actions, readers were quick to point out, were clearly were behind the rise in gasoline prices. I was willfully blind not to see that, I was told.

Look, I am not defending President Biden's energy policies. I had already been critical of Biden's energy decisions. In January I had written The Inherent Risks In President Biden's Energy Plan, which criticized moves like the Keystone XL cancellation. So I fully understand how these decisions can impact oil and gasoline prices in the longer term — but not in mere months.

For those who insisted that Biden's actions had quickly driven up gasoline prices, I asked them to explain. They would respond that these moves could eventually restrict oil supplies. True, but not for years. Keystone XL might have impacted oil supplies a decade from now. The oil markets don't react in real time to events like this.

The drilling permits potentially have a shorter term impact, but even then companies have stockpiled years of permits in anticipation of such a move (as explained here).

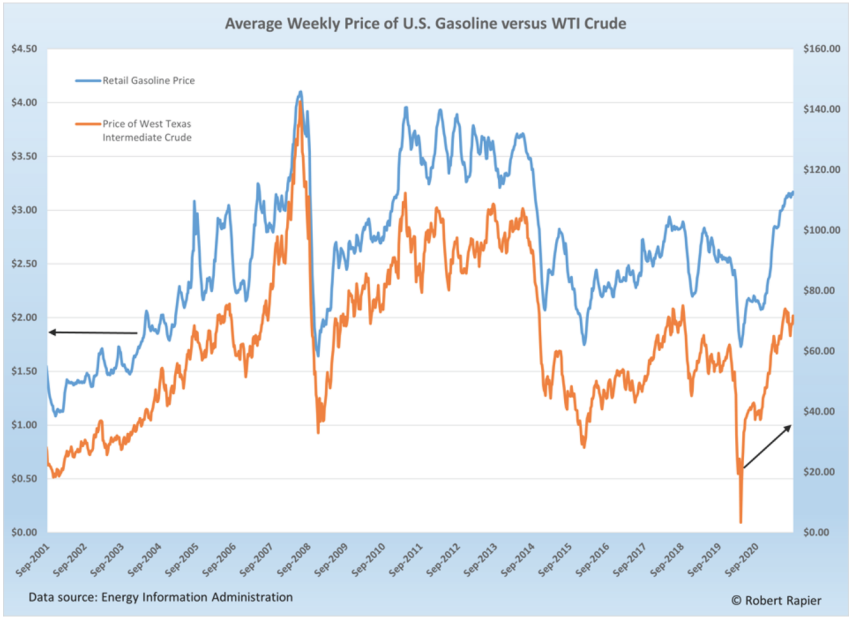
If a hurricane is brewing in the Gulf of Mexico, oil prices will react. If meteorologists forecast 50% more hurricanes in the Gulf of Mexico over the next decade, oil prices won't react. If a country bans internal combustion engines 15 years from now, oil prices won't react today.

If Keystone XL would reduce oil supplies in the future, why wouldn't it impact oil prices today? Primarily because we don't know the oil supply/demand picture at the time Keystone XL would have been completed. The oil markets react to moves by OPEC that quickly impact oil supplies, not to actions that may impact oil supplies in the long run — at a time we don't know what oil demand will be.

The Oil/Gas Price Correlation

https://www.forbes.com/sites/rrapier/2021/09/26/revisiting-the-blame-for-high-gas-prices/?sh=19deb398e31e

Let's look at the past 20 years of gasoline prices versus the price per barrel of West Texas Intermediate crude oil.



The price of retail gasoline versus West Texas Intermediate crude oil. ROBERT RAPIER

This graphic shows a high degree of correlation between the price of oil and the average retail price of gasoline. How high is this correlation? According to my Excel analysis, it's a whopping 96.8% over the past 20 years. In other words, changes in gasoline prices are almost exclusively correlated with underlying changes in oil prices.

Exceptions can occur if there are short term refinery outages (which would tend to decrease oil prices and increase gasoline prices) and seasonal changes in gasoline (which can independently impact gasoline prices) but the bottom line is "If you want to understand what's happening with gasoline prices, look to oil prices."

So, What's the Explanation?

Note when oil and gasoline prices began to rise. That rise started in May 2020. Between the first week of May 2020 and the last week of December 2020, oil prices had tripled. Was President Trump to blame for this?

No, the reason oil and gasoline prices rose is that the economy started to open back up from the Covid-19 shutdowns. Those shutdowns had negatively impacted a couple of million barrels of U.S. oil supplies, and those supplies were slow to bounce back once the economy opened back up. That's why we have soaring oil and gasoline prices.

Keep in mind that the entire world has experienced this. Do people honestly believe that cancellation of the Keystone XL pipeline drove up gasoline prices in Tokyo? Further, this price rise has taken place across most commodities. We have seen soaring lumber prices, base metals prices, cotton, oats, sugar — all primarily associated with the Covid-19 impacts on the economy.

The Oil Industry has Thrived This Year

One major irony is that if you are a supporter of the U.S. oil industry, you should cheer higher oil prices. Low oil prices in recent years drove many producers out of business. Indeed, under President Trump, the share prices of oil producers languished. Again, I am not blaming him for this. It's a function of the macro factors that influenced oil prices.

This year, oil prices have risen, and so have the share prices of oil producers. For example, ConocoPhillips, the world's largest independent publicly traded pure oil and gas company, has risen 64% year-to-date. Other oil companies have experienced similar gains. Should they thank Biden? No, because he isn't the reason oil prices rose.

But, I will reiterate something I pointed out earlier this year. Either Biden is driving up gasoline prices, which helps the U.S. oil industry, or Biden's policies have nothing to do with higher gasoline prices, and thus his policies are doing nothing to help the U.S. oil industry.

It is in fact the latter. Despite the sharp rise in the price of gasoline this year, Biden deserves neither the credit nor the blame — although in the longer term his policies are likely to lead to higher future gasoline prices.

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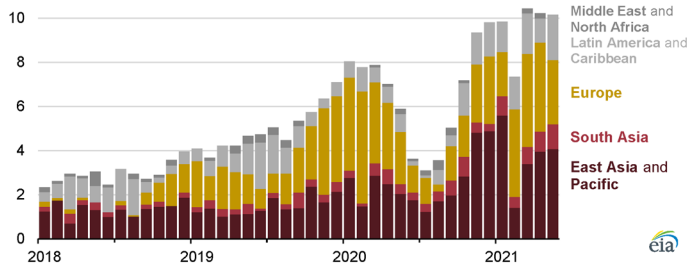
Robert Rapier

Robert Rapier is a chemical engineer in the energy industry. Robert has 25 years of international engineering experience in the chemicals, oil and gas, and... **Read More**

Senator KING. Second is natural gas. I am really worried about exports. I have been making this argument for five years, and I have a chart that indicates what is going on.

[The chart referred to follows:]

Monthly U.S. liquefied natural gas exports by destination region (Jan 2018–May 2021)
billion cubic feet per day



Senator KING. Remember, I talked about the law of supply and demand. So this is exports. And if you take it back, this starts with 2018. If you take it back about another five years, they were zero. And now, as you see, we are up to 10 billion cubic feet a day, which is about 10 or 11 percent of current U.S. production. So it has gone from zero to 10 or 11 percent that is going to export, as the Chairman says, it is because of high prices. That is where the gas is going to go.

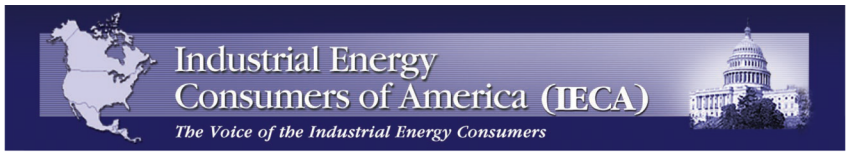
My problem is the projection, and we have plants that have been approved to take this number to 20 percent and even higher. Our friend Mr. Bryce is an advocate of the free market. There is no question, Mr. Bryce, that an increase of 20 percent in demand for a commodity that, at least at this present time, seems to be growing fairly slowly, is going to increase prices, right?

Mr. BRYCE. I think so, yes.

Senator KING. Okay, no question about that. We are exporting our principal advantage in the world economy. We are literally subsidizing Chinese manufacturing by sending them our natural gas.

The other item I want to submit for the record is a letter received just yesterday by Industrial Energy Consumers of America, which are big corporations, big companies employing 1.8 million people with $1 trillion worth of sales.

[Letter from Industrial Energy Consumers of America follows:]



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November 15, 2021

The Honorable Joe Manchin
Chairman
Senate Committee on Energy and Natural Resources
Washington, DC 20510

The Honorable John Barrasso
Ranking Member
Senate Committee on Energy and Natural Resources
Washington, DC 20510

Re: Comments for the Record on Hearing on Domestic and International Energy Price Trends

DOE Approved LNG Exports to Non-Free Trade Agreement (NFTA) Countries Equal to 70 Percent of Net U.S. Supply is Not in the Public Interest Under the Natural Gas Act (NGA): Why a Consumer Safety Valve is Needed

Dear Chairman Manchin and Ranking Member Barrasso:

One hundred percent of the member companies of the Industrial Energy Consumers of America (IECA) are manufacturing companies.

The U.S. Department of Energy (DOE) has approved excessive volumes of LNG exports to NFTA countries of 58.2 Bcf/d through 2050, a volume equal to 70 percent of U.S. 2020 net supply of natural gas.[1]

Exporting 70 percent of our natural gas to NFTA countries is in *their* public interest, and not in *our* public interest under the Natural Gas Act (NGA). NFTA countries often discriminate against U.S. manufactured products. Nonetheless, from February 2016 to August 2021, 70 percent of all U.S. LNG shipments were to NFTA countries.[2] We support fair trade via free trade agreements (FTAs), but we also need to ensure that the principal of parity is also in place.

The public interest, both as to domestic prices and national security, is protected only when domestic production and pipeline capacity is robust enough to meet domestic demand: **exports must be limited to surplus supply of natural gas.** For the last several months, U.S. storage

[1] U.S. Energy Information Administration (EIA), www.eia.gov. In 2020, 83 Bcf/d was available for U.S. consumers and LNG exports. Gas not available for consumers and LNG exports includes natural gas classified as lease and plant fuel, pipeline and distribution, and net exports by pipeline to FTA countries Mexico and Canada.
[2] LNG Monthly published October 2021, U.S. Department of Energy, https://www.energy.gov/sites/default/files/2021-10/LNG%20Monthly%20August%202021.pdf

inventories, in advance of the winter heating season, have been below the five-year average, which has resulted in prices that range from 100 to 200 percent higher than the previous year.

We ask a fundamental question, under the NGA, is it in the public interest to increase natural gas production, pipeline and storage capacity by 70 percent to accommodate the approved DOE NFTA export demand? Is increased production and thousands of miles of new pipelines necessary to accommodate a 70 percent export increase in the public interest?

LNG exports to China, an NFTA country, are surging and they are the third largest buyer of U.S. LNG.[3] China subsidizes energy and other costs for their manufacturers, making it extremely difficult for U.S. manufacturers to compete. Their actions are premeditated and centrally planned by their government, yet we are supplying them with America's natural gas to keep their factories running. If not for China's subsidization of their manufacturing sector, there would be more manufacturing investment and jobs within the U.S.

In August, according to the U.S. Energy Information Administration (EIA), U.S. LNG exports to China topped 51 Bcf, more than three times as much at the same time last year. This accounted for 17 percent of total U.S. exports. Unfortunately, this is just the tip of the iceberg. New long-term contracts have been announced. On November 3, 2020, a long-term contract between China's Sinopec, a state-owned-enterprise (SOE), and Venture Global LNG was signed for $30 billion over 20 years.[4] The contract will double China's imports of U.S. LNG.[5] Separately, Unipec, a subsidiary of Sinopec will buy 3.5 million tons from Calcasieu Pass LNG, also owned by Venture Global LNG. In October 2020, Cheniere Energy Inc. announced a new 13-year deal to supply LNG to the Chinese company ENN Natural Gas, a natural gas distribution company.[6]

Because of LNG exports, and because U.S. consumers are captive and do not have an alternative to natural gas, we pay more for natural gas and electricity, while LNG exporters make outsized profits. This is not a win-win scenario or in the public interest under the NGA. On October 14, 2021, S&P Global Platts Analytics stated that unless production increases, "you are talking about $12/MMBtu, $14/MMBtu gas to incentivize either curtailing LNG exports or curtailing exports to Mexico."[7]

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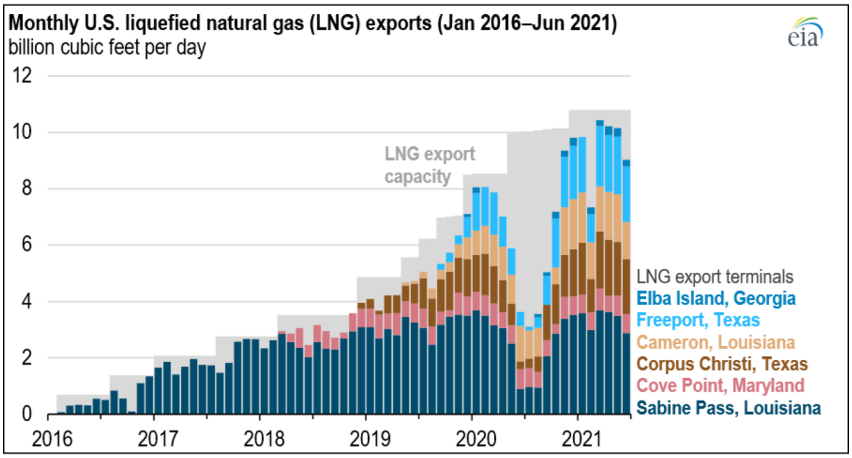
[3] LNG Monthly published October 2021, U.S. Department of Energy, https://www.energy.gov/sites/default/files/2021-10/LNG%20Monthly%20August%202021.pdf

[4] "Natural gas powerhouse Venture Global signs largest-ever supply deal by an American company," CNBC, November 4, 2021, https://www.cnbc.com/2021/11/04/natural-gas-powerhouse-venture-global-signs-largest-ever-supply-deal-by-an-american-company.html

[5] "Sinopec signs China's largest long-term LNG contract with U.S. firm," Reuters, November 4, 2021 https://www.reuters.com/business/energy/sinopec-signs-20-yr-lng-contract-with-us-venture-global-lng-2021-11-04/

[6] "Cheniere and ENN Sign Long-Term LNG Sale and Purchase Agreement," October 11, 2021, https://lngir.cheniere.com/news-events/press-releases/detail/231/cheniere-and-enn-sign-long-term-lng-sale-and-purchase

[7] Henry Hub could reach $12-$14 this winter as capital discipline limits supply growth: Platts Analytics, https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/101421-henry-hub-could-reach-12-14-this-winter-as-capital-discipline-limits-supply-growth-platts-analytics



The DOE's U.S. LNG export driven policy has never denied an application, despite objections from IECA in those proceeding. We are now at a critical point and the DOE needs to act now to address the impact of prior decisions. With excessive exports, domestic security of supply and resulting prices can become more severe with time. This approach was adopted by Australia, and they are feeling the pain due to this imbalanced approach which favors exports and drives-up Australia's domestic natural gas prices. Australian consumers pay the Asian LNG net-back price, which means that they pay the same high prices as the Asian LNG consumers, despite being a country with significant natural gas resources.

In past years, a consumer safety valve was not needed, but significant changes to the levels of exports, investments in drilling, challenges to building new pipelines, and current and proposed federal and state regulations will make it harder to build pipelines.

WHY A CONSUMER SAFETY VALVE IS NEEDED

The DOE LNG export-driven policy has resulted in excessive LNG export approvals that permanently change the U.S. natural gas, electricity, NGLs, and pipeline markets for the worse.

Prior to excessive LNG exports, supply and demand determined reliability and prices. All sellers and buyers competed on a level playing field. With excessive LNG exports, unless production can always increase to meet the needs of additional LNG export volumes and provide a surplus of supply for the domestic market, availability and prices will be dictated by foreign countries demand. Likewise, unless there is always excess natural gas pipeline capacity, after accounting for increased LNG export demand, U.S. consumers will not have the capacity they need.

U.S. natural gas production is not increasing to meet accelerating LNG export demand to maintain a surplus for the domestic market.

Gross U.S. dry natural gas production increased from 74.6 Bcf/d in 2015 to 91.7 Bcf/d in 2020, a 17.1 Bcf/d increase.[8] But, net availability of natural gas to U.S. consumers only increased from 70.8 Bcf/d to 76.5 Bcf/d, or 5.7 Bcf/d after deducting LNG exports, lease and plant fuel, pipeline and distribution use, and net pipeline exports to Canada and Mexico for both years. Domestic consumption increased from 68.5 Bcf/d to 75.8 Bcf/d, or 7.3 Bcf/d a 10.6 percent increase. Increased LNG and pipeline exports to Mexico are decreasing net natural gas availability to U.S. consumers.

LNG exports increased from zero in 2015 to 6.41 Bcf/d in 2020 and are now operating at 11.1 Bcf/d and consumes 14.5 percent of the 2020 net supply.

And it will only get worse from here. There is another 8.4 Bcf/d of LNG export capacity that is approved and under construction. Another 23.9 Bcf/d is approved and not under construction, totaling 43.4 Bcf/d, and others are still in prefiling.

U.S. consumers do not have an alternative. We are captive consumers.

When it comes to purchasing off-the-shelf consumer goods and services, U.S. consumers have alternatives. But not when it comes to natural gas. This is especially an important issue for the manufacturing sector. EIA studies have shown that equipment which is using natural gas, cannot be switched to electricity.[9] Plus, nearly half of all U.S. households heat primarily with natural gas. EIA states that they expect households that use natural gas as their primary space heating fuel will spend $746 this winter, 30 percent more than they spent last winter. A combination of flat 2021 U.S. natural gas production and record-high levels of LNG exports have resulted in below average storage levels and upward pressure on prices.[10]

The global LNG market is not a free-market. U.S. manufacturers and consumers cannot compete with foreign government-controlled entities who can pay any price for LNG, no matter how high. We cannot.

U.S. consumers cannot compete on price with foreign government-controlled entities who purchase LNG. Foreign government SOEs and their regulated utilities can pay any price, no matter how high to keep the lights on in their countries. They can and will buy-away U.S. natural gas that we need to operate our manufacturing facilities. They have automatic cost pass-through and several governments set (or subsidize) their domestic prices for natural gas and electricity below cost. For U.S. homeowners, this means higher costs for heating and electricity. For the manufacturing sector, the consequences are much greater. A competitiveness issue.

Increased natural gas prices have significant inflationary impacts on the economy.

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[8] "Natural Gas Consumption by End Use," U.S. Energy Information Administration (EIA), https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm
[9] Manufacturing Energy Consumption Survey 2018, U.S. Energy Information Administration (EIA), pages 14-15, https://www.eia.gov/consumption/manufacturing/pdf/MECS%202018%20Results%20Flipbook.pdf
[10] EIA Winter Fuels Outlook https://www.eia.gov/outlooks/steo/special/winter/2021_Winter_Fuels.pdf

The price of natural gas also impacts the cost of electricity and natural gas feedstocks, which are used to produce chemicals and plastics. Natural gas power generation sets the marginal cost of power, which means that when natural gas prices rise, so does the price of electricity. For example, in the report PJM Real-Time Energy Market in 2020, natural gas generation accounted for 72.3 percent of marginal resources.[11] PJM is the largest electricity wholesale market. The implications are significant nationwide.

Increasing natural gas prices negatively impact the U.S. economy. For example, natural gas prices directly impact the price of natural gas liquids (NGLs) which are used as a feedstock, not a fuel. The price of natural gas directly correlates to the price of NGLs. As prices for natural gas go up, so do NGLs, which increases the raw material costs of chemicals and plastics, which are used across the economy, causing inflation. Natural gas is used to produce nitrogen fertilizer. In this case, it is the farmers and food production industry who are impacted. Steel, aluminum, and cement are all large consumers of energy, and this directly impacts the construction and auto industries. There are many more examples of the negative impact of higher natural gas prices on the manufacturing sector.

In July of 2020, the DOE extended all LNG export approvals for 30 years to 2050, which shifts all market risks to U.S. consumers and away from LNG exporters.

No one can forecast energy supply and demand for a 30-year period. The DOE's actions to extend LNG export terminal approvals to 30 years, shifts all of the risks of supply and price on domestic consumers and reduces risks to the LNG exporters and countries that would receive the LNG. The DOE policy gives LNG exporters and foreign countries guarantees of access to our market, without guarantees of a reliable supply for domestic consumers. The DOE's actions allow exporters to do long-term planning to build more export terminals. The reverse is true for manufacturing companies who have growing reasons to question whether reliable supply and pipeline capacity will be available for new investment here.

There is no federal reliability oversight of the natural gas market and the pipeline capacity needed for delivery to consumers.

Unlike the electricity market where Congress granted the North American Electric Reliability Corporation (NERC) nationwide market reliability oversight, there is no such organization for natural gas. For electricity, nationwide reserve generation capacity is readily transparent to the market. For pipelines, no federal agency knows how much reserve pipeline capacity is available.

Because of the long lead times necessary to put a new pipeline in service, it is vital to know whether there is sufficient capacity to serve increasing domestic and export demand, especially at peak winter and summer demand. Since about 40 percent of U.S. power generation is natural gas-fired, both natural gas and electricity reliability is at stake.

The DOE LNG studies used to evaluate public interest determination under the NGA never considered availability of pipeline capacity.

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[11] State of the Market Report for PJM, 2020, http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2020/2020-som-pjm-vol2.pdf

The seriousness of the ongoing decline in available pipeline capacity cannot be overstated. Pipeline capacity has not expanded at the same rate as LNG exports and the DOE approved export volumes. All three of the DOE LNG export studies used to justify increased LNG exports did not consider pipeline capacity. By itself, this is a reason to reevaluate the public interest determination of export volumes. The DOE approved NFTA exports equal 58.2 Bcf/d, without knowing what pipeline capacity is available jeopardizes domestic reliability.

We know that LNG exporters have locked-up firm pipeline capacity. This decreases pipeline capacity that is available to domestic consumers. Once locked up, domestic consumers do not have access to it. If a manufacturer wants to build a new facility, it may not have sufficient pipeline capacity and the plans for construction will be terminated.

The problem is that new interstate pipelines are not getting built, they are getting cancelled. Potential new FERC regulatory changes to pipeline permitting, certain anti-fossil energy states and activists could make it even harder and more time consuming to build or expand needed interstate pipelines and take-away pipeline capacity.

For example, the Marcellus and Utica are two significant sources of natural gas supply. S&P Global Platts reports that only 2 Bcf/d of spare pipeline capacity is available.

Other LNG export countries do not have a large manufacturing sector at risk. The U.S. does.

The two largest LNG exporting nations are Australia and Qatar in that order. Neither have a large domestic market for natural gas and neither have large manufacturing sectors. LNG exports put the entire U.S. manufacturing sector, which contributes $2.2 trillion in GDP and 12.5 million high paying jobs, at risk. An LNG export terminal employs only about 300 employees.[12]

The BP Statistical Review of World Energy report sums it up nicely. As a percent of global natural gas consumption, Australia is 1.1 percent and Qatar is 0.9 percent, while the U.S. is 21.8 percent. Furthermore, the U.S. has only 6.6 percent of global natural gas reserves.[13]

U.S. consumers and the economy should be a priority for domestic natural gas resources, over LNG exports and foreign country buyers.

For years, the U.S. was dependent upon other nations for energy. Now that we have energy independence, we have handed it over to foreign nations to dictate our domestic natural gas reliability and prices. We are shipping away U.S. manufacturing's competitive advantage.

Natural gas, electricity, and natural gas feedstock prices have significantly increased, driven by a year over year increase in LNG exports.

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[12] Value Added by Industry, U.S. Bureau of Economic Analysis (BEA), www.bea.gov; and Employment, Hours, and Earnings from the Current Employment Statistics survey, U.S. Bureau of Labor Statistics (BLS), www.bls.gov

[13] Statistical Review of World Energy, 2021, Page 38 https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf

As stated above, natural gas production has not increased at the same rate as LNG exports and national inventory levels are below the five-year average. If there were no LNG exports, the U.S. would have sufficient supply and prices would not have been impacted. A safety valve would have prevented this from happening.

When LNG exports increase without a corresponding increase in production and pipeline capacity, domestic prices increase, and national security becomes at risk. Consumers cannot rely upon increasing domestic supply of natural gas and pipeline capacity. Therefore, it is prudent to reduce LNG exports to levels that assure a surplus supply to the benefit of the domestic market and economy.

Thank you for the opportunity to comment on this important hearing.

Sincerely,

Paul N. Cicio
Paul N. Cicio
President & CEO

The Industrial Energy Consumers of America is a nonpartisan association of leading manufacturing companies with $1.1 trillion in annual sales, over 4,200 facilities nationwide, and with more than 1.8 million employees worldwide. It is an organization created to promote the interests of manufacturing companies through advocacy and collaboration for which the availability, use and cost of energy, power or feedstock play a significant role in their ability to compete in domestic and world markets. IECA membership represents a diverse set of industries including: chemicals, plastics, steel, iron ore, aluminum, paper, food processing, fertilizer, insulation, glass, industrial gases, pharmaceutical, building products, automotive, brewing, independent oil refining, and cement.

Senator KING. If exports were limited to a surplus, then it would not affect domestic prices, but it has to be affecting domestic prices and it is getting serious now. But it is going to be a real problem in three or four or five years because we are on track to export 20, 30, 40 percent of our natural gas. And that is going to be a disaster for an advantage that we have now. All the testimony has been how low our prices are compared to the rest of the world. Why would we want to screw that up? And that is what is happening to our manufacturers.

Senator Barrasso is right to our electric consumers, we are squandering an advantage right now because of uncontrolled exports of natural gas. Now what I am going to be proposing is legislation, not to limit it, not to control it, not to cut it off, but to at least have the Department of Energy do a study when they are going to approve an export license as to what the affect will be on domestic prices. To me, that is just common sense. We do not do that now. In fact, there is a presumption in favor that is in the national interest, that is the phrase, the 'national interest' in the Gas Act to approve these applications. I think that is crazy. And that is exactly what we are doing, and what my legislation will do is simply say, "We want you to do a study of what the impact will be on domestic prices." And if we say, oh, that is okay, we can live with that, that is one thing, but right now, we do not even do that kind of analysis or if we do, it is after the fact and slowly.

Mr. Chairman, I think this is a really important hearing and this natural gas export is—we are racing blindly into a future and cutting off our most significant economic advantage vis-a-vis the rest of the world, particularly China.

Thank you.

The CHAIRMAN. I agree wholeheartedly.

With that, we will have Senator Daines.

Senator DAINES. Chairman, thank you and I appreciate you having this hearing. It is a good discussion.

We are moving into winter in Montana.

Senator MURKOWSKI. We are already there.

Senator DAINES. Alaska moved there several months ago. Thanks, Lisa.

[Laughter.]

Senator DAINES. And we are expecting to see higher energy prices as well as higher heating bills. Not only are gasoline and diesel prices at the highest they have been since 2014, Montanans can expect to be paying more to heat their homes this winter as well.

According to the Energy Information Administration, Montanans who heat their homes with natural gas are expected to pay almost 24 percent more this winter than last winter. This trend is only going to get worse if we pass this reckless tax and spending bill that the House and Senate have been contemplating. We need to look no further than the energy crisis happening in Europe to see where this Administration wants to take the United States. Europe is the movie trailer for the United States if we continue down the path of destroying traditional, made-in-America energy.

According to the International Energy Agency, Europe's natural gas prices—and this was in the written testimony by the witness—

are 39 times higher than they were in 2020. Why? Because Europe moved too fast away from coal and nuclear and they put all their eggs in one basket. So when the wind stopped blowing, when they were forced to rely on Russia and others for natural gas, they started to see prices soar. If President Biden gets his way, and the Democrats pass the reckless tax and spend bill, the United States will be headed toward the same kind of position, the same kind of future. This reckless tax and spend bill slaps Montana businesses with new fees, taxes, and regulations that will drive energy prices up. It is also going to kill jobs.

Mr. Chairman, with unanimous consent, I would like to place into the record a letter I received from the Montana Petroleum Association that states clearly if the methane fee and the tax and spend bill get signed into law, it will kill jobs, increase energy prices, and force some small Montana businesses to shut down wells and hurt local revenue.

The CHAIRMAN. Without objection.

[Letter from the Montana Petroleum Association follows:]

MONTANA PETROLEUM ASSOCIATION, INC.

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Post Office Box 1186
Helena, MT 59624-1186

www.montanapetroleum.org
Telephone (406)442-7582

November 11, 2021

The Honorable U.S. Senator Steve Daines
320 Hart Senate Office Building
Washington, DC 20510

Dear Senator Daines:

I am writing to express Montana Petroleum Association's strong opposition to the proposed methane fee contained in President Biden's Build Back Better Act.

According to a Rystad Energy analysis, the proposed methane fee announced by the U.S. House Rules Committee could cost the U.S. petroleum and natural gas industry $1.3 billion in 2025 under a status quo scenario. While the latest draft bill relaxes some of the previously proposed regulations, it will still have a deep economic impact, especially on Montana producers. It is significant to point out the impacts will be directed towards smaller producers and conventional legacy fields that make up the overwhelming majority of Montana's oil and gas production.

EPA's plan to decrease the Subpart W reporting threshold from 25,000 tons CO2e/year to 10,000 tons, if implemented, would impact an even larger number of small Montana producers who will be included in the methane fee calculation. Even in a status quo scenario where the industry's methane performance holds as is, the annual $1.3 billion methane fee will be largely borne by smaller producers nationally. For those producers who will still qualify for reporting requirements under Subpart W, the proposal's economic impact will be biased even more towards Montana's smaller producers and legacy oil and gas operations.

This proposed fee will also have a tremendous effect on utility natural gas rates adding additional costs to not only winter heating expenses but also electrical generation as the shift from coal thermal generation to intermittent renewable energy will require additional buildout of firming resources using natural gas.

Montana has a robust methane /VOC registration and regulatory process in place. Originally adopted by the Montana Legislature in 2005 and placed into administrative rule in 2006, this program has been embraced by industry and includes a stringent inspection and enforcement component as well as ongoing education regarding gas capture.

The last of the major oil production companies has left Montana. Montana's oil industry is now made up of independent oil and gas producers with numerous small independent companies. These proposed new fees along with additional EPA regulations will no doubt force many producers to shut-in or plug many wells costing local and state revenue and jobs. I have included an information sheet showing the affected counties where Montana producers operate. We are asking you to oppose any proposed methane fees or taxes associated with President Biden's Build Back Better Act to keep the remaining jobs alive.

Best regards:

Alan Olson, Executive Director
Montana Petroleum Association

cc: US Senator Jon Tester

2019 County Drilling And Production Statistics

County	Production			Well Completions				
	Oil Barrels	Assoc. Gas MCF	Gas MCF	Oil	Gas	CBM	Dry	Service
Big Horn	42,383	0	172,920	0	0	0	0	0
Blaine	259,435	284	3,150,420	2	0	0	1	0
Carbon	333,099	825,707	333,213	1	0	0	0	0
Carter	13,890	0	0	0	0	0	0	0
Chouteau	0	0	609,792	0	0	0	0	0
Custer	0	0	1,807	0	0	0	0	0
Daniels	6,086	0	0	0	0	0	0	0
Dawson	517,660	320,850	0	0	0	0	0	0
Fallon	3,612,686	784,282	5,615,987	3	0	0	0	0
Fergus	0	0	8,157	0	0	0	0	0
Garfield	7,232	1,926	0	0	0	0	1	0
Glacier	269,580	85,536	798,264	0	0	0	0	0
Hill	949	40	2,576,935	0	0	0	0	0
Liberty	65,021	33,280	739,366	0	0	0	0	0
McCone	1,654	0	0	0	0	0	0	0
Musselshell	107,191	3,602	0	0	0	0	0	0
Petroleum	15,308	0	0	0	0	0	0	0
Phillips	0	0	7,661,107	0	0	0	0	0
Pondera	92,899	0	37,395	0	0	0	0	0
Powder River	2,253,176	3,400	0	1	0	1	1	3
Prairie	42,469	5,560	0	0	0	0	0	0
Richland	10,209,050	16,967,629	0	13	0	0	0	2
Roosevelt	3,570,855	4,603,611	0	7	0	0	0	1
Rosebud	154,746	9,039	0	2	0	0	1	0
Sheridan	638,465	308,579	0	0	0	0	0	0
Stillwater	16,325	0	22,703	0	0	0	0	0
Sweetgrass	0	0	12,308	0	0	0	0	0
Teton	52,725	0	3,609	0	0	0	0	0
Toole	222,994	54,675	1,833,794	2	1	0	1	0
Valley	68,631	8,106	714,181	0	0	0	0	0
Wibaux	389,849	154,823	153,459	0	0	0	0	0
Yellowstone	7,915	130	0	0	0	0	1	0
Total:	22,972,273	24,171,059	24,445,417	31	1	1	6	6

The volume of oil shown in this report includes condensate or reported natural gas liquids.
Associated gas is gas from a well that produces less than 10,000 standard cubic feet of gas for each barrel of oil.

Senator DAINES. The impacts of these proposals are real for Montana and will only add to the pain that Montana families are feeling because of this Administration-induced inflation and these anti-energy policies.

What is not being talked about enough too is the chilling effect this anti-American energy philosophy is having on the capital markets as well to continue to invest, long-term, in oil, natural gas, in coal production and this is all part of the equation and the economics here because of the policies of this Administration.

Mr. Bryce, the Democrats' tax and spend bill includes dozens of provisions that will harm domestic oil and gas production, including higher royalties, a new methane fee, and more. Do you believe that these provisions result in higher energy costs and less domestic energy production?

Mr. BRYCE. I think there's no doubt, sir, that if you constrain domestic supply, domestic production, you're going to have to rely more on foreign markets. I'm 61 years old. For nearly my entire life, Congress and policymakers on Capitol Hill have been talking about the perils of imported energy and so I find it incredible over the last few months to hear this Administration appealing to OPEC. I mean, it's almost like I read it in the Onion.

Senator DAINES. Furthermore, look at what is going on with Russian oil at the moment. You know, our oil imports from Russia have doubled over the course of the last year. We now import so much Russian oil, they are now the second largest importer of oil to the United States. We import more oil from Canada, but Russia is number two and it has doubled. If you do the quick math, we are importing about 850,000 barrels a day of Russian oil. That's equivalent to what the Keystone pipeline would have produced and moved through my state of Montana, including 100,000 barrels of Montana and North Dakota crude.

So you can see this mass balance of what is happening at the moment. You shut down pipelines. You have to make up this difference. Now, including the pipelines not built yet, but you start, you play for the future here, long-term and we are only creating more dependencies on adversaries like Venezuela, Russia, as well as the Middle East for our oil. I would rather get more from Alaska, from my colleague here that sits to my left.

Mr. Bryce, today I am introducing the Supporting Made in America Renewable and Traditional Energy Act. We call it the SMART Energy Act. This bill bolsters U.S. oil and gas as well as renewable energy production on public lands and public waters. I strongly believe the U.S. needs to ensure an all-of-the-above energy portfolio. I do not think you see a single person here on the Republican side who is opposed to renewable energy. We just want to see a balanced portfolio so we do not end up where Europe has ended up at the moment. We cannot go back to the days of overdependence on foreign countries for our energy. Do you agree the U.S. should increase made-in-America energy including renewable and traditional energy sources?

Mr. BRYCE. I believe so, sir. This is something that has been a thesis that policymakers on Capitol Hill have been talking about since 1973. The International Energy Agency was formed after the oil crisis of 1973 focused on energy security. So absolutely, I think

that I will say, well, I will add that what I have seen in Texas, and I know Senator Heinrich has left the dais, this idea of levelized cost of energy does not include the dispatchability of renewables. And I do live in Texas. I'm from Oklahoma and proudly so, but when the ERCOT grid was on the brink of failure, wind and solar were nowhere to be found despite $66 billion spent on renewables in Texas in the years before the blackouts.

So I am for renewable energy. I have solar panels on the roof of my house. But we have to be careful about the stability and integrity of our electric grid, first and foremost.

Senator DAINES. Yes, thank you. I just hope we take a look at what is going on in Europe right now and do not make the mistakes that Europe has made. Thank you, Mr. Chairman, I appreciate it.

The CHAIRMAN. Thank you, Senator.

Senator Cortez Masto.

Senator CORTEZ MASTO. Thank you, Mr. Chairman. Thank you to the panelists for being here today.

Mr. Nalley, let me start with you. I am from Nevada. I was fortunate to be home this past week driving around the state and along with many Nevadans filling up my gas tank and saw firsthand how Nevadans are paying at the pump right now and how much it is costing. Since 2015, Congress has enacted eight laws, including the newly signed Infrastructure Investment and Jobs Act that have mandated over 350 million barrels of crude oil from the Strategic Petroleum Reserve. Additionally, Congress has required the Department of Energy to sell approximately 1.5 billion barrels of crude oil to pay for SPR modernization programs.

Mr. Nalley, can you speak to some of the immediate relief that tapping the Strategic Petroleum Reserve would provide to all Americans right now?

Mr. NALLEY. As you said, the SPRO is a really important resource of the United States. Based on past analysis we've done, our assessment of the current situation is that it would provide temporary relief of what's available. As you just articulated, there are limits to what can be released in a short-term situation. We did some recent analysis where somewhere between 15 million barrels to 48 million barrels for a short period of time would bring down the price of crude oil by about $2 per barrel, about five to ten cents per gallon at the pump.

Senator CORTEZ MASTO. So is it reasonable to think that we need some short-term and long-term relief right now?

Mr. NALLEY. As you know, EIA is really a policy-neutral organization. I don't want to get into what the policy——

Senator CORTEZ MASTO. I appreciate that, and I think that is what I am asking the Administration to look at. I know just $6 billion in sales from the SPR was included as a pay-for in the bipartisan infrastructure package. This will provide some relief to so many that are seeing these high gas prices that we are talking about right now, along with the long-term implications and hopefully, long-term solutions coming together. We can look to address this.

Mr. Nalley, are you able to provide an overview of some of the emergency tools that the Department of Energy and the Adminis-

tration have to address extreme problems with the nation's energy supply?

Mr. NALLEY. My staff could get back with your staff with that information.

Senator CORTEZ MASTO. I would appreciate that. Thank you.

Let me just say this, as we have touched on today, the economic costs of climate change are widespread and difficult to predict making its effects especially dangerous for energy price trends, as we have talked about. Mr. Nalley, you ended your written testimony by referencing regional weather events, including the prolonged drought in the Western U.S. and how this is impacting short-term generation and fuel sources. Can you elaborate on the impacts that extreme weather and climate change are having on domestic and international energy markets?

Mr. NALLEY. I don't know that I can offer you a whole lot, but there certainly have been situations with hurricanes. Hurricane Ida, for example, that came through the Gulf of Mexico and knocked production offline for an extended period of time. And the Texas freeze that happened. There are certainly events throughout the country that are inevitable that happen, that cause energy disruption and price impact.

Senator CORTEZ MASTO. Mr. Gould, would you agree with that? And then would you also elaborate—I believe it was in either your written testimony or the answers to some of the conversations we are having here that in some other countries that had renewable energies, the energy prices were lower. Is that a correct statement and can you elaborate on that a little bit?

Mr. GOULD. So first to say that we certainly agree that the incidence of extreme weather events is rising and that's something that needs to be very much on the radar screen of energy policymakers and also energy market analysts. This year we've had droughts in Brazil that caused Brazil to take a lot more LNG from international markets. That's been one of the factors that has increased market tightness this year. So on that first point.

And the second point regarding the analysis that was released yesterday by the Agency of European Energy Regulators and it looked at which countries in Europe have seen the largest increase in electricity prices in recent months, looking in particular at the month of September. And it found that the countries that had the largest increase were those with the highest share of natural gas generation and also the most limited interconnections with other countries. The countries that had the smallest increase in electricity prices were those primarily in the Nordic countries that have invested heavily in renewables. I think I mentioned also that one of the other countries that hasn't seen such a large increase in prices was Poland, and that's to do with the relatively large share there of coal-fired generation.

Senator CORTEZ MASTO. Thank you. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Senator.

Senator Hyde-Smith.

Senator HYDE-SMITH. Thank you, Mr. Chairman.

We are certainly dealing with an energy crisis here, and it is a result of failed energy policy. There is no question whatsoever, as we all know, the assault on American energy came on day one of

the Biden Administration with the cancellation of the Keystone pipeline and moratorium on new oil and gas leases which significantly affected my state. The first lease sale in the Gulf of Mexico in a year is expected to take place tomorrow—only prompted by a Federal Court Order is the reason it is taking place tomorrow. Still, there is the hesitancy by the Administration to schedule future lease sales as required by law under the 2017 through 2022 five-year program. Additionally, since the Administration is waiting on its infamous comprehensive review, no preparations for sales beyond 2022 have even been discussed.

The last time the issue of the comprehensive review was brought up this Committee was told by several witnesses that it would have it by summer of 2021, which has come and gone. We still have no clear answer as to when this review will finally come to light. We are only a few weeks away from 2022 with no preparations for future lease sales.

Mr. Bryce, how will this Administration's lack of preparedness for 2022 offshore lease sales affect energy prices?

Mr. BRYCE. Well, ma'am, I can't predict that, but what I can say is that if you're not going to lease on federal lands and federal waters, you'll have less drilling in the United States and that will mean more reliance on foreign sources because what Mr. Nalley has clearly said and in reading the IEA testimony, oil demand is snapping back very, very strongly all over the world and for all the remarks about clean energy and clean energy economies, zero carbon, the world still runs—in America, in particular—it still runs on propane, natural gas, diesel fuel, jet fuel, and fuel oil and that's not going to change for decades to come. So I'm for domestic hydrocarbon production.

Senator HYDE-SMITH. Previous studies have shown that banning oil exports could lead to higher gasoline prices. Do you agree with this?

Mr. BRYCE. I can't speak to that, ma'am.

Senator HYDE-SMITH. The second question: Looking to the role that U.S. liquefied natural gas, or LNG, plays right now in global markets, what consequences or repercussions could result from preventing U.S. LNG exporters from meeting their contractual obligations?

Mr. BRYCE. Well, I haven't thought about this before, ma'am, but I think the first one would be litigation by those exporters suing the government for being forced to abrogate their contracts. These are legal contracts. These are legal businesses operating in America and they should be able to fulfill their contracts. But I think, you know, again, this idea that we would limit exports of natural gas or crude, well then, what else are we going to limit? Is it going to be airplanes or corn or soybeans, farm products, any of the other things that the U.S. exports? So I think American producers of any commodity have a right to sell it to the markets that make the most sense for them.

Senator HYDE-SMITH. Could this potentially damage the United States' reputation of being a reliable energy supplier to our allies and to our trading partners that we have these contracts with?

Mr. BRYCE. I think that's a fair argument. And I think from, you know, in talking with some people that I know who are in the drill-

ing sector, particularly in the Gulf of Mexico, they are assessing their contracts and realizing they have as much political risk now in the United States as some of them do in Mexico, which is a remarkable statement.

Senator HYDE-SMITH. Which would definitely compound the problem we are already dealing with. I think my time is running out.

Thank you, Mr. Bryce.

Mr. BRYCE. Thank you, Senator.

The CHAIRMAN. Thank you, Senator.

Senator Hickenlooper.

Senator HICKENLOOPER. Thank you, Mr. Chair. As Senator King mentioned, I think this is a really useful and productive panel and session.

I want to get back to a little bit of discussion again about why has price gone up so much. Mr. Nalley, maybe you can, I mean, basically that reserve calculations, both in this country and globally, have not changed significantly except for some minor disruptions I am aware of, the lifting costs have not changed that much. Is it some function of during the pandemic shutdown that the supply chains basically got somehow—that their dormancy made them less sufficient, less resilient? Is that fair to say?

Mr. NALLEY. I'm sorry, I'm not quite sure——

Senator HICKENLOOPER. I find it perplexing to see why we have seen such large swings in the price of crude oil when reserves, lifting costs, all the basic calculations that generally go toward price of most of our products in the world seem to indicate that we are still in a commodity that is, that where price is often dictated by producers that are not dependent on maintaining a certain price for a certain period of time. Some are, but many are not.

Mr. NALLEY. I think the biggest swing in price is just simply because the demand came back quicker than production. That's really driven up the price substantially and we forecast that demand will reach the pre-pandemic level in 2022, but production won't catch up. We see world oil balancing in later in 2022. But until the production catches up with the demand, that's why we see elevated prices.

Senator HICKENLOOPER. Right. I guess my question is really why is that, why is it taking so long for production to catch up? Why is there not more resiliency in the system? And how could we build more resiliency in the system? That is the question I want to get to.

Mr. NALLEY. Well, we were showing that global production will come back in 2022 and most of it is coming from about 40 percent, 50 percent from OPEC. There will be an increase from Canada. U.S. production is falling. I think it comes back to 25 percent of the growth in 2022. We don't see U.S. production catching back up with the pre-pandemic level during 2022. I think because it was such an economic downturn, prices, you know, such a sharp shift in the beginning of the pandemic, so much of the production was shut down. It takes a while for that to come back online.

Senator HICKENLOOPER. It takes a while. The general responses I do not find satisfying just in the sense that it does not seem like there is that much involved in the shutdown. I understand that

shutting in a well doesn't happen in a matter of minutes, but I do think there is a way to design more resiliency.

Mr. Gould, a lot of political hay has been made of President Biden's pushing OPEC to increase oil production in light of our nation's climate goals. In my view, I think there is a world view that incorporates both, and I guess I would want to ask you two questions. One is what are some of the policies governments can use to help keep both energy prices and greenhouse gas quantities low in the long run? Do you understand what I am asking?

Mr. GOULD. Yes, certainly. Just one point to make is that as we see the markets today there are 5.8 million barrels a day of spare capacity being held by the OPEC Plus countries and that's not including the potential capacity from Iran. So there is a reserve of potential production there which is not yet coming to the market. I would say, however, that I think we're slightly more polished than the EIA on this in terms of the increase in U.S. production over the next year. We have U.S. production increasing by some one million barrels a day in 2022 from existing fields coming back and bringing U.S. production back to pre-pandemic levels.

But in terms of the longer-term policies that can help in this regard, clearly, there's a lot that can be done on the demand side and there is still an untapped reserve of efficiency measures that could certainly help in curbing growth or even bringing down liquids demand or oil demand around the world. And there are alternative fuels, there are alternative technologies, particularly in the passenger transport sphere that can also be very valuable as the U.S. and other countries are indeed showing. So that combination of electrification, efficiency—they're very powerful weapons in the hands of policymakers to reduce some of the vulnerabilities that we see today.

Senator HICKENLOOPER. Great. Thank you very much. I have more questions that I will submit to you all in writing, but Mr. Bryce, I have, at some point I will chase you guys down just because I think you have so much of the information that we need in our decision-making over the next months.

Mr. Chair.

The CHAIRMAN. Thank you, Senator.

Senator Marshall.

Senator MARSHALL. Thank you, Mr. Chairman. It is always great when we have these hearings and people on both sides of this dais agree on something. And I think that everybody in this room agrees that lowering the supply of energy increases the price. Lowering the supply of energy increases the price. So the question is then why is the supply of energy decreasing, right? That should be the question we are talking about. Why is the supply of energy decreasing across this nation?

As I talk to people back home—I grew up in one of the richest oil counties in the world, supplying the largest amount of oil in World War I from Butler County, Kansas. Where I grew up now is agriculture and oil, oil and agriculture. This is an industry I follow every day. I am inundated with people that have been in this business for 30, 40, 60 years and cannot get financing now. Good, stable businesses. And you know why? It is the ESG rules, right?

Mr. Nalley, would you agree with me that if people are struggling to get financing to drill new wells that it is going to decrease the supply of energy?

Mr. NALLEY. Well, yes, I would agree that if there's less drilling, there's less supply, yes.

Senator MARSHALL. If there is less financing it is hard to drill.

Would you agree with me that stopping drilling on federal lands or stopping drilling in waters on the ocean, that if we make it harder for that to happen because of federal policy, that would decrease the supply of oil and natural gas?

Mr. NALLEY. Yes.

Senator MARSHALL. Okay.

And then, would you agree with me if there were less pipelines available to ship gas, natural gas, or oil from Canada or from Alaska to the mainland, that that would decrease the supply of energy?

Mr. NALLEY. Yes.

Senator MARSHALL. Yes. And you would agree with me that the policies of this White House have made all of those instances true. That what I just said, the policies, more ESG making it harder to get financing, stopping drilling on federal lands, shutting down pipelines would decrease the supply of energy?

Rhetorical question. The answer is, of course, yes. Okay.

Mr. Bryce, you have a unique resumé here. I want to talk about the social injustice of increased energy costs—how it disproportionately impacts senior citizens on fixed incomes as well as that single mom. One of the stories I would share with you as an obstetrician, a woman would have 10 to 12 visits to my office in rural Kansas. And when the price of gasoline got above $3 per gallon, magically, they wanted to start spacing out their visits. Why? Because they were driving 30, 60, 90, 120, 150 miles to see me, and they could not afford the gasoline. This in an inequity issue. The ultimate equity issue is energy costs, right?

If you are paying high prices for your utilities, paying high prices for gasoline, it is a social injustice. Why does this White House want to increase the cost of gasoline at the pump? Why does this White House want to increase utility costs for hard working Americans? Is this a social injustice? Those are my questions. And why do you think the White House wants to drive these prices up?

Mr. BRYCE. Well, sir, I can only speculate. But what I do know is that when you look across the country and particularly at California and other places where this electrify-everything push is underway, you're forcing, you're imposing regressive taxation on the working class, on people who don't live, as Jennifer Hernandez says, in the keyboard economy, the people who have to drive to work. They have to be there. The people who pump the gas, who pour the coffee, who serve the food. Those are the people who are going to be hit the hardest. As you point out, in rural America, those are also going to be the people who are hit hard.

One other point, if I could, on the electrify-everything push, earlier, in January, in the Federal Register, the Department of Energy published data showing that the cost of electricity on a per BTU basis is four times that of natural gas. So this push to electrify everything that is underway in California is just a form of regressive taxation by prohibiting the use of natural gas in homes and busi-

nesses and forcing consumers to use electricity instead. You're effectively forcing a high-cost energy form onto them and removing a lower-cost form of energy. I think it's bad policy, and I'm not a partisan—I'm not a Republican, I'm not a Democrat—I'm disgusted, Senator.

[Laughter.]

Senator MARSHALL. Yes.

Mr. BRYCE. But when you look at what the Democrats are pushing, it is almost all regressive policy when it comes to energy.

Senator MARSHALL. Yes, that dose of humanism, of realism. These are real people with real jobs who are now paying high energy costs, and it is going to impact them. They will not have enough money to feed their children, because the gasoline prices are higher as well. Thank you so much for your time—all the witnesses. I yield back.

Mr. BRYCE. Thank you, sir.

The CHAIRMAN. Senator Kelly.

Senator KELLY. Thank you, Mr. Chairman.

I have a similar question for Mr. Nalley. First of all, thank you and thank you to the EIA for, thank you for your testimony on rising energy prices. I want to focus also on gasoline prices. This is affecting real people in my state who have real jobs, as Senator Marshall mentioned. AAA has ranked Arizona as one of the top ten most expensive retail gas markets in the nation. As of today, the average price of regular, unleaded gasoline in Arizona is $3.69. Yesterday, it was $3.62. It went up seven cents in 24 hours. This is more expensive than the national average of yesterday—$3.41 per gallon.

Energy analysts say the main reason is that crude oil consumption is exceeding global production, which was disrupted last year. We all know that. Although domestic oil consumption is returning to pre-pandemic levels, global production has not caught up. Whatever the explanation, the impact it is having is that hard working families in my state who commute to work and drop their kids off at school every day are seeing their costs go up and they need some relief.

Mr. Nalley, in your testimony the EIA predicts crude oil prices currently at $81 a barrel will drop about $10 per barrel next year as global production increases. So when will this drop in oil prices translate into lower gasoline prices for Arizonans?

Mr. NALLEY. Typically, there's about a 30-day lag once you see the drop in crude oil prices. It is about 30 days before you actually see that in gasoline markets.

Senator KELLY. And as a percentage decrease, do they tend to be about the same?

Mr. NALLEY. The cost of gasoline at the pump is roughly 50 percent of its price of crude oil.

Senator KELLY. So if we see, let's say, a 12 percent decrease in the price of crude oil, would you expect a 12 percent decrease in the price of gasoline?

Mr. NALLEY. I think, roughly, yes. I'd probably have to pull out a calculator, but I think that's about right.

Senator KELLY. My state receives most of its gasoline from refineries in California and Texas. If you remember last February,

Texas had the polar blast. It knocked out refineries and increased gasoline prices. Do you feel that Texas is better prepared this winter than they were last winter for this kind of event?

Mr. NALLEY. I think what Texas experienced is pretty unusual, pretty rare, but I believe Texas has put some new rules and regulations in place to protect against that.

Senator KELLY. Do you feel those new rules and regulations have resulted in change in their refinery infrastructure?

Mr. NALLEY. I think we'd have to get back to you on that. I don't know that I have enough information to answer your question today.

Senator KELLY. Alright, I would appreciate that.

And finally, can EIA project how gasoline prices might be impacted if refineries are knocked offline again this winter? Do you do any analysis, try to make any prediction if we see what we saw last February in Texas?

Mr. NALLEY. Can we do it if an event occurs? Sure, yes, we can take a look and always try to figure out what the impact would be in that situation. In terms of a regular, ongoing product that we put out, no, there's no such thing, but if it was such a situation like the Colonial pipeline situation, for example, where we were able to do some real-time analysis and try to figure out what the impact was there.

Senator KELLY. I would appreciate it if you do have the opportunity to do that analysis, if you do, if you could get back to my staff.

Mr. NALLEY. Absolutely.

Senator KELLY. Thank you, Mr. Nalley.

I yield back the remaining time.

The CHAIRMAN. Senator Cassidy.

Senator CASSIDY. Thank you, Mr. Chairman.

Now, obviously, the purpose of this is to come up with wise public policy. Thank you very much for your testimony. And the thought occurs to me that it is not just abstract. Mr. Bryce, you make an incredibly good point that lower-income Americans, Britons, Germans, you name it, are the ones bearing the price for decisions made by some that somehow think they know what's better for that person as opposed to their basic pocketbook. I will also point out that we are, if you will, in a counterpoint when we discuss energy policy with both foreign policy as well as environmental policy—specifically greenhouse gas emissions.

So with that, it is kind of a set up, and I will point out that the environmental left has wished to have higher energy costs in an effort to transition to a lower fossil-fuel future and the irony, of course, is now the left wishes to retain our exports, in effect, the same effect as if we had increased drilling because they wished to offset the stated goal of their policy. Now there's a lot of craziness here. It is just crazy.

Mr. Gould, first with you. Mr. Gould, I think you are conflating when you say the Nordic countries have invested more in renewables and therefore have more stable electrical prices. I think what you really mean is that they are using hydropower and that hydropower, yes, is renewable. It is not what we typically think of in our

conversations of wind or solar. It is hydropower. Is that a correct interpretation of what you're saying?

Mr. GOULD. The Nordic countries have invested heavily in hydropower alongside other renewables, yes.

Senator CASSIDY. Yes. And the hydropower is what is giving them the stable prices and the lower prices than elsewhere because we have already spoken of the wind drought. In fact, I was trying to look but no one has done a relationship. Perhaps one of you will—that one of the reasons that England is paying such a high price for gas is that they had bet on North Sea winds always blowing. There has been a wind drought. Wind was 34 percent of their electrons, then they went through a six-month period of getting none. They had not invested in storage for natural gas. And so, paradoxically or maybe not, there is a direct relationship between betting on renewables and paying a heck of a lot more for natural gas.

Now this is short-sighted policy that is both bad for the consumer, but it is also bad for international/global greenhouse gas emissions because now they and others are burning more coal. So I would point out that when we think about our policies, we actually have to think about them second and third degree, not just congratulate us on things which sound good when we first pass it.

Mr. Bryce, when Senator Heinrich talked about the levelized price of renewables, he did not include the cost of the backup peaker plants or other fossil-fuel generation required because, obviously, you cannot store electrons from wind and from solar. If you include that cost of the required backup, baseload, natural gas, whatever, peaker plants, within the cost of the renewable, what would be the cost of that renewable relative to natural gas?

Mr. BRYCE. Well, sir, I don't have those numbers at hand. What I do know is that whatever renewable capacity is added, it doesn't mean you can retire all of the thermal generation that is needed during peak times of peak demand. And Senator Heinrich didn't allow me to respond to it, but that was clearly the case in Texas, where when the grid was on the verge of collapse, and it was, as Bill Magnus, former CEO of ERCOT said on February 25th, it was within four or five minutes of total collapse.

So if you think about that and you think about a grid that is heavily reliant on renewables that cannot deliver power when power is dear and 25 million Texans in the ERCOT market could have been put into darkness, we wouldn't have had 700 people die, sir. It would have been in the tens of thousands.

Senator CASSIDY. So let me ask you this, Mr. Bryce. I said this is a counterpoint argument, both with global greenhouse gas emissions but also with national security. You pointed out that the supply chains for the batteries required for renewables to store their electrons come out of China, either they are mined by Chinese companies or they are processed in China, often using coal as a feedstock for the energy required. What does this do to our national security to be dependent upon China for our batteries as opposed to having the alternative, which is using natural gas, et cetera.

Mr. BRYCE. Senator, it's not just the batteries. It's the neodymium, the other rare Earth elements that are considered the green elements, the lanthanides. China has a 90 percent share of that

market, globally. I'd point you to the report that the IEA did in May on this which laid this case out very clearly and in Mr. Gould's testimony, his written testimony, he pointed to this critical minerals issue. So the idea that we're going to make a quick transition away from hydrocarbons to alternative technologies hinges on a massive increase in mining, and it's not just of rare Earth elements, it's manganese, zinc, copper, cobalt, an enormous array of minerals. And the question is, well, where are we going to mine them?

And this, and the Senate, I know this Committee has had hearings on increasing mining in the U.S., but my guess is the Sierra Club is not going to be pushing for a lot of that mining.

Senator CASSIDY. I thank you. I yield back and I will point out that at this hearing is a counterpoint to both greenhouse gas emissions, environmental policy, as well as foreign policy and national security. It is a great hearing. Let me say that. But I think maybe another to interweave those two, because if we look at energy as an isolated issue, we are going to end up far worse in both global greenhouse gas emissions and in terms of our national security.

Thank you, Mr. Chairman.

The CHAIRMAN. Good recommendation, Senator.

Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman.

Well said, my friend from Louisiana. I think that really sums it up and the nexus here. You just cannot separate this out. I think we are all trying to find easy answers. How many people here at this hearing today have asked you, what are the tools that we can be using? We want a quick fix. And our reality is that the fix comes when you have control over the resource, when you can ramp up your production rather than going tin cup in hand to another country or to the OPEC nations and say, "Pretty please. We do not like the prices that we are paying, can you guys do more?"

There are no easy fixes. I listened with interest to the discussion about the Strategic Petroleum Reserve. When I was sitting up there as Chairman or Ranking Member, I fought to defend the resources that are in the SPR, not using them as a piggy bank to bail us out when we do not like the high prices and whoever is in the White House needs to have a little political relief. It is not about political relief. But I also know that there is no easy button on the SPR either. We have already put in place numerous sales to get resources and revenues for things that are totally unrelated to the price of oil and we know that those particular sales are in off years. So for us to say, "well, we are just going to go sell some more oil from the SPRO." If anybody thinks that is an easy fix to today's price at the pump—my friend from Arizona mentions that gas at the pump in Arizona is $3.69. I was home this weekend and I was looking for it and could not find it for less than $3.80 and it was somewhere between $3.80 and $3.90 back home and that was in Anchorage. In the community that my folks live in down in Southeastern, they are paying about $4 or $4.20, I think it is.

This is real and it is impacting every aspect of people's lives and it is about really a level of equity and fairness to individuals. And these pressures are hard, but we cannot deceive people into thinking that there is some easy button out there that we just have not

pushed yet because we are waiting for the right political leverage. This is about our ability to produce.

Mr. Bryce, I really love what you said there at the end in response to Senator Cassidy about our reality with moving toward renewables. I am a huge advocate of doing more with renewables, but you have to have the base to start with and that base is the minerals that we will need. So we have to be talking about how we are going to incent and put into place those mechanisms.

I wanted to raise this issue to Mr. Nalley and Mr. Gould because I think, Mr. Bryce, you were asked this question by another member here and you said that that is not your bailiwick here, but this is relating to crude exports. I worked very hard some years back to lift the ban on domestic crude oil exports and it looks like the Biden Administration has kind of walked back some of that as an idea, but they were exploring the possibility of restricting domestic crude oil as part of an attempt to counter these rising prices. But if you go back, and you look at the 2015 EIA report at the time, it actually indicates that the reverse is true, that fewer export restrictions would likely have either no overall impact on domestic prices or perhaps would drive those prices down.

I guess the question that I would like to have Mr. Nalley and Mr. Gould respond to is how would more restrictive oil export policies impact our domestic prices? So if you can begin first, Mr. Nalley.

Mr. NALLEY. Sure, well, it's always a great question about importing and exporting of crude oil. As a basis, the U.S. refineries are built to work on the heavier crudes that come out. It's imported and the crude oil out of the United States is lighter. It's the export. So it's an international market and we're very dependent upon the international market. So if we cut our crude oil exports, we're still going to have tremendous amount of imports to meet the U.S. needs.

Senator MURKOWSKI. People do not understand that so much of this is related to the refining capacity that we have domestically.

Mr. Gould, can you respond as well? Thank you.

Mr. GOULD. I would concur with the remarks just made by my colleague from the EIA. The U.S. flows of crude and refined products to and from international markets are complex. They're to do with different refinery configurations and different grades that are required in different parts of the system. There's an easy way to try and simplify this debate, but in practice these flows are quite complicated.

Senator MURKOWSKI. Thank you.

Again, Mr. Chairman, no easy button here. Thank you.

The CHAIRMAN. No easy button at all.

Senator MURKOWSKI. Good hearing.

The CHAIRMAN. Senator Lee.

Senator LEE. Thanks so much, Mr. Chairman, and thanks to both of you for being here—all of you, I should say.

Mr. Bryce, I would like to start with you if that is alright. Now in your testimony you indicated that there are four factors that have been contributing to massive energy shortages and energy price spikes across Europe. First, you pointed to underinvestment. Now, domestically we have seen some investors, some financiers, rather like Black Rock, divesting from companies that generate

more than 25 percent of their revenues from thermal coal production. I have also heard of companies pressuring or threatening others who happen to determine that they do not want to divest from fossil fuels. Do you think this trend has had a direct impact or will have a direct impact on American energy security?

Mr. BRYCE. I think it already has, sir. I have been talking to people that I know who are in the energy sector. There's a shortage of capital available to drillers and some of this is due to the fact, frankly, that the drilling in the EMP sector burned through about $300 billion and just simply lost it and consumers benefited from that destruction of capital, but now drillers are facing much more restrictive loan agreements and they're having to live within their cash-flow. But my point, more specifically in my written testimony, was on the underinvestment in hydrocarbon exploration and production in Europe and the lack of production out of the North Sea and then the Dutch also curtailing production from the Groningen Field.

Senator LEE. Right.

You have indicated that overreliance within Europe on imported energy has contributed to this energy insecurity in your——

Mr. BRYCE. Yes, sir.

Senator LEE. And at the same time, the Biden Administration seems to be proposing to increase royalty rates with the help of a number of Members of Congress in the Democratic Party and to tax coal and gas power companies. Now coupled with the oil and gas leasing moratorium imposed by the Biden Administration from the very outset of its Administration, it seems like a lot for the energy industry to face. But more than the energy industry, we are concerned about their customers, about the people who rely on those things. Do these kinds of actions have a direct impact on the ability or the willingness of companies to invest in domestic energy production?

Mr. BRYCE. Absolutely, and I think it's moreover, sir, the area where this is the most dangerous is in electric generation and the fragilization of our electric grid and what Meredith Angwin calls the 'Fatal Trifecta'—too much dependence on renewables, too much dependence on imports and too much dependence on natural gas. It directly threatens the viability and resilience of our electric grid, and this is the mother network. It is the most important energy network in our country, and it's getting scant attention from Washington.

Senator LEE. You have also stated that overinvestment on intermittent sources was driving up prices, as in California where some consumers are projected to pay three times the national average for electricity. Do you think that the enactment of the Democrats' clean energy performance program, also described as the muscle behind President Biden's climate agenda, would likewise have a tendency to drive up energy costs throughout the United States?

Mr. BRYCE. There's no question about that, sir. I published a piece in Forbes a few weeks ago on the CEPP. Not only would it reduce the resilience, affordability, and reliability of the electric grid, it would be a handout of epic proportions to the solar and wind business. So in many cases they would be getting far more

in federal subsidies than they would be getting in the wholesale market for their power they produce.

Senator LEE. For the same reasons then, would it be a fair assumption that simultaneous overreliance on intermittent energy sources that occurs at the same time as underinvestment in reliable sources, something that could result in Americans experiencing rolling power outages. Is that the sort of thing that could happen as a result of this?

Mr. BRYCE. Sir, I've experienced it firsthand. I experienced it February 15th at 2:00 a.m. My lights went out for 45 hours.

If I can just add one other quick point. To me, the idea that we would make our electric grid more reliant at a time when, due to climate change, we're expecting more extreme weather, to make our energy and power systems more dependent on the weather makes no sense at all.

Senator LEE. And in some cases, it could threaten the lives of people. In other words, it can be more than just an inconvenience. For some, it could mean the difference between life and death.

Mr. BRYCE. 700 people died in the blackouts in Texas, sir.

Senator LEE. Thank you.

The CHAIRMAN. I cannot believe I am going to say this. Senator Hoeven.

[Laughter.]

Senator HOEVEN. Thank you, Mr. Chairman.

Mr. Nalley, your testimony mentions that natural gas prices in the U.S. have tripled as of last month and that areas like New England are at risk of higher price spikes due to limited pipeline capacity. Would more robust pipeline infrastructure result in lower prices and less dependence on foreign imports?

Mr. NALLEY. New England does face a certain set of challenges because of the limited pipeline capacity. So yes, it is subject to higher prices.

Senator HOEVEN. So would more robust pipeline infrastructure result in lower prices and less dependence on foreign imports?

Mr. NALLEY. Yes.

Senator HOEVEN. Okay.

The House Reconciliation bill imposes a new fee on methane emissions, which I am sure concerns our Chairman, as well as myself, which is—it is just a tax on natural gas. The bill also increases fees and royalty rates for U.S. producers operating on federal lands. Is it fair to assume that these proposals will lead to lower U.S. production and increase our reliance on energy from less stable parts of the world?

Mr. NALLEY. So any pending legislation, I, you know, being a policy-neutral organization, we wouldn't want to comment on that.

Senator HOEVEN. In general, theoretically, would higher taxes and increased fees and royalties cause the price of a commodity to go up?

Mr. NALLEY. Yes.

Senator HOEVEN. Thank you.

Crude oil pricing: In 2015 we passed a bipartisan effort to lift the decades-old ban on U.S. crude exports which has helped to grow our energy resources. Would you agree that lifting the ban on U.S.

crude exports has helped counter the influence of our global energy competitors, like Russia and OPEC?

Mr. NALLEY. We would have to get back to you on that.

Senator HOEVEN. Okay.

Pipelines: Line 3. We are an ag state. North Dakota is an ag state and we are very concerned about increased fuel prices across the board, but certainly how they impact our farmers, you know, being a large ag producing state. Recently, the Line 3 pipeline that crosses North Dakota was restored to full capacity, replacing an existing pipeline originally built in the 1960's. Do you see a need for further capacity expansions to transport crude oil into and throughout the United States as well as natural gas?

Mr. NALLEY. Pipeline capacity is an issue. It affects regional areas where gas and where oil can flow easily. So yes.

Senator HOEVEN. Okay.

And if Line 3 had not been replaced and its design capacity restored, what would have happened to fuel prices? What would have been the impact on rail traffic, particularly for farmers dependent on rail capacity to move their product to market as well?

Mr. NALLEY. I would have to look at this particular situation. I don't know off the top of my head today.

Senator HOEVEN. Mr. Gould, in your testimony, you noted that global demand for three major traditional fuels: natural gas, oil, and coal have all increased in response to the economic recovery from the COVID–19 pandemic. You also mentioned occurrences of fuel switching from natural gas to coal in response to record high gas prices. Are efforts to curtail new fossil fuel production exacerbating the challenges of ensuring we have sufficient energy supplies to meet consumer demand?

Mr. GOULD. I think there's been a halving in investment in oil and gas upstream since 2014 and, as all of the distinguished members of the Committee are aware, there has not been anything close to a halving in consumption over that period. So we've had a dramatic fall in investment over the last seven years in the upstream. The reasons for that, though, are primarily due to the falls in the oil price in 2014, 2015, and again last year, which cut revenues, which led companies to cut back heavily on their upstream production. So I certainly agree that we've seen a very significant fall in investment in recent times. I think the primary responsibility for that lies in the market dynamics that I've described.

Senator HOEVEN. Because coal continues to be a cost-effective, dependable fuel source, does the IEA continue to agree that carbon capture technologies are indispensable to meeting both our energy needs and climate goals?

Mr. GOULD. Yes, we do modeling of different climate scenarios. We require to have carbon capture utilization and storage as a very important technology in these decarbonization scenarios—in these energy transition scenarios. One of the reasons for that is in the power sector, but there are also important applications for this technology in industry, also in the production of hydrogen and also potentially in direct air capture technologies as well.

Senator HOEVEN. Thank you.

Thank you, Mr. Chairman.

The CHAIRMAN. We are going to be wrapping it up here because I have to go vote, but Senator Barrasso is going to ask a question. I am going to ask one very quick question, then I am going to leave, but I want to thank all three of you. It has been a great meeting. And we are probably going to have you back, okay?

Mr. Gould, if I could ask you this: I think the position of the IEA has always been that the best thing we can do for climate right now is to rapidly develop carbon capture sequestration and utilization as a valued waste product. We could help the climate more by realizing there is going to be more fossil that is going to be continued and relied on. I say that because 10 years ago China had 1,799 coal-fired plants and now they have 2,991 coal-fired plants, and they are building, I think, another 450 more. They will be at 3,451 coal-fired plants. India had 525 10 years ago. They have 852 now, and they are building another 100. They will have 952. The United States had 589 10 years ago. We are down to 504. The rest of the world had 966 coal-fired plants and now they have 2,255 coal-fired plants. We are the only nation that has reduced our reliance on coal energy and the environmentalists in this country would make you believe we are basically polluting the whole world's climate, which is crazy.

Is there any collaboration between the U.S., China, and India to find and unlock that box on carbon capture sequestration and utilization to make it more cost-effective so there is a value-added product rather than just basically liquefying CO_2 from clear-stream carbon to pressurizing it and putting it in the ground? And if there is nothing that comes back with value, the cost is prohibitive. We know that.

Are you seeing any type of collaboration or is it something that you all, from the IEA, could initiate and inspire us to come together on that we should agree? We are not going to stop these countries from using fossil. They are going to follow America—they haven't. We have gone down. They have all doubled, tripled their consumption. Just in megawatts, China 10 years ago had 200,000 megawatts, and today they have 1,046,000 megawatts. India had 61,580, and today they have 233,000. We had 327,000 megawatts 10 years ago, and we are down to 232,000. Again, we are the only nation that has decreased and nobody has followed. Nobody has followed us.

So all I am asking is, somebody has to do something and spur this on. And I think IEA, leading that charge and challenging us to finally come together and agree with China, with India, and all the other coal, you know, fossil-dependent countries, to find a solution for carbon capture.

Any comment on that?

Mr. GOULD. I am sorry, I certainly strongly agree with the sentiment and that any attempt to deal with the climate challenge has to not just deal with the flow of existing—flow of new projects into the system and as we are all aware, the number of new coal plants being built has fallen very substantially in recent years and it is likely to fall again because finance is drying up and indeed, the Chinese President has said that China will no longer finance coal plants abroad.

But that still leaves, as you rightly say, more than 2,000 gigawatts of existing coal-fired capacity. And if that coal-fired capacity continues to operate unabated according to its normal operating lifetime, that is half of the remaining carbon budget for a 1.5-degree stabilization just disappearing just on that one item. So it is essential that we find solutions and I completely agree that the U in CCUS, the utilization part is one with—which is an increasing focus for many organizations around the world. There are yet to be any large-scale applications there that would seem to offer a large-scale solution, but it is an area where we will be very happy to take up the baton as well. Alongside work, also, in making plants operate more flexibly so that they can accompany the rise in renewables and also, the potential to co-fire them with low-carbon fuels, including ammonia.

So that's the sort of portfolio of solutions alongside, of course, retirements in some cases that would allow us to deal with the emissions from that existing stock of coal-fired plants.

The CHAIRMAN. Well, sir, but we have seen what has come out of the COP26, just recently with India's pushback, with China's pushback. They are not retreating. And the bottom line is, if you are going to shame other countries or they are trying to shame well, I am just saying this, I have always believed that you cannot eliminate your way to a cleaner climate. You can definitely innovate with technology. And for some reason, it is being professed around the world that we have to eliminate, eliminate, eliminate. It is not happening, sir. It has not happened in the past. It is not going to happen in the future. We have to innovate. And someone's got to bring all of us together, and we are hoping that you will be part of that mix.

Mr. GOULD. With great pleasure, thank you very much.

The CHAIRMAN. Thank you, sir.

Mr. GOULD. And I completely agree on the importance of innovation for the technologies that we don't yet have in market readiness, and I think that the U.S. is very well-placed to lead the innovation of that as well.

The CHAIRMAN. Thank you very much.

Senator Barrasso.

Senator BARRASSO [presiding]. Thanks, Mr. Chairman.

Following up on your eliminate versus innovate. Mr. Bryce, for years Democrats in Congress and the environmental activists have lobbied the banks to deny loans to oil and gas producers. On day one of the Administration, President Biden joined their efforts. He restricted oil and gas permitting. He ended oil and gas leases on federal lands and waters, and we are now reaping the consequences of these policies. Will restricting loans to American oil and gas producers solve the issue of climate change?

Mr. BRYCE. No sir, it won't. It will reduce exploration of production in the United States and therefore, potentially, lead to higher prices and certainly more imported oil.

Senator BARRASSO. So will choking off access to our nation's oil and gas resources solve climate change?

Mr. BRYCE. No sir.

Senator BARRASSO. And would you please discuss the economic consequences of trying to end oil and gas production here in the United States?

Mr. BRYCE. Well, I'm a native of Tulsa, which, for about 20 minutes was known as the oil capital of the world. I think that title is now clearly Houston, Texas, but if we kill the domestic oil and gas industry, many of which are small producers, that with a few individuals running what are known as stripper wells, it not only reduces overall crude and gas production in the U.S., it will result in higher unemployment and for many towns and small towns in Oklahoma, Texas, Louisiana, New Mexico, it could be a devastating blow.

So there's no free lunch, sir.

Senator BARRASSO. I do want to put something into the record. Today, the Business Wire published an article titled, "Banning Exports of U.S. Crude Oil Would Likely Raise Gasoline Prices, Not Lower Them." It was according to Kurt Barrow, who is Vice President of IHS Markit who said, "Without the ability to export U.S. crude, you enter a situation where there is a tighter global market." It goes on to say, "This would lead to supply chain and processing inefficiencies and possibly even higher gasoline prices as a direct result of the export ban."

I ask unanimous consent to enter this article into the record and I see no objection at this point.

[Laughter.]

[Business Wire article follows:]

IHS Markit: Banning Exports of US Crude Oil Would Likely Raise Gasoline Prices, Not Lower Them

November 16, 2021 12:01 AM Eastern Standard Time

WASHINGTON--(BUSINESS WIRE)--Instituting a ban on U.S. crude exports has currently been put forward for consideration as a "tool" to alleviate rising U.S. gasoline prices—average price in October up 36% from a year ago. This is one of the notable factors contributing to the surge in inflation, the highest increase in U.S. consumer prices in 31 years. However, the unintended consequences of such a policy would likely increase gasoline prices rather than lower them, according to a new analysis by IHS Markit (NYSE: INFO), a world leader in critical information, analytics and solutions.

"A U.S. crude oil export ban would make the situation worse—for the United States and the world—at a time when global supply chains are already under exceptional strain," said Jim Burkhard, vice president and head of crude oil markets, IHS Markit. "Such a ban would disrupt global oil supply chains, run counter to decades of U.S. policy promoting the free flow of oil and gas, lead to inefficient and costly re-allocation of domestic crude oil production, disrupt supplies for allies and discourage domestic production—which would all put upward pressure on U.S. gasoline prices. It would also send an unnerving signal to allies and partners about the reliability of the United States."

Gasoline prices in the United States are connected to the global oil and gasoline market—and not the price of domestically produced crude oil, the analysis notes. A ban on exporting domestic U.S. crude oil production may lower the price of domestic crude. However, this could discourage production of both oil and natural gas with the result likely being a tighter world oil market—without lowering gasoline prices.

Instead, the disruption to the oil supply chain—both domestically and internationally—would likely increase gasoline prices, the analysis finds.

"Removing the 3 million barrels per day of crude that the United States exports to Europe, Asia and elsewhere would deliver a shock to the world market. The lost barrels would have to be replaced from somewhere else. And it is not clear if all of that could or would be replaced in a tight market," said Burkhard. "Such a disruption of international crude oil flows would lead to a scramble to find other oil and generate more upward pressure on crude oil prices—and thus increase the price of U.S. gasoline."

Implementing an export ban would also force a costly and inefficient re-allocation of crude oil supplies to refineries, the analysis says.

A large share of U.S. refining capacity is configured to process a different type of crude than the kind that the United States exports. Refineries in the United States are already operating at high utilization rates. Additional processing of another type of crude—a type that those refineries are not designed for—would only occur with increasing inefficiency, says the analysis.

Geography is also a complicating factor. Oil produced in Texas and the central United States that otherwise would be exported is difficult and costly to move to refining centers on the Atlantic or Pacific coasts. There are no crude oil pipelines to either coast and what rail facilities exist have been out of use.

"Without the ability to export U.S. crude, you enter a situation where there is a tighter global oil market or U.S. refineries are inefficiently processing types of crude that they are not configured for, or both," said Kurt Barrow, vice president, oil markets, midstream and downstream, IHS Markit. "This would lead to supply chain and processing inefficiencies and possibly even higher gasoline prices as a direct result of an export ban."

The most effective supply-side force that could lower oil prices is more oil production, the analysis finds. The United States is currently expected to be the world's leading source of oil production growth in 2022. The imposition of a crude export ban could place that growth in jeopardy.

"Instituting a crude exports ban would threaten U.S. oil production growth and make the world oil market more heavily dependent on OPEC+ increasing their production to meet demand," said Burkhard. "This would test the amount of additional production capacity available in the rest of the world."

About IHS Markit (www.ihsmarkit.com)
IHS Markit (NYSE: INFO) is a world leader in critical information, analytics and solutions for the major industries and markets that drive economies worldwide. The company delivers next-generation information, analytics and solutions to customers in business, finance and government, improving their operational efficiency and providing deep insights that lead to well-informed, confident decisions. IHS Markit has more than 50,000 business and government customers, including 80 percent of the Fortune Global 500 and the world's leading financial institutions. Headquartered in London, IHS Markit is committed to sustainable, profitable growth.

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Release Summary

Banning exports of U.S. crude oil would likely raise gasoline prices, not lower them, IHS Markit analysis finds.

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Oil Market Briefing

15 November 2021

Will banning US crude oil exports lower gasoline prices? No—but it will disrupt the oil supply chain

Jim Burkhard, Vice President
Kurt Barrow, Vice President

Key implications

On 8 November, 11 US Senators asked President Biden to "consider all tools available at your disposal to lower U.S. gasoline prices...[including] a ban on crude oil exports." The letter from the senators was prompted by the 36% increase in US retail gasoline prices over the past year, which in October contributed to the highest US consumer inflation rate in 31 years. At a time when global supply chains are under exceptional strain, a US crude oil export ban would make a bad problem even worse—for US consumers and the world.

- **A ban on US crude oil exports would set off a scramble for supply, driving up prices and raising further questions about the reliability of the United States as a partner.** A crude oil export ban would wreak havoc in global oil supply chains, run counter to US policy promoting free flow of oil and gas, lead to inefficient and costly reallocation of domestic crude oil production, disrupt supplies for allies, and discourage domestic production—and put upward pressure on US gasoline prices. A policy with a benign intent would inadvertently multiply difficulties in the United States and beyond.

- **The price of gasoline in the United States is connected to global oil and gasoline prices—and not the price of domestically produced crude oil.** Gasoline is freely imported and exported—the United States does both. In the early 2010s, when US production growth was reviving after decades of decline—and a ban on US crude oil exports was still in place—the discounted price of domestic crude oil production had little, if any, influence on gasoline prices. After the crude export ban was lifted in December 2015 as part of a deal that increased incentives for renewable energy, US crude oil production reached new all-time highs and added substantial new volumes to the global oil market.

- **Most US crude oil exports are of light sweet crude oil grades, which cannot easily replace heavy sour crude oil imports run in many US refineries.** US refining investment from the 1980s

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to the early 2000s was directed toward processing heavy crude oil—and not the light sweet crude oil that has driven the great revival of US crude oil production since 2008. US refineries are already operating at high utilization rates, so additional processing of light sweet crude oil would only occur with increasing inefficiency.

A crude oil export ban would launch a supply scramble

The average US retail price of gasoline in October was $3.38 per gallon—up 36% from a year ago when the price of gasoline averaged $2.49 per gallon. The rise in gasoline prices contributed to the highest increase in US consumer prices in 31 years—up 6.2% in October from a year earlier. The Biden administration is keen to see lower gasoline prices. On 8 November, 11 US senators asked President Biden to "consider all tools available at your disposal to lower U.S. gasoline prices...[including] a ban on crude oil exports." However, a ban would not lower gasoline prices. Instead, it would have unintended consequences that would disrupt the oil supply chain—domestically and internationally—by forcing an economically inefficient allocation of crude oil supplies to refineries. Such a change would likely have the opposite effect of the intended policy change—leading to higher gasoline prices than otherwise would be the case.

Simply put, most US crude oil exports are of light sweet crude oil grades, which cannot easily replace heavy sour crude oil imports run in many US refineries. US refineries do process US light sweet crude oils – about 6 mmbd – but US refining investment from the 1980s to the early 2000s was directed toward processing heavy crude oil—and not the light sweet crude oil that has driven the great revival of US crude oil production since 2008. US refineries are already operating at high utilization rates and are running all the light sweet crude oil that is economical, so additional processing of light sweet crude oil would only occur with increasing inefficiency.

The most effective supply-side force that could lower oil prices is more oil production. The three oil superpowers, in terms of production, are the United States, Russia, and Saudi Arabia. In October, crude oil output from Saudi Arabia rose above pre–COVID-19 (fourth quarter 2019) levels and Russian output is down about 4%. It is in the United States where production is down the most—about 10% below the fourth quarter 2019 level. However, the United States is now poised to be the world's leading source of oil production growth in 2022. This would diminish OPEC+'s global oil supply power. However, a crude export ban would threaten the ability of US industry to increase production because it would lower US domestic crude prices without lowering the price of gasoline. This would keep the world oil market heavily dependent on OPEC+ increasing production to meet demand—in other words, a repeat of 2021.

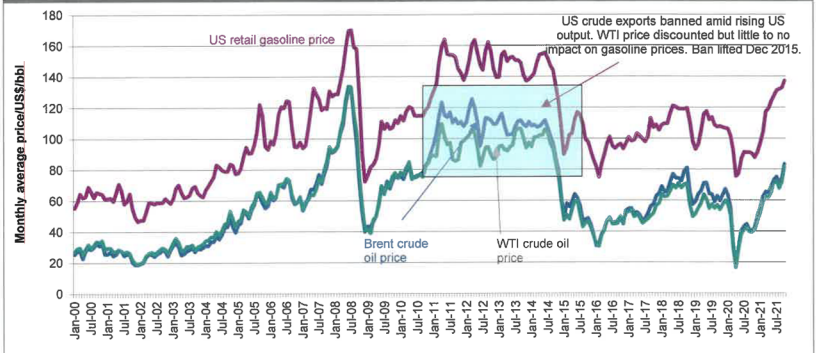
In addition to a ban on crude oil exports, the 8 November letter said that a release of crude oil from the US Strategic Petroleum Reserve (SPR) should also be considered. The impact of an SPR release would depend on the volume and duration that was offered to the market. An SPR release would at least not create upward pressure on oil and gasoline prices and could ease prices, at least briefly.

US gasoline prices connected to the global oil market

Gasoline is freely imported and exported—the United States does both. This means US gasoline prices are connected to the global oil and gasoline market—and not the price of domestically produced crude oil. A ban on exporting domestic US crude oil production could lower the price of domestic crude production, which could discourage production of both oil and gas and lead to an even tighter oil market. Lower domestic crude oil prices would be unlikely to increase US refinery utilization much. US refinery utilization is already at a relatively high level. In recent months, US refinery capacity utilization has been 90.3–92.4%. From 2010 to 2019, the average utilization rate was 89.5%.

In the early 2010s, when US production growth began to surge after decades of decline—and the ban on US crude oil exports was still in place—the discounted price of domestic crude oil production had little, if any, influence on gasoline prices. After the crude export ban was lifted in December 2015 as part of a deal that increased incentives for renewable energy, US crude oil production reached new all-time highs and added substantial new volumes to the global oil market. From 2016 to 2020, average US retail gasoline prices generally ranged from $2 to $3 per gallon ($84–126 in barrel terms, see Figure 1).

Global crude oil and US retail gasoline prices, January 2000 to October 2021



Note: US retail gasoline price includes federal and state taxes, distribution, and marketing costs. Gasoline price in dollars per barrel.
Brent crude oil, the global crude oil price benchmark, priced in the North Sea, United Kingdom.
WTI, the US crude oil price benchmark, Cushing, OK.
Source: US Energy Information Administration

So far this year, the United States has produced 11 MMb/d of domestic crude oil and exported 3 MMb/d of it. Crude oil imports have averaged 6 MMb/d. The reason why the United States imports and exports crude oil is that each refinery is designed to process certain qualities of crude oil—from heavy sour (often high sulfur) grades to light sweet (low sulfur) grades. Most US oil production is light sweet crude oil, which a large share of US refineries is not configured to process efficiently. Without export outlets, US domestic crude prices would fall in order to incentivize domestic refineries to process more oil that they are not configured to refine. This would lead to supply chain and processing inefficiencies and possibly even higher gasoline prices, which, in the case of an export ban, would be a direct result of government policy.

Geography matters too. US crudes produced in Texas and the central United States are difficult and costly to move to the either the west or east coasts—there are no crude oil pipelines to either coast. Some rail facilities exist but most are not used today and some are located at shut-down refineries. In the case of an export band, transporting US crude by rail to the coasts would lead to higher costs, transportation bottlenecks, and it would strand new Texas export infrastructure with no oil to export.

Such supply chain disruptions would be multiplied outside the United States. The 3 MMb/d of US crude oil exports to Europe, Asia, and elsewhere would have to be replaced with other crude oil. And it is not clear if all of that could or would be replaced—and it would also shrink the supply of oil available to import into the United

States. In any case, such a disruption of international crude oil flows would lead to a scramble to find other oil and generate more upward pressure on crude oil prices—and thus increase the price of US gasoline.

This would also run counter to decades of US government policy, which has promoted the free flow of oil and opposed restrictions. It would hit US allies and partners, including Japan, South Korea, India, the Netherlands, and many others that import US crude oil, reinforcing concerns about US reliability, and would also likely increase the US trade deficit, as exports of oil and natural gas have been important elements in the US trade balance.

Global oil market prices account for 70% of the US retail gasoline price

There are four main elements that shape the price of gasoline in the global oil market, and thus the price of gasoline in the United States. These are listed below in descending order of importance to gasoline price formation:

- **Global crude oil price: 56%[1] of the gasoline price.** The price of globally traded crude oil is the single largest element in the price of gasoline. The global price of crude oil—with Brent crude oil the most important benchmark—is determined by many different factors that reflect the balance between demand, supply, and expectations in the world oil market. According to the US Energy Information Administration (EIA), the global crude oil price accounted for 56% of the US retail gasoline price from 2011 to 2020.
- **Taxes: 16% of the gasoline price.** Federal and state taxes on gasoline sales is the second largest element in US retail gasoline prices. Taxes accounted for 16% of the price of gasoline.
- **Product margin: 14% of the gasoline price.** Refiners purchase crude oil and refine it into many different products, of which gasoline is one. The difference between the cost of crude oil and the price at which refineries sell gasoline is referred to as the product margin, which accounts for a dynamic mix of costs and profits. In the United States, the product margin has been the third-largest element of gasoline price, accounting for 14% of the retail gasoline price.
- **Distribution and marketing: 14% of the gasoline price.** The fourth and smallest element of gasoline prices is distribution and marketing costs and profit. Once gasoline is produced at a refinery, it needs to be distributed to gasoline retail outlets across the United States and then sold.

At a time when global supply chains are under exceptional strain, a US crude oil export ban would make a bad problem even worse—for US consumers and the world. A crude oil export ban would disrupt global oil supply chains, run counter to US policy promoting free flow of oil and gas, lead to inefficient and costly reallocation of domestic crude oil production, disrupt supplies for allies, and discourage domestic production—which would all put upward pressure on US gasoline prices. A policy with a benign intent would inadvertently multiply difficulties in the United States and beyond.

[1] The share of each element in the US retail gasoline price is from the US Energy Information Administration covering the 2011–20 period.

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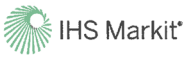

Mr. BRYCE. Sir, if I could build on Mr. Nalley's point that part of that is the mismatch between domestic crude quality and the crudes that are suited for American refineries and I think he made that point well.

Senator BARRASSO. For all witnesses, I am going to ask you to raise your hand. On day one of the Administration, President Biden killed the Keystone XL pipeline. No surprise there. He made a lot of press about it. He very proudly did that. The Keystone XL pipeline would have brought oil from Canada to the Midwest and the Gulf Coast and now President Biden is considering shutting down the Line 5 pipeline, which currently ships oil from Canada to Michigan. Meanwhile, the Administration has repeatedly begged the OPEC cartel and Russia to produce more oil.

Do any of you believe it is in the best interest of the United States to import more oil from OPEC and Russia and less from Canada?

Nobody. Let the record reflect, no one has raised their hand.

Mr. Gould, I just had a couple of final questions before we end, if you could? The European Union does rely on Russia for about half of its natural gas supply. The number is expected to grow once the Nord Stream II pipeline begins shipping natural gas. Do you agree that U.S. liquefied natural gas provides our allies, especially those in Europe, a critically important alternative to Russian natural gas?

Mr. GOULD. Yes, I do believe that.

Senator BARRASSO. And will you discuss just some of the benefits that U.S. liquefied natural gas provides Europe?

Mr. GOULD. I think it provides optionality and optionality is incredibly important when you are negotiating with existing suppliers, when you go into those negotiations knowing that you have the possibility to seek alternative sources of supply if those negotiations don't work out. I think, together with the integration of the European gas market, that's been a very important force in helping the competitive and open European gas market emerging in recent years.

Senator BARRASSO. And would you agree that U.S. liquefied natural gas exports then have helped America's allies and trading partners truly reduce their greenhouse gas emissions?

Mr. GOULD. I think in many cases you'll see that increased gas use in recent years has displaced more carbon-intensive fuels. You've seen that in Europe, you've seen that in some other countries around the world, and of course, you've seen it in the United States of America.

Senator BARRASSO. Well, thank you all for being here. I am very, very grateful. This is going to conclude the morning's hearing.

Members have until the close of business tomorrow to submit additional questions for the record. The hearing is adjourned.

I appreciate all of your efforts and under the previous order the business meeting stands in recess. We will reconvene on Thursday morning at 10:00 a.m., when we will also consider both the two nominations of this morning's agenda and the bills on the legislative agenda.

Thank you all very, very much.

[Whereupon, at 12:06 p.m., the hearing was adjourned.]

APPENDIX MATERIAL SUBMITTED

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Stephen Nalley

QUESTIONS FROM CHAIRMAN JOE MANCHIN III

Q1. Being a net-exporter of energy provides us with important geopolitical tools. However, that needs to be balanced against keeping our energy prices at home low. As you mentioned, the U.S. Energy Information Administration (EIA) has previously studied this topic in 2012 and 2014.

Q1A. Can you share if the data is changing and whether high Liquefied Natural Gas (LNG) export prices are incentivizing the export of our natural gas resources rather than refilling storage reserves ahead of the winter season?

A1A. U.S. LNG exports grew from an average of 4.6 billion cubic feet per day (Bcf/d) from January to October 2019 to 5.9 Bcf/d for the same period in 2020 and 9.8 Bcf/d for the same period in 2021. Even with growing exports, the amount of natural gas in storage in the United States as of November 19, 2021, was only 1.6% below the previous five-year average. Additional details are available via EIA's natural gas resource pages: https://www.eia.gov/energyexplained/natural-gas/.

Q1B. What is the status of our natural gas storage reserves currently as compared to where there were this time last year?

A1B. As of November 19, 2021, U.S. working natural gas storage levels were 3,623 Bcf, 8.1% below their levels on November 19, 2020, and 1.6% below the previous five-year average. For more information, please see EIA's natural gas storage reports: https://ir.eia.gov/ngs/ngs.html.

Q1C. What can the data tell us to inform the U.S. Department of Energy (DOE's) public interest determination and protect American consumers from price spikes?

A1C. The United States first exported more natural gas than it imported in 2017. According to our most recent forecasts, U.S. natural gas production will have grown almost 24% between 2017 and 2021. In 2017, exports made up about 10% of the disposition of natural gas in the United States, which includes consumption as well as exports. So far in 2021, natural gas exports have made up 18% of the disposition of U.S. natural gas. Growing domestic production provides some protection from price movements, but price spikes can still occur due to more extreme weather events and, regionally, because of limitations on natural gas pipeline infrastructure. For more information, please see EIA's most recent natural gas reports: https://www.eia.gov/naturalgas/reports.php#/T202.

U.S. Senate Committee on Energy and Natural Resources
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Q1D. The new study that you mentioned, is it just looking at LNG or other energy exports as well and their impact on domestic prices?

A1D. Our current study is a multiyear effort to examine what determines U.S. natural gas prices, including any possible effects of our participation in international markets through LNG exports. We are not examining any other energy exports in this effort. On November 16, 2021, we held a workshop to discuss the topic with academic and industry participants. For more information, please see EIA's website at https://www.eia.gov/finance/workshops.php.

Q2. Energy efficiency is not only a key solution for addressing climate change, but it is also central to the stability of our energy markets. The more productive we can be with our energy use, the smaller the swings between periods of low energy demand and high energy demand will be. Not only would this make our energy demand more predictable and reliable, but it would also mitigate the wild fluctuations in the price of oil, natural gas, and electricity that we are seeing today.

Q2A. Given the clear value that energy efficiency offers, why have we seen such a slow growth, and even decreases in some cases, in energy efficiency investments?

A2A. Energy efficiency has made structural gains over the past decade as U.S. households and businesses have invested in more energy efficient processes, buildings, and equipment. At the same time, total electric utility spending on demand-side management and energy efficiency programs has remained relatively constant, and energy savings from these utility programs have remained relatively consistent as well over the last three years. Academic literature cites many potential barriers to increased energy efficiency, including lack of awareness, affordability, misalignment of incentives, mismatched incentives between participants, and the overall complexity of efficiency markets. No single factor, however, clearly stands out in terms of explaining these trends.

Q2B. How can we re-frame energy efficiency beyond just a tried and true way to save energy and money, but also as a tool to improve energy resilience and moderate energy price volatility?

A2B. Increases in energy efficiency and demand management programs can provide long-term benefits that extend beyond simple short-term cost savings. For example, lowering baseload and peak electricity generation can reduce the level of investment needed in generation and transmission equipment to meet a sufficient level of energy resilience. Programs run by the U.S. Department of Energy's Office of Energy Efficiency & Renewable Energy can further clarify different energy efficiency measures and

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
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explain and quantify the benefits of these programs to assist in decision-making, as can the U.S. Environmental Protection Agency's Energy Resources for State, Local, and Tribal Governments web page at https://www.epa.gov/statelocalenergy

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Stephen Nalley

QUESTIONS FROM RANKING MEMBER JOHN BARRASSO

Q1. Are you aware of any studies showing that exports of crude oil from the United States since 2015 have contributed to rising gasoline prices in the U.S.? If so, please provide links or citations to each.

A1. We are aware of the following four studies that examined the relationship between crude oil and gasoline prices:

- U.S. Congressional Research Service. *U.S. Crude Oil Export Policy: Background and Considerations* (R43442; December 31, 2014), by Phillip Brown, et al. (https://sgp.fas.org/crs/misc/R43442.pdf).

  The report states,

  > "The effect on domestic gasoline prices is a major consideration, among several, associated with allowing crude oil exports. Commercial studies and federal government analysis suggests that gasoline prices are correlated to international crude oil prices—since gasoline and other petroleum products can be exported without restriction—and U.S. gasoline prices could possibly decrease if crude oil exports were allowed."

- Stevens, A. (2015) *U.S. Crude Oil Pricing Analysis*. Stancil & Co. (https://www.ourenergypolicy.org/wp-content/uploads/2015/07/US-Crude-Oil-Pricing-Analysis-Stancil-July-2015-FINAL.pdf).

  The report finds that "lifting the crude export ban would result in a domestic crude price increase of approximately $3.00 per barrel."

- U.S. Congressional Research Service. *U.S. Crude Oil Exports and Retail Gasoline Prices*. (IN10915; June 13, 2018), by Phillip Brown and Robert Pirog. (https://sgp.fas.org/crs/misc/IN10915.pdf).

  The report states,

  > "Multiple economic studies by various organizations were conducted that assessed the potential impact to U.S. gasoline prices (see Appendix B of this CRS report). Generally, study results indicated that U.S. gasoline prices would decline. However, at least one study suggested that allowing crude oil exports may result in higher domestic gasoline prices."

- U.S. Government Accountability Office. (2020). Crude Oil Markets: Effects of the Repeal of the Crude Oil Export Ban. (GAO-21-118). Washington, DC. (https://www.gao.gov/assets/gao-21-118.pdf).

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Stephen Nalley

The report concludes that the repeal of the oil export ban did not affect U.S. gasoline prices because U.S. gasoline prices are determined by global oil prices.

Q2. Concerning the levelized cost of electricity (LCOE), EIA notes, "actual plant investment decisions consider the specific technological and regional characteristics of a project, which involve many other factors not reflected in LCOE values." EIA also notes that comparing LCOE for dispatchable and non-dispatchable technologies "must be done carefully."

Q2A. Is this still EIA's position?

A2A. LCOE, as a measure of economic competitiveness, does not account for differences between technologies that provide different levels of value to the grid, for example between firm generation (such as coal, nuclear, geothermal, most hydropower, and natural gas combined-cycle plants) and variable generation like wind and solar.

LCOE measures the cost of an average unit of electricity but does not measure the value of that electricity or of the plant that produced it. For example, electricity produced during a period of high demand is likely to be more valuable than electricity produced when demand is low, and facilities that can produce electricity when needed or can adjust production quickly offer support to the grid that those with less control over generation levels cannot provide. For this reason, LCOE of different resources can generally be compared most meaningfully as a measure of economic competitiveness when the resources being compared provide similar services to the grid. These measurements must be combined with other measures when comparing resources that have fundamentally different characteristics (for example, baseload, peaking, or variable) or provide fundamentally different grid services (for example, frequency regulation, reserves, or voltage support).

We provide a more detailed discussion in our report, *Levelized Costs of New Generation Resources in the Annual Energy Outlook 2021*, February 2021, https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf.

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Stephen Nalley

Q2B. Is it accurate to compare the LCOE for baseload units, such as nuclear, to the LCOE for intermittent generating sources, such as wind and solar? If so, why? If not, why not?

A2B. Comparing LCOE for units with fundamentally different characteristics, such as nuclear compared to wind or solar, without considering other sources of value the resources or units provide to the grid, falls short of proving the full picture of economic value.

Resources operating with different duty cycles (for example, baseload, load-following, peaking, diurnal solar-cycle, and weather-dependent wind pattern) provide different values to the grid. Therefore, I encourage you to make use of the value-to-cost ratio discussed in our report *Levelized Costs of New Generation Resources in the Annual Energy Outlook 2021* (February 2021, https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf) as a more meaningful approach to economic comparisons among technologies with fundamentally different duty cycles.

Q2C. What is the LCOE of solar energy at nighttime?

A2C. Solar plants without storage are offline at night. Because solar power is not generated at night, we cannot calculate a nighttime LCOE for solar power, but LCOE measures the average unit of generation over the lifetime of a plant, including periods when plants are offline, so lack of nighttime generation is factored into published LCOE values. In our *Annual Energy Outlook 2021*, we have estimated a $31.30 per megawatthour LCOE for a solar plant entering service in 2026 across all expected generation hours (a capacity-weighted estimate of the average in 2020 dollars, not including available tax credits). The addition of energy storage, such as batteries, may extend the ability of solar to generate into the night. As indicated in the answer below (Question 2F), EIA estimates the cost of a PV system plus a 4-hour battery at $45.13 per megawatt-hour for a plant entering service in 2026. Such a system is not necessarily designed to generate through the night, but to extend the effective generation window of a solar facility through evening peak demand hours.

Q2D. What is the LCOE of wind energy when the wind is not blowing?

A2D. Wind plants without storage are offline when the wind is not blowing. Because wind power is not generated when the wind is not blowing, we cannot calculate an LCOE for wind power when the wind is

not blowing, but LCOE measures the average unit of generation over the lifetime of a plant, including periods when plants are offline, so lack of generation when the wind is not blowing is factored into published LCOE values. In our *Annual Energy Outlook 2021*, we have estimated a $31.45 per megawatthour LCOE for an onshore wind plant entering service in 2026 across all expected generation hours (a capacity-weighted estimate of the average in 2020 dollars, not including available tax credits).

Q2E. What is the LCOE for wind energy plus storage?

A2E. We have not modeled a technology that combines wind energy and storage technology, and we do not have the information about the design and operation of such a facility needed to provide an estimate of its LCOE at this point. Because wind resources are less diurnally predictable than those of solar and because wind diurnal and seasonal output patterns differ greatly across the United States, we cannot generalize this combination of technologies for the country as a whole. The effort would require a detailed model of wind operations in specific regions of the U.S. electric grid.

Q2F. What is the LCOE of solar energy plus storage?

A2F. In our *Annual Energy Outlook 2021*, our estimate of the capacity-weighted average LCOE for solar PV generation with storage was $45.13 per megawatthour for a new plant entering into service in 2026 (in 2020 dollars and without the available tax subsidy). Our estimate assumed a typical plant configuration of a 150 megawatt (MW) PV unit sharing an inverter with a 50 MW, four-hour battery. We also assumed the system operation was set to shift a portion of the solar output to higher-value evening hours. Although this configuration reasonably reflects many plants entering service in recent years, other possible PV-battery configurations are available, with different cost and performance profiles.

Q3. For the purposes of the reliability of the electric grid(s), which is more valuable: an electron generated by an intermittent energy resource or an electron generated by a dispatchable energy resource?

A3. Electricity generated to meet demand in any given period has the same value regardless of the source. For reliability purposes, in order to meet reserve margin requirements, generating capacity that is fully dispatchable has greater value to the grid than generating capacity that is not fully dispatchable, regardless of whether that capacity actually generates electricity during a given period or not.

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Stephen Nalley

Q4A. How did imports of liquefied natural gas (LNG) into the U.S. compare with exports of LNG from the U.S. in 2018, 2019, 2020, and through the most recent data in 2021?

A4A. The United States exported more LNG than it imported for the first time in 2017. Since then, U.S. LNG exports have continued to grow annually, but imports have decreased. In 2020, the United States exported almost 50 times as much LNG as it imported. This disparity has continued to grow in 2021; during the first nine months of 2021, U.S. LNG exports averaged about 9.6 billion cubic feet per day (Bcf/d) while LNG imports have been negligible, averaging about 0.1 Bcf/d. For more information, please see EIA's most recent natural gas reports: https://www.eia.gov/naturalgas/reports.php#/T202.

Q4B. How did LNG imports to and exports from the U.S. relate to the production of natural gas in the U.S. for each of the same years?

A4B. LNG imports have reflected a declining share of the natural gas available in the United States, while LNG exports have accounted for a growing share of U.S. production. Over the last few years, LNG exports have increased as a share of U.S. dry natural gas production, rising from about 3.5% in 2018 to a little more than 7% in 2020 and to more than 10% thus far in 2021. Total LNG exports in 2021 through September already exceed the total for all of 2020. The ratio of LNG imports compared with U.S. dry natural gas production decreased in each successive year from 2018, when it was 0.25%, to 0.15% in 2020 and to 0.07% thus far in 2021. For more information, please see EIA's most recent natural gas reports: https://www.eia.gov/naturalgas/reports.php#/T202.

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Stephen Nalley

QUESTION FROM SENATOR MAZIE K. HIRONO

Q1. The FERC, NERC and Regional Entity Staff Report, "February 2021 Cold Weather Outages in Texas and the South Central United States," released on November 16, 2021, identified the share of outages and derates of generating units in Texas by fuel type as follows: natural gas (59%), wind (27%), coal (9%), solar (1%), nuclear (4 outages, rounding to 0%), and "other" (4%). Has the Energy Information Administration gathered any information on the February 2021 outages in Texas that would contradict those findings in the November 16 staff report or have other data suggesting that renewable power generating units were the primary cause of the outages in Texas?

A1. EIA has received no new information that contradicts the findings of the report nor any that provides additional insight into the primary cause of the outages in Texas.

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Stephen Nalley

QUESTIONS FROM SENATOR JOHN HOEVEN

Q1. In 2015, Congress and the President acted to lift the decades old ban on U.S. crude oil exports, and in 2018, the U.S. became the world's top oil producer. As the number two producer at the time, North Dakota's development of its abundant reserves of light sweet crude in the Bakken helped the U.S. surpass both Russia and Saudi Arabia in total crude production.

Do you agree that lifting the ban on U.S. crude exports has helped counter the market influence of our global energy competitors – namely Russia and OPEC?

A1. U.S. crude oil production and exports have been growing and taking market share from some OPEC countries since 2015. Most likely, U.S. crude oil production would not have grown as much during this period if the export ban had remained in place, and absorbing increased volumes of the type of crude oil that the United States produces would have required extensive investments in domestic refineries. OPEC members and Russia have reduced their production several times during this period to prevent global inventory increases and crude oil price volatility. Nonetheless, by holding spare capacity, OPEC members and Russia retain significant market influence regardless of the decision to lift the U.S. export ban.

Q2. North Dakota is an important agriculture state, and the cost of fuel directly impacts farmers. Recently, the Line 3 pipeline that crosses North Dakota was restored to full capacity, replacing an existing pipeline originally built in the 1960s.

If Line 3 had not been replaced and its design capacity restored, what would have happened to fuel prices, and what would have been the impact on rail traffic, particularly for farmers dependent on rail capacity to move their agriculture products to market?

A2. Line 3 entered service in early October, but we currently have crude oil by rail data only through September. Consequently, we have not yet assessed the effects on rail capacity or prices.

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Stephen Nalley

QUESTIONS FROM SENATOR JAMES LANKFORD

Q1. The administration has proposed a variety of emissions reduction targets, chief among them are:

- A net-zero electricity sector by 2035;
- A net-zero economy by 2050; and
- A 50-52 percent reduction in economy-wide emissions by 2030, as compared to 2005 levels.

Mr. Nalley, what would the impact of these policies be on consumer prices and the reliability of our electric system? Will EIA provide formal modeling of these proposals?

A1) We have not analyzed these proposed emissions reduction targets because the full range of associated policies have not yet been established. However, we are working on improving our models to better represent a fully decarbonized or net-zero carbon emission electric power sector or economy, including representing various policies that might work toward those goals.

Q2. In recent weeks and months, the Biden administration has called on the Organization of the Petroleum Exporting Countries and Russia to boost energy supplies to quell prices increases in the US. Mr. Nalley, provided that our policies send signals to industry that encourage additional production, does the US have sufficient oil reserves here at home to limit dependence on OPEC+ to meet demand and smooth price spikes over the long run?

A2. The United States is deeply involved in the international trade of oil and petroleum products. Because most U.S. refineries are configured to process heavier grades of crude oil than those produced domestically, our refining operations require imports. Although it might be possible to replace some imports of light and medium grade crude oils from OPEC and Russia, our refineries would have to make significant investments to eliminate the crude oil imports they commonly use. That said, the share of U.S. crude oil imports from OPEC and Russia declined from 50% in 2011 to 15% in 2020. Remaining sources of crude oil imports in 2020 were Canada (61%), Mexico (11%), and 20 other countries (13%). For more information, please see EIA's reporting on total U.S. imports of crude oil and other products: https://www.eia.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbbl_m.htm.

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Stephen Nalley

We have substantial oil resources in the United States, which have supported the doubling of domestic crude oil production between 2011 and 2020. Our latest report on U.S. crude oil reserves (with data through 2019) suggests we have proved reserves that are the equivalent of about seven years of current domestic refinery inputs. Proved reserves reflect current prices and technologies, and the resource base is much larger.

Q3. Mr. Nalley, I would like to follow-up on the discussion of natural gas and oil exports we had at the hearing. If we limited exports of either commodity, would you expect domestic production to increase, decrease, or stay the same? Put another way, does limiting export opportunities have any impact on domestic production levels?

A3. Some reduced natural gas exports could be placed in storage, but given their volume, any significant and extended reduction of net exports would result in reduced production. Through October this year, the United States produced 92.6 billion cubic feet per day (Bcf/d) of natural gas and consumed 80.5 Bcf/d, exporting 12.1 Bcf/d (net of imports).

Although some reductions in U.S. crude oil exports could be absorbed in Gulf Coast refineries, reductions in U.S. exports would result in reduced production. Through October this year, the United States exported 2.9 million barrels per day (MMb/d) and imported 6.0 MMb/d of oil. Most Gulf Coast refineries have been constructed to process large volumes of heavy crude oil and only limited amounts of light crude oil. U.S. exports largely consist of light crude oil while imports are largely heavy crude oil, of which the United States produces very little.

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Stephen Nalley

QUESTIONS FROM SENATOR MARK KELLY

Q1. Has EIA examined the policies implemented in Texas this year to protect energy infrastructure against extreme winter weather?

A1. EIA has not examined policies implemented in Texas nor potential infrastructure impacts from extreme weather in the state.

Q2. Does EIA have projections or studies on how gasoline prices might be impacted if refineries are knocked offline this winter due to an extreme weather like the freeze event that occurred in Texas in February?

A2. We have not developed any analysis of how gasoline prices might be affected if Texas refineries are disrupted this winter due to extreme weather, as occurred in February. Given current high gasoline prices and low gasoline inventories across the country, even short periods of severe weather could potentially affect gasoline markets. In the event of another weather-related supply disruption, the extent and duration of the outage, supply options such as inventories and imports, and crude oil prices would all influence gasoline prices.

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Stephen Nalley

QUESTIONS FROM SENATOR JOHN HICKENLOOPER

Q1. EIA forecasts, and you testified, that the most likely outcome of this energy crunch is a return to more normal conditions, as supply catches up with still somewhat pandemic-suppressed demand. As we transition towards a clean energy future, are there any steps we can take to ensure we have an energy delivery system capable of responding more rapidly to demand changes? Can you discuss the role of different resources or technologies in creating a more rapidly responding energy system?

A1. The U.S. energy system has already shown a great deal of resilience during the pandemic. The complex combination of different resources and technologies (including electric power supply from a diverse and responsive portfolio, liquid fuels and natural gas that can draw from storage and trade options, and industrial fuel-switching, energy storage, grid-interactive efficient buildings, and other energy management options) all support a rapidly responding energy system. Market information provided through prices and policies, investment, capital additions, system operations and consumer behavior all contribute to the technological innovations needed to maintain and increase the resilience of our energy system.

Q2. The best policies not only help us prevent potential crises like those we see today, but also improve the day-to-day running of our energy system. To that end, can you provide some examples of technologies or investments which, if they were in place today, would not only have helped alleviate the current energy crunch we face, but could help lower energy costs and greenhouse gas emissions?

A2. In electric power, examples include technologies or investments that enhance grid operational flexibility and the ability to increase intermittent renewable resources. In transportation, examples include fueling or charging infrastructure to allow consumers greater flexibility and confidence in choosing new vehicles. Investments that can reduce daily and seasonal swings in demand would include insulation and energy efficient equipment in homes and businesses. There are many technologies that could perform this function, and this is not an exhaustive list.

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Tim Gould

Questions from Chairman Joe Manchin III

Questions: Energy efficiency is not only a key solution for addressing climate change, but it is also central to the stability of our energy markets. The more productive we can be with our energy use, the smaller the swings between periods of low energy demand and high energy demand will be. Not only would this make our energy demand more predictable and reliable, but it would also mitigate the wild fluctuations in the price of oil, natural gas, and electricity that we are seeing today.

a. Given the clear value that energy efficiency offers, why have we seen such a slow growth, and even decreases in some cases, in energy efficiency investments?

b. How can we re-frame energy efficiency beyond just a tried and true way to save energy and money, but also as a tool to improve energy resilience and moderate energy price volatility?

Answers:

a. Energy efficiency is widely called the "first fuel" due to the positive contribution it can make to sustainable development and economic performance, as well as energy system stability.

In general, there are a few reasons why effective energy efficiency measures are not being deployed to the extent that would be expected from their well-known benefits. These include:

i) Information barriers: where the purchasers of capital equipment and services may not have access to all the information required to make informed choices about more efficient technologies and choices on the market.

ii) Financial barriers and market failures: these occur when purchasers may not have the financial resources to purchase higher efficiency equipment with higher upfront costs. In other words, purchasers may base investment decisions on options that have lower upfront capital costs rather than examining lifecycle costs, where upfront costs are repaid through lower operating costs.

iii) Misaligned incentives and behavioral barriers: there can be split incentives when the actor that makes a purchasing decision is different to those incurring the operating costs. For example, in housing, the property owner or landlord may purchase the housing and its installed equipment, while the tenant pays the energy bills.

Effective government policy – covering regulation, information and incentives – can be employed to successfully overcome many of these barriers. The IEA works with governments around the world to identify best practices, share experiences and support better policy making in this area.

b. Apart from reductions in energy consumption, energy costs and carbon emissions, energy efficiency delivers many other benefits, including in terms of energy resilience, macroeconomics, health and

competitiveness. Emphasizing these benefits in terms of enhancing peoples' economic well-being and quality of life is a key way to demonstrate the value of energy efficiency. The IEA works to quantify these impacts to support the case for energy efficiency action, and will publish major new analysis on this topic in 2022.

An important advantage of energy efficiency-related policies is that they can lower the peak demand for energy / electricity, keeping demand fluctuations low and thereby reducing the amount of investment needed for network expansion and upgrading. Energy efficiency, particularly in technologies that can reduce demand spikes, can fulfil this goal at a fraction of the cost of network expansion. Digitalization technologies on a network level – like demand response, peak shaving or frequency and voltage regulation – can further enhance system stability. In economic and social terms, energy efficiency can lead to higher productivity, increased competitiveness, job creation, and stronger GDP growth.

Questions from Ranking Member John Barrasso

Question 1: In your testimony, you note that the largest spikes in electricity prices during Europe's recent energy crisis have been associated with natural gas, not renewable energy resources. Over the longer term (e.g., from 2005 to 2020), IEA data show that the price for electricity paid by households in France Germany, Italy, Spain, and the United Kingdom (which have very different fuel mixes for electricity generation) have increased (in real terms) about 30% to 70%. Over the same period, the average price in the United States has increased about 5%. During this period, natural gas prices in Europe generally declined. Thus, natural gas prices do not explain the rising trend in electricity rates. Have energy and tax policies been significant contributing factors to the rising trends in electricity prices in France Germany, Italy, Spain, and the United Kingdom since 2005?

Answer:

As the question notes, IEA data show that the price for electricity paid by households in France, Germany, Italy, Spain and the United Kingdom has increased over the period from 2005-2020 by at least 30% in real terms, while the rise in the United States has been much smaller, at around 5%. In our view, changes in natural gas prices play a part in explaining the regional differentials. In the early 2000s, natural gas prices in the United States were generally slightly higher than in Europe, but this changed with the shale revolution. From 2008 onwards, average annual natural gas prices in the United States have typically been well under half of those in Europe.

Energy and tax policies have also played a part, although the precise causes for the increases in household energy prices cannot easily be determined due to the mix of production, transmission and distribution costs, as well as various taxes and levies. One exception is in Germany, where the costs of subsidies for renewable energies are an explicit price component called the "EEG surcharge", and so trends over time are more visible. When introduced in 2000, Germany's EEG surcharge was 0.19 ct/kWh (all prices in Euro cents), and this had risen to 6.5 ct/kWh in 2021. The surcharge rose noticeably in the early years after its introduction but has been quite stable in recent years (a 4% rise

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Tim Gould

between 2014 and 2021), despite an increase in the renewables share in Germany from 27% to 44% over this period. A reason for this stabilisation is that the costs of renewables like wind and solar PV have fallen dramatically; a significant part of the EEG payments result from high subsidy commitments from early phases of the support scheme. The EEG surcharge in 2022 has already been announced and it is set to fall by more than 40% to 3.7 ct/kWh. This is related mainly to the rise in wholesale electricity prices, which provide higher revenues for electricity produced from renewables and reduce considerably the need for additional financial support. The last time the EEG surcharge was below 4 ct/kWh was in 2012.

Question 2: IEA data show that industries in the United States typically pay far less for natural gas, electricity, fuel oil, and coal than most of their OECD counterparts.

a. In general, does affordable energy give U.S. industries a comparative advantage?

b. Is it true that some companies operating within energy-intensive sectors in Europe have shifted investments and production to countries overseas with more affordable energy, including the United States?

Answer:

When prices rise, different heavy industrial sectors often express concern about the impact on their margins, and thus on their competitiveness. This is particularly the case for those sectors that are more reliant on natural gas or electricity, such as the chemical industry, aluminum or secondary steel production. Such concerns can be exacerbated in sectors exposed to international trade if price differentials across regions grow. The IEA's World Energy Outlook has explored this issue on many occasions in its analysis, notably in examining the impact of the shale revolution on US industrial competitiveness in its 2013 edition.

Some European industrial associations have expressed publicly their concerns over higher energy and carbon costs. The European chemical industry, for example, supports the European Green Deal and Europe's ambition to become carbon neutral by 2050. It also notes that "today, energy costs in the EU are often higher than in other industrialised regions. Higher European carbon costs will inevitably erode margins and hinder the industry's ability to provide a sufficient return on investments in the long term. This would make non-EU countries a more attractive place to invest and, consequently, impact adversely on jobs and growth prospects in Europe."[1]

We have seen some examples of curtailed or paused industrial production in Europe as a result of the recent high energy prices in 2021, including firms such as Arcelor Mittal[2], CF Industries[3] and

[1] https://cefic.org/policy-matters/climate-change-and-energy/eu-carbon-market-and-ets-link-tbc/
[2] https://www.ft.com/content/65081acd-8382-42eb-a246-8a20871ed889
[3] https://www.bloomberg.com/news/articles/2021-09-15/soaring-european-gas-prices-force-fertilizer-plants-to-shutter

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Tim Gould

> Ameropa[4]. This has been observed in other regions as well, including China.[5] Some global industry players have been shifting their production loads from European or Asia-based facilities to those in the United States or Australia where natural gas prices in particular are more attractive (e.g. Yara[6]). This phenomenon has not, for the moment, clearly translated into physical relocation of plants but has more often been limited to a rebalancing of production loads across international production portfolios.

Question 3: Are you aware of any studies showing that U.S. exports of crude oil since 2015 have contributed to rising gasoline prices in the United States? If so, please provide links or citations to each.

Answer:

> We are not aware of any studies showing that US exports of crude oil since 2015 have contributed to rising gasoline prices in the United States.

Question 4: On October 14, 2021, the *Wall Street Journal* published an article by Jinjoo Lee, titled, "This Oil and Gas Roadmap Could Lead Planners Astray." It discusses IEA's World Energy Outlook (WEO) and explains that:

> the IEA's report last year stopped including a forecast for a "current policies scenario," which excludes goals that governments have announced but aren't enforcing. The agency had said back in 2020 that this was because it is "difficult to imagine this 'business-as-usual' approach prevailing in today's circumstances." That is troubling on a number of levels, but mainly because it rules out a real possibility that governments might not meet those targets…The risk is that the IEA's forecast becomes more of a wish list than a clear-eyed look. That becomes a problem if its forecasts are used by governments and companies to judge how much investment must still be made in fossil fuels to ensure a smooth transition. Bob McNally, founder of energy consulting firm Rapidan Energy Group, argues that a premature peak consensus wouldn't only be wrong but also dangerous.

The U.S. Department of Energy's Energy Information Administration and most other forecasters include such a reference case in their own analogous projections.

a. What is your response to the concerns that IEA's forecast becomes "more of a wish list than a clear-eyed look" and "dangerous"?

b. I respectfully request that IEA resume conducting a Current Policies scenario in the next WEO and subsequent WEOs. Would IEA do so? If not, please explain in detail: (1) why including a Current Policies scenario is inappropriate; and (2) how IEA's decision not to conduct a Current Policies scenario is consistent with its mission to promote energy security and affordability?

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[4] https://www.euractiv.com/section/politics/short_news/romanias-largest-fertiliser-producer-halts-production-over-gas-prices/
[5] https://www.reuters.com/business/energy/what-does-chinas-power-policy-shift-mean-metal-makers-other-energy-hogs-2021-10-13/
[6] https://www.reuters.com/business/energy/yara-brings-ammonia-europe-after-gas-price-hike-ceo-says-2021-09-20/

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Tim Gould

Answers:

a. The overarching aim of the World Energy Outlook is to deepen our understanding of the future of energy. It does this by constructing scenarios that explore the implications of different policy choices, investment trends and technology dynamics. Different scenarios allow us to explore the consequences of different courses of action or inaction and the opportunities and risks that lie ahead. One of the scenarios, the Stated Policies Scenario (STEPS), reflects a detailed bottom-up assessment of today's policy settings in different sectors. Aspirational energy and climate targets are only met in this scenario insofar as they are backed up by detailed measures for their realization, an approach that is taken to keep this scenario grounded in day-to-day policy realities. As a result (contrary to the assertion in the Wall Street Journal article), most long-term targets announced by governments are not met in this scenario.

b. We continuously revise and revisit the scenarios that are included in the WEO to address the most pressing and pertinent questions facing policy makers and other stakeholders. For example, the WEO 2020 introduced the Delayed Recovery Scenario (DRS), in which there are continued impacts on the economy arising from a prolonged public health crisis from Covid-19. Another example is in the WEO 2021, which introduced the Announced Pledges Scenario to examine where all today's announced energy and climate commitments would take the energy sector, if they were all to be implemented in full and on time.

   The Current Policies Scenario was last examined in detail in the WEO 2019. It was not included in the WEO 2020 or in WEO 2021, as the key underlying assumption – that there would be no changes in policies beyond those already fixed in existing legislation and regulation – was difficult to envisage against a changing backdrop of the Covid-19 pandemic and the evolving global response to climate change. In today's circumstances, the Stated Policies Scenario is designed as a way to take a detailed and dispassionate look at the state of play in energy policy-making. As noted above, it takes into account long-term energy and climate targets only to the extent that they are backed up by specific policies and announced measures. In our latest World Energy Outlook, the projections in this scenario show a degree of continuity with current trends, i.e. global oil demand remains above 100 million barrels per day in 2050; global natural gas demand rises above 5 000 billion cubic meters by mid-century, some 30% higher than today.

Question 5: If growth in demand for crude oil fails to decouple from Gross Domestic Product, as IEA's most frequently cited "STEPS" scenario assumes, and instead grows closer to rates assumed in IEA's 2019 Current Policies scenario, what are the likely impacts on crude oil prices later this decade relative to IEA's current projection?

Answer:

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Tim Gould

The links between growth in demand for crude oil have been loosened considerably in recent years; the amount of oil consumed per unit of economic output has been steadily declining over recent decades, at a faster pace than the decrease in total energy intensity, a finding that holds true for different parts of the global economy. This trend continues in all our scenarios.

In the 2019 Current Policies Scenario, which was published prior to the start of the global pandemic, global oil demand was projected to grow to 2040 at a compound annual average growth rate of around 1% per year. This compares with 0.4% in the Stated Policies Scenario from the same year (the annual average growth rate to 2040 in the WEO-2021 Stated Policies Scenario is higher, at 0.8%, because 2020 was an abnormal base year).

Higher demand in the Current Policies Scenario requires a higher oil price to keep demand and supply in equilibrium. The oil price in 2030 in the Stated Policies Scenario from WEO-2019 is $88/barrel (in $2018); in the Current Policies Scenario it is $111/barrel.

Question 6: On May 18, 2021, the press broadly interpreted IEA's *2050 NetZero Roadmap* as calling for a ban on investment in new upstream oil and gas exploration and production. Press headlines that day included:

- "End new oil, gas and coal funding to reach net zero, says IEA," by Nina Chestney, *Reuters*;
- "Stop New Oil Investments to Hit Net-Zero Emissions, IEA Says," by David Hodari, *Wall Street Journal*; and
- "To reach climate goals, new oil and gas investment must be stopped, energy agency says," by Stanley Reed, *New York Times*.

In your testimony, you state "the amount being invested today in upstream oil and gas is half of what it was seven years ago, and is geared toward a world of stagnant or even falling demand for these fuels." You go on to say that: "This is one of the very few areas of energy sector investment that is *reasonably well aligned* with the levels described in the IEA's landmark Net Zero Emissions by 2050 Scenario" (emphasis added).

Does IEA favor or recommend government policies that ban, restrict, or discourage new private sector investment in upstream oil and gas exploration and production? If so, how is this position consistent with IEA's mission to promote energy security and affordability?

Answer:

Governments worldwide have in recent years increased their emissions reduction ambitions, and countries representing more than 80% of global CO_2 emissions have pledged to achieve net zero emissions. Our Net Zero by 2050 Roadmap (NZE) shows what would need to happen globally to translate commitments into reality and limit the rise in global average temperatures to 1.5 degrees Celsius above pre-industrial levels. It highlights that a huge increase in policy ambition is required alongside a massive boost in spending on clean energy technologies.

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Tim Gould

If such a surge in deployment of low emissions alternatives is secured, then the analysis indicates that "the rapid drop in oil and natural gas demand in the NZE means that no fossil fuel exploration is required and no new oil and natural gas fields are required beyond those that have already been approved for development." Investment in fossil fuels supply declines in line with lower demand for fossil fuels but does not cease in the NZE. Average annual upstream oil and gas investment between 2021 and 2030 is similar to the level in 2020.

Anticipating and mitigating potential impacts on energy supplies is a central to ensuring orderly clean energy transitions. In a world that tackles climate change, the fossil fuel industry will need to adapt investment to anticipate declining demand, taking into account the need to recover investments and avoid stranded assets. In the NZE, declines in fossil fuel demand mean it can be met with existing fields that are already in operation or that soon will be. But the fact that no new oil and natural gas fields are required in the IEA's energy sector pathway to net zero emissions by 2050 does not mean that limiting investment in new fields will lead to the energy transition outcomes in this pathway.

Questions from Senator Mazie K. Hirono

Question 1: Hawaii still depends on burning oil to generate most of its electricity, which is a big part of the reason why the residents of Hawaii face the highest power prices in the country. In 2008, the state of Hawaii and the Department of Energy set out the Hawaii Clean Energy Initiative to reduce the burden that dependence on oil places on the state's economy, among other reasons. Hawaii is making progress on the initiative, with over 35 percent renewable power in the state and a target of 100 percent renewable power by 2045. In your testimony, you noted that "solar projects now offer some of the lowest-cost electricity ever seen" and that wind power is a "similar success story." In your estimation, would increasing the amount of renewable power and storage have helped reduce the electricity prices increases currently facing consumers?

Answer: In IEA analysis, wind and solar PV are a very low cost option for expanding the supply of clean electricity across many regions and conditions. While we have not explicitly analyzed the power systems in Hawaii, we are confident that displacing oil with renewables would improve the affordability of electricity for consumers.

The levelized costs of electricity (LCOE) of solar PV has fallen by 85% on average globally over the past decade, and onshore wind power by more than half. At the same time, the offshore wind industry is rapidly developing, expanding beyond Europe, where its growth was fostered, to China and now the United States. For example, data for 2020 indicates a utility-scale solar PV project had an average LCOE of $50/MWh in the United States, and Hawaii enjoys good solar conditions. Combining a utility-scale solar PV project with battery storage systems would have a combined LCOE of $80/MWh or less (estimated for a 100 MW solar project with 20 MW/80 MWh battery system). For comparison, oil-fired generation has an LCOE in excess of $200/MWh when crude oil prices are $70 per barrel or above.

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Tim Gould

Looking ahead, after recovering from the short-term supply chain issues, the costs of renewable energy technologies and battery storage are set to fall further. In the Announced Pledges Scenario in the World Energy Outlook 2021, the LCOE of solar PV is projected to decline by 40% by 2030 in the United States and battery storage systems by 45% over the same period.

To fully assess the impacts on consumer electricity prices, total system costs must be considered, but the far lower costs of renewables than oil-fired generation provides a great opportunity to reduce consumer bills under normal conditions, as well as protecting consumers from any future oil price shocks.

Question 2: Energy price increases place the biggest financial burden on lower-income households. Drawing on your observations of the member countries of the International Energy Agency, what could policymakers in the United States do to help reduce the impact of price increases on the most vulnerable households?

Answer:

The measures that are available in the short term to governments to limit the impact of price increases on vulnerable households include temporary, targeted relief from some taxes or charges, various types of emergency income support, safeguards to avoid disconnections from the grid and potentially some temporary deferrals of bill payments. It is also important to address bottlenecks or anti-competitive behavior that may be affecting the operation of fuel markets. Whatever near-term measures are taken, they should be implemented in such a way that do not worsen the investment environment for low-carbon energy sources and technologies.

Over the medium and longer term, the exposure of lower-income households to fuel price volatility can be reduced by a suite of measures, including efforts to improve the energy efficiency of buildings and appliances, and to increase electrification of mobility and heating. Reaching this point requires policies that assist lower-income households with the additional upfront costs of efficiency improvements and low emissions equipment such as electric vehicles and heat pumps.

Questions from Senator James Lankford

Questions: For many years, the International Energy Agency published as part of their World Energy Outlook projections of demand for fuels like oil and coal based on current policies. In 2020, IEA replaced this current policies baseline with a stated policies baseline, which includes policies governments say they will adopt but have not necessarily yet implemented. IEA states that "policies assessed in the Stated Policies Scenario cover a broad spectrum. These include Nationally Determined Contributions under the Paris Agreement, but much more […]".

a. Mr. Gould, what makes IEA confident that the "current policies scenario" is so unlikely that there is no need to model it, even to have as a baseline against which to measure the impact of additional policies?

b. If the old "current policies scenario" ends up being a more accurate projection of future demand, would we need more investment in resources like oil and coal to meet that demand?

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Tim Gould

c. If investors and producers plan for lower demand in line with the new "stated policies scenario," but demand actually is at the old "current policies scenario" trend, would there be an energy supply shortage?

    1) If yes, how would this shortage impact consumer prices and global economic growth?

Answer:

a. We continuously revise and revisit the scenarios that are included in the WEO to address the most pressing and pertinent questions facing policy makers and other stakeholders. The Current Policies Scenario was last examined in detail in the WEO 2019. It was not included in the WEO 2020 and in WEO 2021 as the key underlying assumption – that there would be no changes in policies beyond those already fixed in existing legislation and regulation – was difficult to envisage against a changing backdrop of the Covid-19 pandemic and the evolving global response to climate change. In today's circumstances, the Stated Policies Scenario is designed as a way to take a detailed and dispassionate look at the state of play in energy policy-making. It takes into account long-term energy and climate targets only to the extent that they are backed up by specific policies and announced measures. In our latest World Energy Outlook, the projections in this scenario show a degree of continuity with current trends, i.e. global oil demand remains above 100 million barrels per day in 2050; annual global natural gas demand rises above 5 000 billion cubic meters by mid-century, some 30% higher than today.

b. The Stated Policies Scenario projects fairly robust growth in oil and natural gas demand to 2030, and a rise and subsequent decline in global coal demand, such that coal use in 2030 is at the level seen in 2020. If demand for fossil fuels is higher than projected in this scenario in 2030, then this would require additional investment, over and above the levels in the Stated Policies Scenario, in order to keep these markets in balance.

c. As noted, demand in the Stated Policies Scenario is higher in the near term for oil and natural gas, and flat for coal. The risk of under- or over-investment is ever-present in commodity markets. As we remarked in the most recent World Energy Outlook: "If the supply side moves away from oil or gas before the world's consumers do, then the world could face periods of market tightness and volatility. Alternatively, if companies misread the speed of change and over-invest, then these assets risk under-performing or becoming stranded."

Questions from Senator John Hickenlooper

Question 1: The IEA has called for policy makers to accelerate a clean transition, and pointed to carbon pricing in particular as a tool to make the market work toward that goal. Under what circumstances could nations continue to use fossil energy under modest carbon pricing regimes, while still efficiently lowering emissions across an economy?

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Questions for the Record Submitted to Mr. Tim Gould

Answer:

In our Net Zero Emissions by 2050 Scenario (NZE), there are large reductions in the use of fossil fuels, but their use does not fall to zero in 2050. For example, in 2050 in the NZE, more than 30% of global fossil fuel use – including 70% of oil use – is in applications where the fuels are not combusted and so do not result in any direct CO_2 emissions. Examples include use as chemical feedstocks and in lubricants, paraffin waxes and asphalt. A further half of fossil fuel use in 2050 is in plants equipped with carbon capture, utilization and storage (CCUS) technologies. This includes around 925 billion cubic meters of natural gas that is converted to hydrogen with CCUS, as well large quantities of coal and natural gas that are used with CCUS in the electricity and industrial sectors, mainly to extend the operations of young facilities and reduce stranded assets.

Question 2: The best policies not only help us prevent potential crises like those we see today, but also improve the day-to-day running of our energy system. To that end, can you provide some examples of technologies or investments which, if they were in place today, would not only have helped alleviate the current energy crunch we face, but could help lower energy costs and greenhouse gas emissions?

Answer:

Deployment of renewable technologies is often very cost-effective and naturally reduces exposure to the effects of fuel price volatility. Improvements in energy efficiency across transport, industry and buildings also provide a very effective way to improve the day-to-day running of the energy system while reducing emissions. Historical patterns show that efficiency measures have not attracted as much attention as they deserve. Initial policy support – covering regulation, information and incentives – is often needed to stimulate investment, but the savings accrue to firms and households, reducing short-term risks of energy insufficiency and income stress, and freeing up funds that can be reinvested to stimulate further economic activity and induce further job growth.

Clean energy technology innovation should also be a near-term priority. Without innovation, the transition to modern, clean and resilient energy systems would be at risk. Governments have a major role to play in supporting innovation, especially in areas that the private sector perceives as being too risky. Developing new technologies – such as advanced batteries, nuclear technologies, hydrogen and bioenergy – can help countries build domestic resilience by diversifying the energy mix, lower the cost of future energy supplies, and provide new business opportunities and jobs. In sectors where few scalable decarbonization options currently exist, such as heavy industry and long-distance transport, technology innovation has a vital role to play in helping to ensure that new clean energy technologies help countries reach emissions reduction goals.

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Question for the Record Submitted to Mr. Robert Bryce

December 22, 2021

Question from Senator Bill Cassidy

Question: During the hearing, one of my colleagues spoke of the leveled price of renewables, but he did not include the cost of the backup plants or other fossil fuel generation required since you cannot store electrons from wind or solar energy. If you include the cost of that required backup baseload power within the cost of renewable energy, what would be the cost of that renewable energy relative to natural gas?

Robert Bryce response:

The metric known as "levelized cost of electricity" is a commonly used, but highly flawed, way to think about the assets needed to operate the electric grid. As the Energy Information Administration explained in a February 2021 report, LCOE "refers to the estimates of the revenue required to build and operate a generator over a specified cost recovery period." It goes on to say that the LCOE and other similar metrics are "simplifications" of "modeled decisions" that do "not fully capture all the factors" needed to operate and manage our electric grid.

During the November 16, 2021, ENR hearing, Senator Heinrich showed a chart with LCOE for various types of generation and then declared wind and solar energy are the cheapest forms of new power generation. That claim has been made countless times by renewable-energy proponents, but it does not fully account for the cost of the dispatchable power assets (and natural gas generators, in particular) that must be available to provide electricity when weather-dependent renewables like wind and solar are not producing energy.

Now, to the question: if the required baseload power is included, what would the cost of renewable energy be relative to natural gas? The answer to that query is complex and depends on several factors, including whether or not the renewables in question are getting federal tax incentives, including the production tax credit or investment tax credit, which together will cost taxpayers more than $60 billion between now and 2029.

It is true that wind and solar generation may be cheaper than conventional generators during ideal weather conditions. But they are only cheaper if they are added to an existing, resilient

grid that can meet electricity demand 24 hours per day, every day of the year, including during extreme weather periods, and when the wind isn't blowing and sun isn't shining. Put short, not all electricity has equal value.

In addition, calculating the total cost of renewables compared to natural gas-fired generation depends on the type of dispatchable (or baseload) power source being used to offset the incurable intermittency of wind and solar. If batteries are to be used to offset wind and solar, the costs could be extraordinarily high.

In its February 2021 report on LCOE, the EIA estimated that battery storage in 2026 will cost about $120 per megawatt-hour. (MWh) (See Table 1.b). If you add that sum to the expected cost of onshore wind energy at roughly $37/MWh, the all-in cost of onshore wind backed up by batteries will be as much as $157/MWh. That sum is far higher than the projected cost of advanced nuclear (about $77/MWh), combined-cycle natural gas generation (about $37/MWh), or ultra-supercritical coal (about $73/MWh).

In that same February report, the EIA includes what it calls "hybrid" non-dispatchable technologies including an estimate of the cost of a solar system "coupled with a four-hour battery storage system." The EIA puts the LCOE of that system at about $48/MWh. That would make a hybrid system more expensive than combined-cycle gas, but less expensive than advanced nuclear or ultra-supercritical coal.

That said, it is imperative to remember that four hours of battery storage would be wholly inadequate during extreme weather events like Winter Storm Uri, which hammered Texas in mid-February. I speak about that event from personal experience.

At our home in central Austin, my wife, Lorin, and I were without power for 45 hours. A battery system with just four hours of storage would have been of little value during such a prolonged outage. The freezing temperatures and lack of solar (and wind) production in the ERCOT service territory during the winter storm lasted for nearly a week, not just a few hours. In addition, it is well known that batteries do not perform well during periods of extreme weather. Their performance degrades dramatically when the weather is very cold or very hot.

To be sure, batteries are not the only option. If wind or solar energy are backed up by combustion turbines, which according to the EIA have a LCOE of about $107/MWh, then the all-in costs of wind and solar electricity could increase by that same amount, or even more if the price of natural gas spikes, as it did in Texas, Oklahoma, and Kansas, during Winter Storm Uri.

U.S. Senate Committee on Energy and Natural Resources
November 16, 2021 Hearing
The Causes, Outlook, and Implications of Domestic and International Energy Price Trends
Question for the Record Submitted to Mr. Robert Bryce

In summary, LCOE dramatically understates the total cost of delivering electricity to consumers because it doesn't include all of the assets needed to operate and maintain a reliable electric grid. Second, it is abundantly clear that the all-in cost of renewable energy is significantly higher than the cost of using gas-fired generation alone. And finally, as discussed above, how much higher those electricity costs will be depends on the type of conventional generation, or electricity storage system, being used to back up the intermittent renewables.

Finally, I am compelled to reiterate my plea to the members of the Senate Energy and Natural Resources Committee to renew their efforts to enact policies that will make our electric grid more affordable, more reliable, and more resilient. As I testified on November 16, the number of blackouts per year in the United States has gone up nearly 13-fold since 2000. That decline in reliability is exacting a toll on the economy and consumers. The energy crisis now engulfing Europe proves beyond a shadow of a doubt that lavishing billions more in federal subsidies on weather-dependent renewables will not save consumers money. Instead, it will further fragilize our grid and make electricity less affordable and less reliable.

Please let me know if I may answer any further questions.

November 16, 2021

The Honorable Joe Manchin
Chairman
US Senate Committee on
Energy and Natural Resources
304 Dirksen Senate Building
Washington, DC 20510

The Honorable John Barrasso
Ranking Member
US Senate Committee on
Energy and Natural Resources
304 Dirksen Senate Building
Washington, DC 20510

Dear Chairman Manchin, Ranking Member Barrasso:

Thank you for holding a full Committee hearing today on domestic and international energy price trends. I am submitting this letter today on behalf of the American Exploration and Production Council (AXPC), representing the largest independent oil and natural gas exploration and production companies in the United States. We lead the world in the cleanest and safest onshore production of oil and gas, while supporting over 3.2 million jobs across the country, including over 39,000 in West Virginia and 37,000 in Wyoming.

Data from IHS Markit shows that US independents combine to produce about 83 percent of the nation's oil production and 90 percent of its natural gas and natural gas liquids (NGL) production.[1]

The oil and natural gas industry is one of the most thoroughly regulated industries in the US and we recognize the importance of regulations that balance the essential value of American oil and natural gas production with the global challenge of addressing climate change. As an industry, we have an irreplaceable role in developing and employing the technologies and innovative solutions that further our global climate goals, secure our longer-term energy future, and support our national security.

Today's hearing is timely, as much of the world is struggling with rising energy prices. Here at home, the Energy Information Administration (EIA) recently warned Americans that they should expect to pay more to heat their homes this winter—saying that households that use natural gas for heating and will see their bills jump by 30 percent, and those that use propane or heating oil will see increases of 43 percent and 54 percent, respectively. Gasoline prices are 42 percent higher than they were a year ago, and signs of inflation are seen throughout our economy.[2] Meanwhile, in some parts of Europe, misguided energy policies have resulted in price spikes up to five-fold higher from just a year ago.

As demand for oil and gas continues to increase around the world, government policies can either help or hurt—they can alleviate price spikes, or they can worsen them. Unfortunately, many policies being considered by Congress and the Administration today are poorly designed and will exacerbate the problem.

[1] "The Economic Contribution of Independent Operators in the United States" (May 2019) HIS Markit, for IPAA
https://www.ipaa.org/new-study-independent-oil-gas-operators-drive-american-energy-development-by-wide-margin/
[2] Associated Press, "From cars to gasoline, surging prices match a 13-year high" by: Christopher Rugaber, Oct. 13 2021:
https://apnews.com/article/business-consumer-prices-inflation-prices-e80c0c24a6ec5ca1c977eccd6294d01b

Shutting down pipelines, restricting development of oil and natural gas on federal lands, calls for punitive new energy taxes, and costly, duplicative regulations on our industry will not improve our climate – but they will drive up costs for American families and businesses.

Congress can help alleviate Americans' rising energy prices, however, by championing policies that support domestic production.

However, two specific policies that are currently under consideration by Congress today will restrict supply and increase costs, thereby further driving up costs: the so-called methane fee and policies that will reduce production on federal lands.

Methane Tax/New Natural Gas Taxes

AXPC companies are focused on reducing methane emissions from their operations and support effective and reasonable regulation of methane that balances the essential value of US oil and natural gas production with the global challenge of addressing climate change.

The historic reductions in US greenhouse gas emissions over the last decade have been driven by technological advances and the emergence of US natural gas production as a low-cost source of reliable energy. Methane emissions rates in America's largest energy producing regions have continued to decline, even as production increased.[3] And, the Marcellus and Utica Shales in the Appalachian Basin is one of the lowest carbon-intensive and methane-intensive basins in the world.[4]

Through programs like The Environmental Partnership and numerous pilot projects with academia and eNGOs, industry invests significant resources in testing and deploying cutting-edge technologies to detect and reduce methane emissions. These technologies, deployed at scale, are essential to long-term, meaningful emissions reductions in a cost-effective manner.

It is important that regulatory policy enables us to build on that success. **Rather than incentivizing investments in emerging technologies to accelerate emissions reductions, the proposed methane tax would have the reverse effect of hampering investment in breakthrough technologies.** A punitive tax on American producers will also make US LNG less competitive in the global market, to the detriment of efforts to export US LNG to less energy rich countries around the world looking to natural gas to support their climate efforts and provide reliable, low-cost energy to their citizens.

This punitive methane fee amounts to a production tax on America's oil and natural gas industry that would hurt supply of natural gas and could cost the American people over $9 billion and about 90,000 jobs across the country. The jobs lost due to the higher cost of natural gas are not just those in our industry. Natural gas is the largest source of electricity in this country. Thus a tax on natural gas means higher priced electricity and industrial fuels. That means less competitive US manufacturing, which impacts millions of American workers and customers. This would be bad in any economy – but especially one currently experiencing record high inflation rates.

[3] 2021 Annual Report of The Environmental Partnership: https://www.api.org/-/media/Files/Policy/Environment/TEP/2021/The-Environmental-Partnership-2021-Annual-Report.pdf

[4] EQT ESG Report Calendar Year 2020, "Empowering Evolution" https://esg.eqt.com/content/EQT_2020_ESG_Report.pdf

Higher energy costs act as a regressive tax on American families and businesses. The most vulnerable Americans will suffer the largest burden of this policy. One-third of Americans already have trouble paying their energy bills, adding a new tax on natural gas would only make those burdens larger. An analysis by the American Gas Association (AGA) shows that this proposed tax would increase natural gas bills at least 12 percent – maybe even up to 34 percent.[5] This could be on top of the double-digit increase predicted by EIA.[6]

This new natural gas tax also conflicts with President Biden's promise not to raise taxes on Americans making less than $400,000.

In addition to these wide-spread negative effects of the proposed methane fee on American jobs and energy bills, the legislation is constructed in a way that penalizes the industry. Because the legislation relies on flawed, biased formulas, many operators who operate nationally below a 0.2 percent methane intensity will pay this punitive tax. AXPC members, on average, operate nationally at below 0.2 percent methane intensities but would wind up paying hundreds of millions annually under this tax. EPA recently proposed new regulation to address methane emissions which, by its own estimate, will cost industry $13 billion a year in compliance costs and would reduce emissions by 74 percent. Compliance with existing and forthcoming regulations would not prevent producers from facing this new tax. Even producers going above and beyond current and future compliance minimums will find themselves subject to millions of dollars simply because of the way the fee is assessed. In reality, the double hit on capital spend from implementing the two simultaneous approaches will only make it harder for companies to quickly come into compliance with what are significantly costly requirements and already frustrated worldwide supply chain disruptions.

Royalty, Rental and Fee Increases for New Production on Federal Lands

Energy produced on federal lands and waters is critical to America's energy security, accounting for 20 percent of all oil and natural gas produced here.[7] **The myriad of punitive federal leasing policies in the reconciliation bill will lead to less production on federal lands (less supply), which will hurt our energy security and be yet another upward pressure on Americans' energy prices.**

Collectively, AXPC member companies provide billions annually in revenues generated from oil and natural gas development of federal lands. Many AXPC members also operate on tribal lands and have valued, working relationships with tribal nations. We are committed to working with local, state, tribal, and federal governments to responsibly produce the Nation's natural resources, and care deeply about protecting cultural resources and the environment.

Oil and natural gas production on federal lands also supports hundreds of thousands of American jobs and provides Americans with lower household energy costs.[8] A recent study conducted by OnLocation indicates that an indefinite or long-term development pause on federal lands policy would result in an elimination of nearly one million American jobs by the year 2022.[9]

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[5] INGG Release, "Natural Gas Associations Urge Congress to Withdraw New Tax on Natural Gas from Budget Reconciliation" October 26, 2021: https://www.ingaa.org/News/PressReleases/39051.aspx

[6] "US Heating bills set to surge as energy costs jump," BBC News, October 15, 2021 https://www.bbc.com/news/business-58930277

[7] [7] OnLocation,Inc., "The Consequences of a Leasing and Development Ban on Federal Lands and Waters" https://www.api.org/news-policy-and-issues/exploration-and-production/federal-leasing-and-development-ban-study

[8] "Consumer Expenditures--2019." US Bureau of Labor Statistics, September 9, 2020. https://www.bls.gov/news.release/cesan.nr0.htm

[9] OnLocation,Inc., "The Consequences of a Leasing and Development Ban on Federal Lands and Waters" https://www.api.org/news-policy-and-issues/exploration-and-production/federal-leasing-and-development-ban-study

Additionally, the oil and natural gas industry voluntarily contributes millions of dollars to conservation efforts. And, the Great American Outdoors Act, which is the largest public lands conservation bill signed into law in 50 years, is exclusively funded by revenue from federal oil and natural gas.

Notably, the Great American Outdoors Act included:

- The Land and Water Conservation Fund (LWCF) Permanent Funding Act to fully and permanently fund public lands conservation nationwide – which provides $900 million annually into the LCWF, providing critical conservation without the need for appropriations from Congress; and

- The National Parks and Public Land Legacy Restoration Fund, which creates a new fund for national park and public lands restoration of up to $1.9 billion annually for five years ($9.5 billion total) from onshore energy revenues including oil and natural gas, coal, and renewables. Revenues from this fund go to the National Park Service, the United States Forest Service, the Fish and Wildlife Service, the Bureau of Land Management (BLM), and to Bureau of Indian Education schools.

Producing oil and natural gas on federal lands is a lengthy and complicated process, with multiple levels of analysis, public involvement, capital investment, federal and state review, and legal challenges. We believe that enormous benefits can result from continued oil and natural gas development on federal lands, as both our nation and the world will continue to need reliable, affordable energy for decades to come. **Federal lands provisions in the reconciliation bill are extremely problematic for our industry, our workers, and our nation's ability to remain energy secure.**

The federal lands provisions in reconciliation negatively impact existing leases and dramatically increases the cost, risk and business uncertainty associated with developing federal minerals. The current text of the reconciliation bill inappropriately impacts existing leases, includes many duplicative fees, increased fees and rates, problematic language and duplicative requirements.

If these provisions pass in reconciliation, they will create conflicting statutes and lead to a host of litigation and liability *for* the government and the American taxpayer. For example, new bonding requirements – which impacts both existing and new leases –would force companies to provide assurance for activities that are not even required. And, for idle wells, reconciliation text creates a second, conflicting BLM definition and imposes excessive and duplicative financial assurance. It is merely a punitive, unnecessary waste of capital and could run the risk of exhausting the bond market and result in litigation and delays.

The text unreasonably cuts in half, the primary term for leases, from 10 years down to five, a statistically unrealistic timeframe for operators to be able to get through NEPA review and associated legal challenges, permitting, and reach first production. And, the proposed NEPA rules are expected to lengthen the already multi-year process even further. Reducing lease terms for existing leases would also result in major breach of contract issues and potential takings concerns.

The bill also hurts environmental progress by adding methane royalties that disincentivize gas capture and beneficial reuse that other policies, like the new rules in New Mexico, are expressly intended to encourage. In addition to causing lawsuits, it could also lead to more flaring or emissions where gas capture is discouraged. Further, **the bill eliminates the US Secretary of the Interior's authority to protect taxpayers' interest by placing leases in suspension when production is inhibited due to conservation concerns or severe market downturns.**

By increasing the cost and risk associated with developing on federal land, reconciliation will result in significantly less development on federal lands – which will result in significantly less revenue for local and state economies, especially in the west, which is highly dependent upon responsible federal development.

In 2019 alone, DOI reported that it disbursed close to $12 billion dollars from energy production on federal lands to the federal government and states.[10] In New Mexico, which accounts for 57 percent of federal onshore oil production and 31 percent of onshore natural gas production, 30 percent of the state's budget is funded by oil and gas development, much of which is attributable to federal lands development.[11]

Reconciliation provisions that harm the competitiveness of federal leases include:

- A 60 percent increase in onshore minimum royalty rates – from 12.5 percent to 18.75 percent
- New severance fee (at least $0.50 per BOE of production), which is duplicative of royalties
- New Conservation Fee - $4/acre on producing leases (undefined and duplicative of rentals)
- New Speculative Leasing Fee - $6/acre on nonproducing leases (duplicative of bonus bids)
- New expression of Interest Fee for lease bids of $15 per acre (duplicative of administrative fees)
- 500 percent increase in Minimum Bids for leases - from $2/acre to $10/acre
- Roughly doubles the existing lease rental rates operators are required to pay
- Bonding provisions and additional, duplicative bonding for idle wells
- Inspection Fee for Federal Leases, Communitization Agreements, and Units
- Idle Well Fees for well developing Federal Leases

<u>The bottom line is:</u> less production on federal lands will mean less production domestically, which will further drive up energy costs for American families and businesses.

Over the last decade, while costs for most household goods have skyrocketed, American's energy costs have stayed historically low and stable due to the American energy revolution—while reducing emissions more than any country in the world. Domestic energy production supports good paying jobs, low and stable energy costs, greater national security *and* climate progress.

Thank you for your leadership on energy and environmental issues in a way that supports low and stable energy costs, protects American jobs, our economy, and our energy security, while retaining our global climate leadership. We hope this hearing will highlight the impact these flawed policies will have on American families and businesses. This country has the resources to meet the challenge of rising energy cost, and we stand ready solve this challenge.

Respectfully,

Anne Bradbury
CEO
American Exploration and Production Council

[10] US Department of the Interior, "Natural Resources Revenue Data" https://revenuedata.doi.gov/querydata/?dataType=Disbursements
[11] Adrian Hedden, Collapse of Oil Industry in New Mexico Could Last Years, THE JOURNAL, Nov. 27, 2020, available at https://thejournal.com/articles/194050