

**THE STATUS OF THE STRATEGIC PETROLEUM
RESERVE AND RELATED ENERGY SECURITY ISSUES**

HEARING
BEFORE THE
COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE
ONE HUNDRED SIXTEENTH CONGRESS
FIRST SESSION

OCTOBER 17, 2019



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THE STATUS OF THE STRATEGIC PETROLEUM RESERVE AND RELATED ENERGY SECURITY ISSUES

THURSDAY, OCTOBER 17, 2019

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

The Committee met, pursuant to notice, at 10:35 a.m. in Room SD-366, Dirksen Senate Office Building, Hon. Lisa Murkowski, Chairman of the Committee, presiding.

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

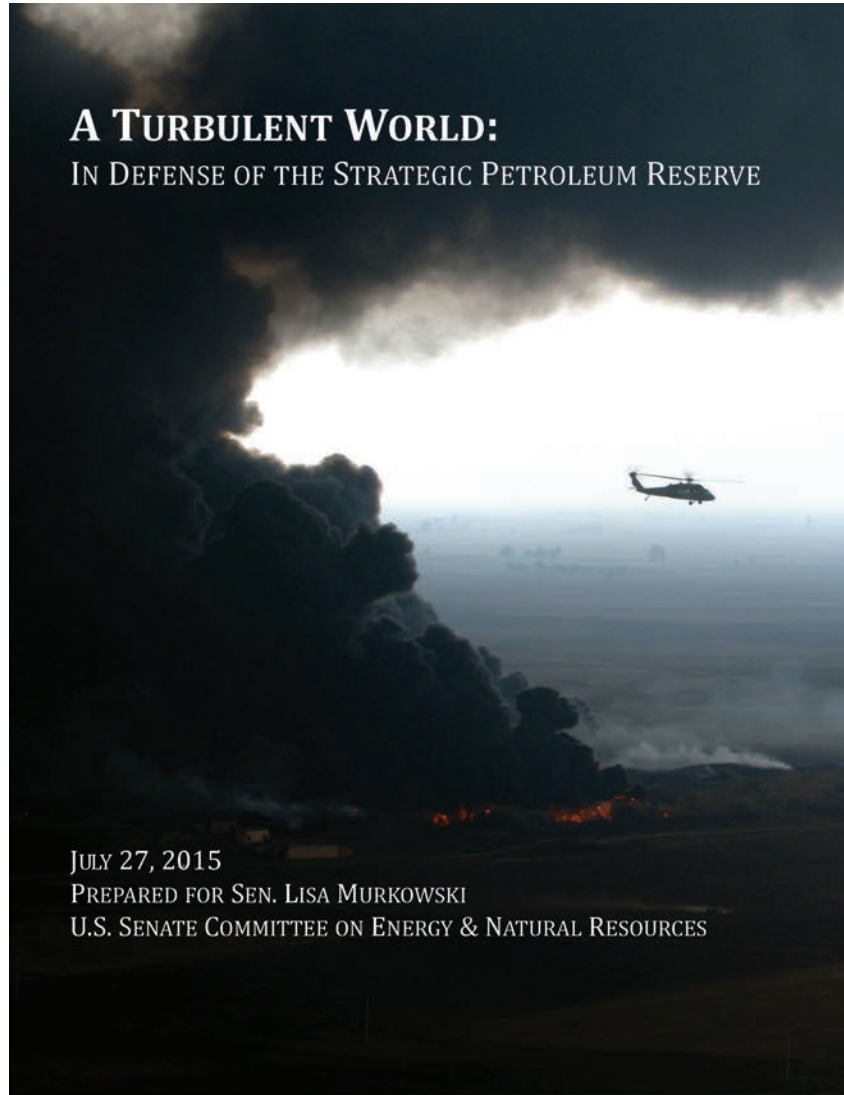
The CHAIRMAN. Good morning, everyone. The Committee will come to order.

We are meeting this morning to examine the status of the Strategic Petroleum Reserve. We call it the SPRO, or the SPR. I call it the SPRO.

We recognize around this Committee, certainly Senator Cantwell when she was Ranking on the Committee, we have had many, many conversations about the significance, the importance of the SPRO. We use a lot of terminology about not using this as an ATM or the piggy bank or the cash mechanism for so many other initiatives. But it seems that we are in a never-ending place trying to educate people about the Strategic Petroleum Reserve. We are going to continue that education process this morning as we speak about its importance to our national energy security.

The SPRO is a vital national asset. In a pair of staff reports that we released back in 2015—I argued that it must be maintained in case of supply disruptions and the economic shockwaves that can follow. We entitled one, “A Turbulent World: In Defense of the Strategic Petroleum Reserve.” This was prepared for the Committee July 27th, of 2015.

[A copy of the 7/27/2015 report referred to follows:]



A TURBULENT WORLD:

IN DEFENSE OF THE STRATEGIC PETROLEUM RESERVE

JULY 27, 2015

PREPARED FOR SEN. LISA MURKOWSKI

U.S. SENATE COMMITTEE ON ENERGY & NATURAL RESOURCES

A Turbulent World: In Defense of the Strategic Petroleum Reserve

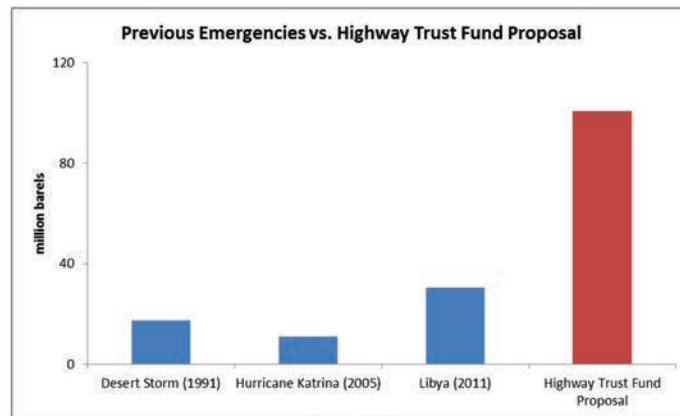
Prepared by Majority Staff for Chairman Lisa Murkowski
U.S. Senate Committee on Energy & Natural Resources
July 27, 2015

Introduction

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

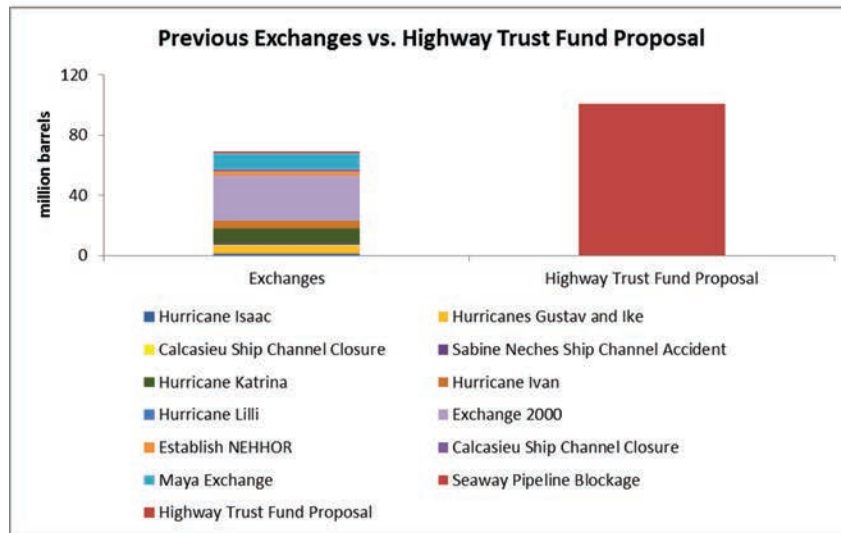
Scope

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

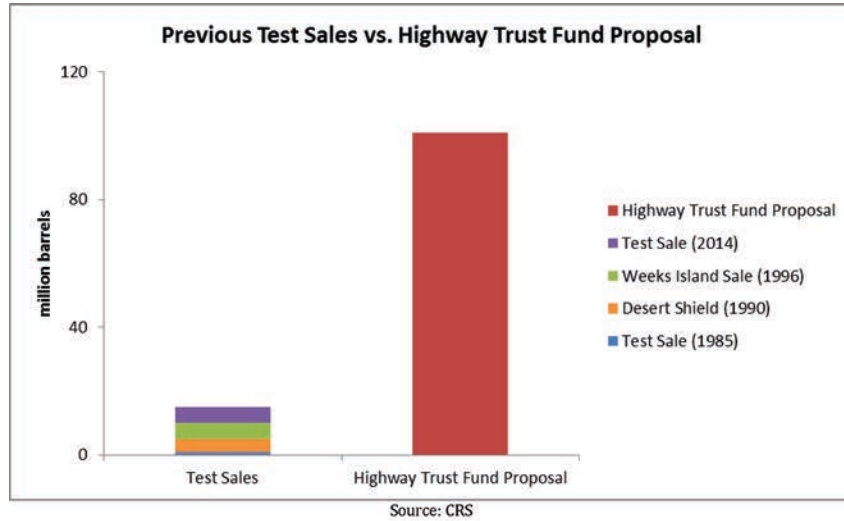


¹ Historical drawdown statistics are drawn from Congressional Research Service, *The Strategic Petroleum Reserve: Authorization, Operation, and Drawdown Policy* (August 27, 2013).

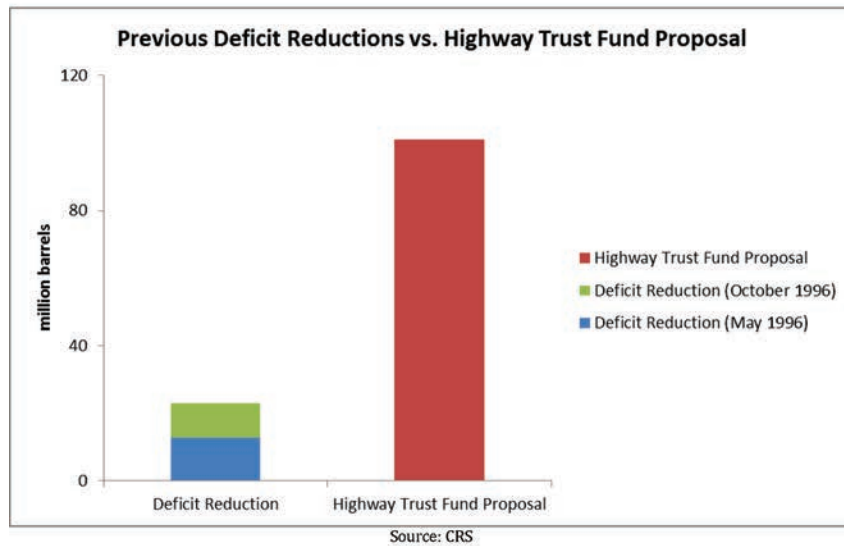
In addition to the presidentially-directed drawdowns, there have also been 12 exchanges of SPR crude oil for a variety of reasons. These have included the creation of new product reserves, as well as responses to natural disasters and other accidents. The combined total of all these exchanges was 68.9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



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



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

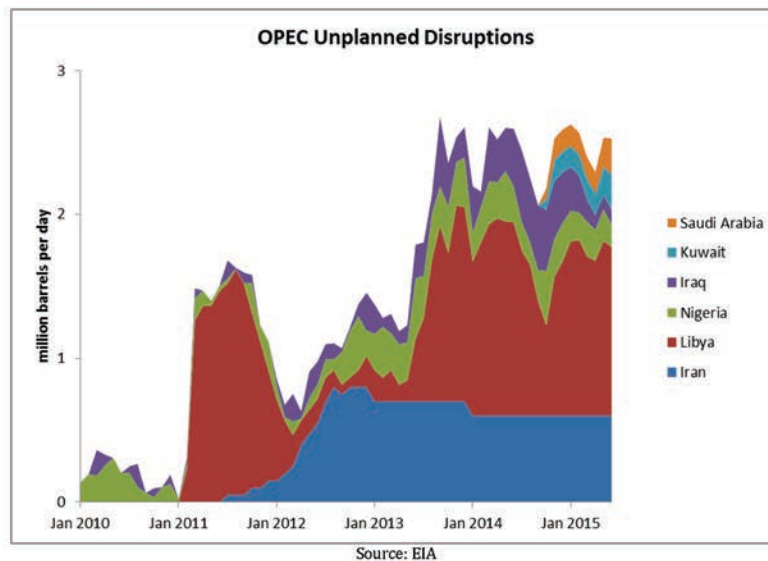


In short, the federal government has drawn down the Strategic Petroleum Reserve numerous times over the past three decades for a total of 166 million barrels. A sale of 101 million barrels would be unprecedented in both its duration and volume.

Threats to Global Oil Production and Distribution

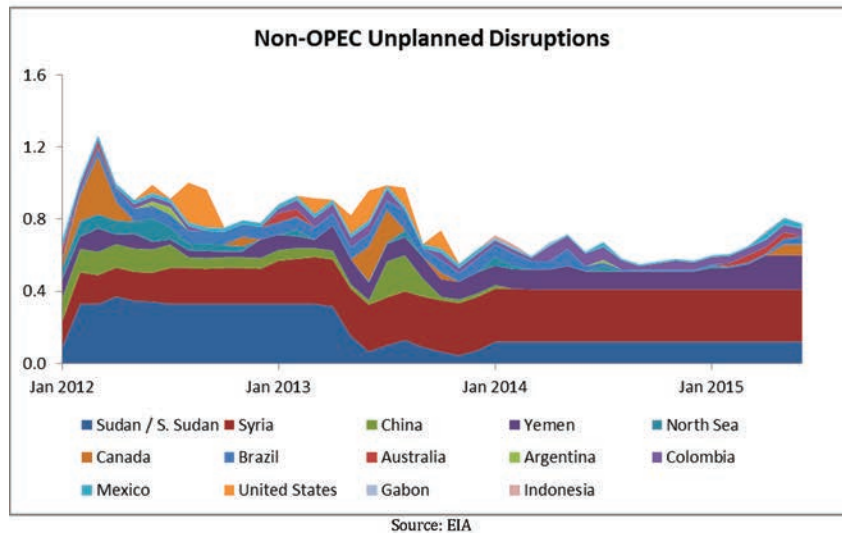
The United States is virtually unique among all members of the International Energy Agency in fulfilling its emergency stockpile requirement through government-controlled reserves. (See Appendix B.) The maximum notional drawdown rate of SPR is approximately 4.4 million barrels per day. The SPR would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

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

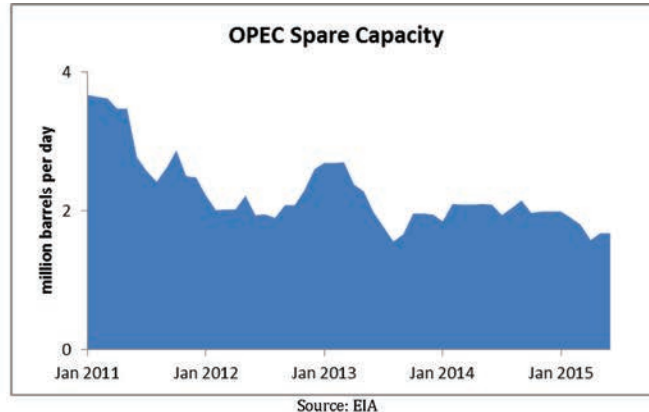


² All unplanned disruption and OPEC spare capacity statistics are drawn from EIA, *Short-Term Energy Outlook* (July 7, 2015): http://www.eia.gov/forecasts/steo/pdf/steo_full.pdf.

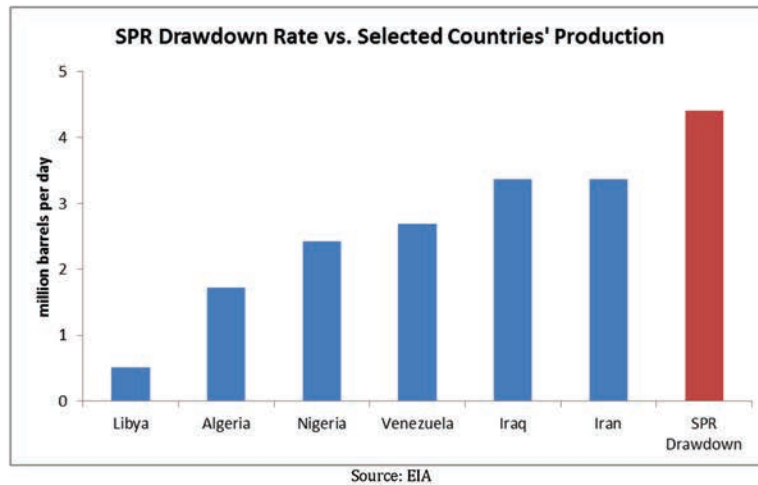
In addition to the outages among OPEC countries, many countries that are not members of OPEC are also experiencing unplanned supply disruptions. These include Yemen and Syria, for example, which are engulfed in civil war. These levels are hovering just under 1 million barrels per day.



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

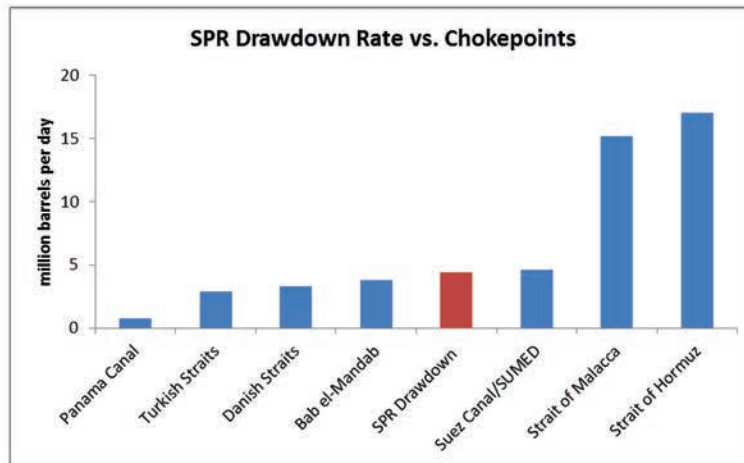


Another measure of assessing the SPR drawdown rate is to compare it to the daily production of selected countries. A capacity of 4.4 million barrels per day is higher than the production levels of several key nations, such as Iran, Iraq, Venezuela, Nigeria, Algeria, and Libya. The Strategic Petroleum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



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

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



Source: EIA

Conclusion

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

Acknowledgments

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

⁴ Chokepoint statistics are drawn from EIA, *World Oil Transit Chokepoints* (November 10, 2014):

http://www.eia.gov/beta/international/analysis_includes/special_topics/World_Oil_Transit_Chokepoints/wotc.pdf.

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



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APPENDIX A:
CRS Memo Re: 2014 Test Sale

MEMORANDUM

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

From: Anthony Andrews, Specialist in Energy Policy

Subject: Strategic Petroleum Reserve Test Sale 2014

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

Legislative Authority

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

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

Test Sale Timeline

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

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

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

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

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

Source: DOE SPR Test Sale 2014 Report to Congress

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

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

Lessons Learned

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

Drawdown Process:

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

Sales Procedure:

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

- bidders generally require at least 5 business days to formulate their bids and acquire the necessary financial instruments (letters of credit and guarantees) to support their bids.
- **Payment Delays**
 - payment method used for the test sale did not lead to quicker payment of invoices
 - the Standard Sales Provision (SSP) payment clause stipulating payment due by the 20th of the month following delivery should remain in effect for future drawdowns.
- **Notice of Sale**
 - information on shipping terminal, points of contact, and certain technical details was not current (and was updated)
 - automated clearing house payment option is no longer acceptable (and was removed)
 - information on FEDWIRE payment method was not current (and was updated)
 - information on the Jones Act was not current (and was updated).
- **SPR Oil Valuation Model**
 - accuracy of valuing the SPR crude oil streams was validated

SPR Office Conclusions

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

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

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

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

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

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

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

Other Considerations

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

One factor had changed since the 2011 sale, however. In 2013, DOE awarded the Fluor Federal Petroleum Operations, LLC² a management and operating contract valued at \$1.46 billion to run the SPR for a period of 5 years, with an option for an additional 5 years based on performance.³ The change in the management contract would have been sufficient rationale for conducting a test sale as a training and readiness exercise.

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

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

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

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

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

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

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



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APPENDIX B:
CRS Memo Re: IEA Stocks

MEMORANDUM

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

From: Robert Pirog, Specialist in Energy Economics

Subject: International Energy Agency Stock Requirements¹

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

Stockholding Structure

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

Industry Stocks

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

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

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

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

Government Stocks

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

Agency Stocks

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

IEA Member Structures

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

Table 1. IEA Stockholding Structures, 2014

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

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

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

The CHAIRMAN. It was important back then, and four years later it is still relevant.

I think we recognize that you don't give up your health insurance policy when you are healthy. We should not give up on the SPRO just because we are producing more oil right now. In fact, I believe the SPRO, the most important strategic energy stockpile in the world, is critical to our American energy dominance.

Global energy markets are what I would call "systemically volatile." And just to kind of put that in context with a couple examples, and I will be quick here, but over the past century, we all know here in this country, we all know about OPEC, the Organization for Petroleum Exporting Countries. It is the quintessential cartel, and its mission is to benefit its members by controlling prices. "OPEC Plus," the cartel's loose alliance with Russia and several other oil-producing countries, is the same story, just with an expanded cast.

Second, volatility predominates from Venezuela to Libya and beyond. In every SPRO "war game," the worst-case scenario has always been a violent shock to the Persian Gulf. Of course, the recent attacks on Saudi Arabian oil processing facilities, recurring incidents involving oil tankers, and persistent concerns about the Strait of Hormuz all foreshadow that potential nightmare.

At a minimum, the activities of "OPEC Plus" and continued strife overseas will ensure that global energy markets remain systemically volatile. And as long as that condition exists, I believe that we need to have a robust and a functional strategic reserve.

The fact that we did not need to tap the SPRO after the Saudi outage does not in any way discount the value of having that as an option. We had that in reserve, and I think that that was critical. It could have been much worse. Indeed, it could very well have been economically cataclysmic.

Just under a third of the SPRO is mandated for sale over the next ten years, a period that I have deemed "the decade of draw-down." We may have over 600 million barrels in reserve today, but over 200 million are scheduled for sale.

A small portion will be sold to enhance our energy security by modernizing the SPRO itself. That is something that Senator Cantwell and I worked on together to make sure that not only do we have the Strategic Petroleum Reserve but that we have a functioning reserve. As that modernization continues, this Committee continues to conduct rigorous oversight.

But using SPRO as an ATM for purposes completely unrelated to energy, let alone energy security, is something else entirely.

So I want to end my comments and thank the panel for being here. I will make introductions after Senator Manchin's opening statement.

I appreciate the fact that all of you have come to the Committee this morning to provide us your thoughts and your expertise.

Senator Manchin.

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

Senator MANCHIN. Well, thank you, Chairman Murkowski, for holding this hearing today.

I want to thank all of you for coming. It is quite an illustrious panel here with a lot of knowledge, and we are anxious for you to share it with us.

Again, I will call it SPRO also, which has played an important role in energy security since the 1970s. The September attack on a major Aramco oil infrastructure in Saudi Arabia certainly makes this a timely discussion. I went to see the attack firsthand. I was there about three weeks ago. And it was an unbelievable, precise, knowledgeable attack that was meant to take out the entire system.

But because of the quick actions and the training that they continually enforce and instill into every one of their employees, even their weekend employees, a young, 22-year-old male basically saved the plant because of the quick actions. If not, we could have seen worldwide disruption, economic, the likes that we have not seen for a long time.

So we are very pleased with that—the attack only cut off 5 percent of the global supply of crude oil and caused a 14 percent price spike when the markets opened, but it could have been much worse. That diminished immediately. They are back to 100 percent, as I am understanding. We watched and saw the quick work that was going on 24/7, around the clock.

In fact, while the U.S. does import crude oil from Saudi Arabia, these volumes are only a little over 10 percent of our import total. In addition to our domestic oil production, we import almost 48 percent of our crude oil, which, I think, very few Americans realize. Forty-eight percent of our oil is from Canada, our predominant import and export partner, as well as Mexico, Iraq, Venezuela and 38 other countries. In fact, in 2018 the U.S. exported 1.7 million barrels of crude oil to 42 countries thanks to Chair Murkowski's great work to lift that oil export ban that we had for so many years.

So we weren't necessarily at risk of being cut off from accessing oil stocks, but we weren't insulated from the attack's price effects either. This is where the Strategic Petroleum Reserve can provide value to protect our country and markets from the consequences of events like the one in Saudi Arabia.

While many things have changed since 1974 when the SPRO was created, I think it still plays a critical role because, at its heart, the Reserve serves a security purpose. But it is not a one-trick pony either. Congress has seen fit to use SPRO in a number of ways. In its four decades of operation, the SPRO has been utilized twice in response to emergency supply disruptions. Once during the 1990 Persian Gulf War and then again in response to export curtailment in Libya in 2011. More recently the Reserve capacity has been used for oil exchanges in response to domestic supply disruptions such as from hurricanes. It has also been used for budgetary tools, as the Chairman has mentioned, and far too many times on both sides of the aisle. The one time we did use it for energy purpose, in relation, was to ANWR. That was one we chose to do and it was used for that, and we can make those decisions later on if it is going to be energy-related.

The time is ripe for discussion about how to best utilize the SPRO going forward and how to maintain the core security role it plays in the most effective ways. I think they say we have the ca-

capacity, and I am sure you are going to talk on that, how much capacity, how much reserve, where we should be and it shouldn't be just dwindled away because we are trying to look for a pay-for, which we have done.

If we, as a Congress, decide to use SPRO sales as a budgetary tool, I think we have a responsibility, truly a responsibility, to ensure that we are conducting our purchases and sales of crude oil in the most fiscally prudent manner to ensure fairness to our taxpayers, but more importantly, to be transparent to the taxpayers of how we are using their reserves.

I also have concerns about when we buy high and sell low—it makes no sense to me whatsoever. Who makes those decisions? I have always felt that we were, the government was, the biggest patsy in the procurement process that I have ever seen in my life. And sitting on this Committee with my Chairman here, I am going to make sure that we do everything to prevent that from happening again, the way it has in the past.

As we stand today, the International Energy Program requires us to maintain reserves equivalent to 90 days of our net imports of crude oil and petroleum products the previous year. Right now, we are surpassing that partially as a result of declining net imports.

In fact, projections have indicated the United States could become a net petroleum exporter as soon as 2020. The oil and gas industry has experienced profound upstream growth in a short amount of time. This is coupled with less rapid, but still distinctive, changes in consumption patterns. All of this means that we have both an opportunity and a challenge before us which requires a close look at multiple factors to take into consideration, because changes will have broad societal impacts.

This Committee has responded to the rapid changes underway in the oil and gas and a larger energy sector before, and we continue to do that as we speak. With that at the front of our minds, I think we need to be purposeful and, indeed, strategic in determining the optimal size, configuration and use of petroleum reserve in the most efficient manner and in protection of our great country in the future.

Thank you, Madam Chair.

The CHAIRMAN. Thank you, Senator Manchin.

Let's go to our panel here this morning. Again, we appreciate you all being here.

The panel this morning will be led off by Dr. Linda Capuano. We have had you before the Committee many times. We welcome you back. Linda is the Administrator for the U.S. Energy Information Administration, EIA. Thank you for being here.

The Honorable Steven Winberg is with us as the Assistant Secretary for Fossil Energy at the Department of Energy (DOE). We appreciate you being here and your leadership over there at DOE.

Jason Bordoff, also familiar to this Committee, is the Founding Director for the Center on Global Energy Policy and a Professor of Professional Practice at Columbia University School of International and Public Affairs. Welcome.

Mr. Phillip Brown is a Specialist in Energy Policy at CRS, the Congressional Research Service, at the Library of Congress. We appreciate all the good work at the Library of Congress. Thank you.

Mr. Keisuke Sadamori is the Director for Energy Markets and Security at the International Energy Agency (IEA). We appreciate your comments here this morning.

Dr. Capuano, if you would like to lead us off with your comments?

We would ask folks to try to keep their remarks to about five minutes. Your full statements will be included as part of the record, and then we will have an opportunity for questions.

So, Administrator.

**STATEMENT OF HON. LINDA CAPUANO, ADMINISTRATOR,
U.S. ENERGY INFORMATION ADMINISTRATION, U.S. DEPARTMENT OF ENERGY**

Dr. CAPUANO. Thank you.

Chairman Murkowski, Ranking Member Manchin and members of the Committee, I appreciate the opportunity to provide testimony on the status of the Strategic Petroleum Reserve and related energy security issues. My discussion will include EIA's current view of the global oil market which is reflected in last week's update of our short-term Energy Outlook.

To summarize that view, although recent crude oil supply disruptions caused short-term price increases, slowing global economic growth continues to put downward pressure on oil prices which we expect will outweigh the concerns about supply stability.

On Saturday, September 14, 2019, crude oil and liquid fuels infrastructure was attacked in Saudi Arabia, causing damage to Saudi Aramco's Abqaiq processing facility and the Khurais oil field. The Abqaiq oil processing facility has a 7 million barrel-per-day capacity, which is about five percent of the world's crude oil and liquid fuels production capacity. The Khurais oil field produces about 1.2 million barrels per day of Arab Light crude oil. EIA estimates that Saudi Arabia's crude oil production averaged 9.9 million barrels per day in August and that it fell to 8.5 million barrels per day in September.

The attack caused an immediate disruption of about 5.7 million barrels per day of crude oil production, which is about six percent of the total global supply, and an additional 1.1 million barrels per day of non-crude liquids production. It also raised vulnerability concerns about Saudi Arabia's spare production capacity, which represents more than 85 percent of the world's spare capacity. Crude oil prices responded immediately to the magnitude and the location of the production outages. Increasing sharply on the first full day of trading following the attack, the Brent crude oil price rose more than \$7.00 per barrel to \$68.42 per barrel on September 16th, and the West Texas Intermediate crude oil price rose more than \$8.00 per barrel to \$63.10 per barrel. This was the largest single-day crude oil price increase in the past decade.

In general, planned and unplanned production outages happen for a variety of reasons and are usually offset by spare crude oil production capacity and oil inventories. The effectiveness of these two mitigating factors depends on the size of the outage and the

prevailing market conditions. These market conditions include possible changes in global supply growth patterns and economic outlook. Currently, spare crude oil production capacity is relatively constrained, but oil inventories are at relatively plentiful levels.

Before the outage, EIA expected global spare crude oil production capacity to average 2.2 million barrels per day in the fourth quarter of 2019. In our October Short-Term Energy Outlook, which included the recent Saudi Arabian outage, we estimated that global spare crude oil production capacity fell by 1 million barrels per day in September. The October outlook also forecasts global spare crude oil production capacity to average 1.6 million barrels per day in the fourth quarter of 2019. Historically, spare capacity at less than 2.5 million barrels per day would indicate a relatively tight oil market; however, our October forecast shows global supply growth outpacing demand growth, which makes the low surplus capacity less of a concern for the remainder of 2019.

Inventories can also act as a cushion for supply disruption. The United States has two types of crude oil inventories: those held by private firms for commercial purposes and those held by the Federal Government in the Strategic Petroleum Reserve. EIA data for the week of September 27th estimates the total U.S. commercial inventories were equivalent to 26 days of current U.S. refinery crude oil inputs and the Strategic Petroleum Reserve holds the volume equivalent of about 40 additional days, resulting in a total U.S. inventory of about 66 days of production.

Aside from U.S. data, the best available data measuring global oil inventories in the Organization for Economic Cooperation and Development data, OECD. Collectively, the OECD, which includes the United States, held about 2.9 million barrels of crude oil and other liquids in inventory as of the end of September, equivalent to about 61 days of supply. The total for all OECD current inventories was about one percent lower than the previous five-year average. Globally, crude oil stock data for countries that are not members of OECD are difficult to acquire with consistent timing and quality.

A few days after the September 14th attack, Saudi Aramco, Saudi Arabia's national oil company, announced about 2 million barrels per day of previously shut-in volumes had already been returned to production and that the remainder would be restored within weeks. Within days, industry sources reported that Saudi Arabia had restored crude oil exports to pre-attack level by augmenting a partial restoration of production with exports from storage and with volumes diverted from domestic refineries. In response, Brent and West Texas Intermediate crude oil prices fell to \$65.59 per barrel and \$59.26 per barrel, respectively, by September 17th. The price declines continued as it became clear the outage would last days instead of weeks or months. By September 30th, prices had fallen below the pre-disruption levels, averaging about \$61.00 per barrel for Brent and \$54.09 per barrel for West Texas Intermediate.

In our September Short-Term Energy Outlook, released before the outage in Saudi Arabia, we forecast Brent crude prices would average \$63.39 per barrel in 2019 and \$62.00 per barrel in 2020. In our September outlook, we expected the global supply would out-

pace global demand in both years, leading to average global inventory builds of 240,000 barrels per day in 2019 and 360,000 barrels per day in 2020. At the time, we also expected that declining OPEC oil production would be more than offset by rising non-OPEC production, led by the United States. In addition, our September forecast crude oil price declines reflected concerns about the global economy, and our global oil consumption growth forecast was only 0.9 million barrels per day in 2019, the lowest level in 2011.

I see that I'm running out of time, so I'll submit the rest of my comments and I will thank you for the opportunity to address the Committee.

[The prepared statement of Dr. Capuano follows:]

Statement of Linda Capuano
Administrator
U.S. Energy Information Administration
U.S. Department of Energy
Before the
Energy and Natural Resources Committee
United States Senate
October 17, 2019

Chairman Murkowski, Ranking Member Manchin, and Members of the Committee, I appreciate the opportunity to provide testimony on the status of the Strategic Petroleum Reserve and related energy security issues. My discussion will include EIA's current view of the global oil market, which is reflected in last week's update of our *Short-Term Energy Outlook*.

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On Saturday, September 14, 2019, crude oil and liquid fuels infrastructure was attacked in Saudi Arabia, causing damage to Saudi Aramco's Abqaiq oil processing facility and the Khurais oil field. The Abqaiq oil processing facility has a 7 million barrel-per-day capacity, which is about 5% of the world's crude oil and liquid fuels production capacity. The Khurais oil field produces about 1.2 million barrels per day of Arab Light crude oil. EIA estimates that Saudi Arabia's crude oil production averaged 9.9 million barrels per day in August 2019 and that it fell to 8.5 million barrels per day in September.

The attack caused an immediate disruption of about 5.7 million barrels per day of crude oil production, which is about 6% of total global supply, and an additional 1.1 million barrels per day of non-crude liquids production. It also raised vulnerability concerns about Saudi Arabia's spare production capacity, which represents more than 85% of the world's spare capacity. Crude oil prices responded immediately to the magnitude and location of the production outages. Increasing sharply on the first full day of trading following the attack, the Brent crude oil price rose more than \$7.00 per barrel to \$68.42 per barrel on September 16, and the West Texas Intermediate crude oil price rose more than \$8.00 per barrel to \$63.10 per barrel. This was the largest single-day crude oil price increase in the past decade.

In general, planned and unplanned production outages happen for a variety of reasons and are usually offset by spare crude oil production capacity and oil inventories. The effectiveness of these two mitigating factors depends on the size of the outage and the prevailing market conditions. These market conditions include possible changes in global supply growth patterns and the economic outlook, which would result in a different global demand growth forecast than we currently expect. Currently, spare crude oil production capacity is relatively constrained, but oil inventories are at relatively plentiful levels.

Before the outage, EIA expected global spare crude oil production capacity to average 2.2 million barrels per day in the fourth quarter of 2019. In our October *Short-Term Energy Outlook*, which included the recent Saudi Arabian outage, we estimated that global spare crude oil production capacity fell by 1 million barrels per day in September. The October outlook also forecasts global spare crude oil production capacity to average 1.6 million barrels per day in the fourth quarter of 2019. Historically, spare capacity at less than 2.5 million barrels per day would indicate a relatively tight global oil market;

however, our October forecast shows global supply growth outpacing demand growth, which makes the low surplus capacity less of a concern for the remainder of 2019.

Inventories can also act as a cushion for supply disruption. The United States has two types of crude oil inventories: those held by private firms for commercial purposes and those held by the federal government in the Strategic Petroleum Reserve. EIA data for the week of September 27 estimates the total U.S. commercial inventories were equivalent to 26 days of current U.S. refinery crude oil inputs and the Strategic Petroleum Reserve holds the volume equivalent of about 40 additional days, resulting in a total U.S. inventory of about 66 days of production.

Aside from U.S. data, the best available measure for global oil inventory is the Organization for Economic Cooperation and Development (OECD) data. Collectively, the OECD, which includes the United States, held about 2.9 billion barrels of crude oil and other liquids in inventory as of the end of September, equivalent to about 61 days of supply. The total for all OECD commercial inventories was about 1% lower than the previous five-year (2014-2018) average. Globally, crude oil stock data for countries that are not members of the OECD are difficult to acquire with consistent timing and quality.

A few days after the September 14 attack, Saudi Aramco, Saudi Arabia's national oil company, announced that about 2 million barrels per day of previously shut-in volumes had already returned to production and that the remainder would be restored within weeks. Within days, industry sources reported that Saudi Arabia had restored crude oil exports to pre-attack level by augmenting a partial restoration of production with exports from storage and with volumes diverted from domestic refineries. In response, Brent and West Texas Intermediate crude oil prices fell to \$65.59 per barrel and \$59.26 per barrel, respectively, by September 17. The price declines continued as it became clear the outage would last days instead of weeks or months. By September 30, prices had fallen below the pre-disruption levels, averaging about \$61.00 per barrel for Brent and \$54.09 per barrel for West Texas Intermediate.

In our September *Short-Term Energy Outlook*, released before the outage in Saudi Arabia, we forecast that Brent crude oil prices would average \$63.39 per barrel in 2019 and \$62.00 per barrel in 2020. In our September outlook, we expected that global supply would outpace global demand in both years, leading to average global oil inventory builds of 240,000 barrels per day in 2019 and 360,000 barrels per day in 2020. At the time, we also expected that declining OPEC oil production would be more than offset by rising non-OPEC production, led by the United States. In addition, our September forecast crude oil price declines reflected concerns about the global economy, and our global oil consumption growth forecast was only 0.9 million barrels per day in 2019, the lowest level since 2011.

The October update of our *Short-Term Energy Outlook*, released last week, shows a lower crude oil price forecast compared with the September outlook. We estimated that OPEC crude oil production fell from 29.8 million barrels per day in August to 28.2 million barrels per day in September, largely driven by the disruption in Saudi Arabia. Even before this latest outage, OPEC crude oil production was at a relatively low level, driven by declining production in Iran and Venezuela. We also recognized a higher level of risk for oil supply disruption than previously assumed. However, we also included lower global economic growth and the resulting lower liquid fuels demand growth in 2019 and in 2020 in the forecast. In effect, our view is that downward oil price pressure from slowing global economic growth will outweigh increased supply stability concerns in the coming months.

We forecast that OPEC spare production capacity will return to pre-attack levels of 2.1 million barrels per day by January 2020. Although the disruption was short-lived, lower spare crude oil production capacity does leave the global crude oil market more vulnerable to supply outages elsewhere. Should another supply outage occur before spare crude oil production capacity is restored, the market will rely on inventories to provide additional supply needed to meet demand, including commercial inventories, and potentially, government-held stocks.

Chairman Murkowski and Members of the Committee, thank you for the opportunity to present this information and this concludes my testimony.

Appendix

Figure 1. West Texas Intermediate crude oil price

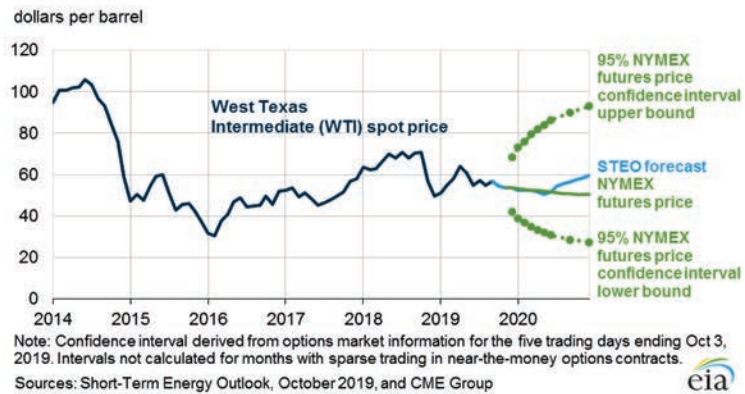


Figure 2. World liquid fuels production and consumption balance

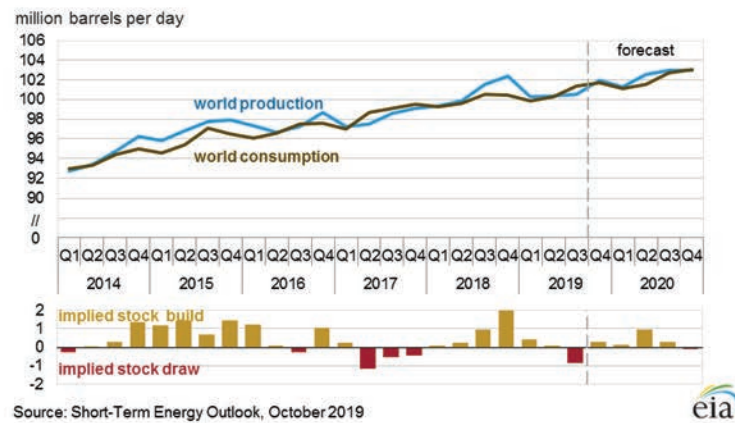
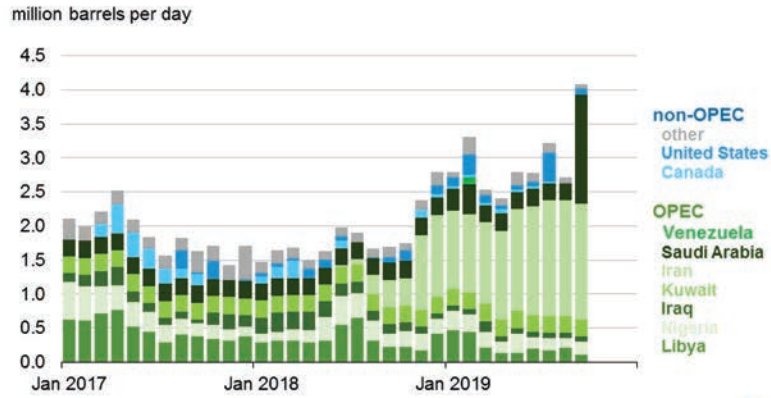


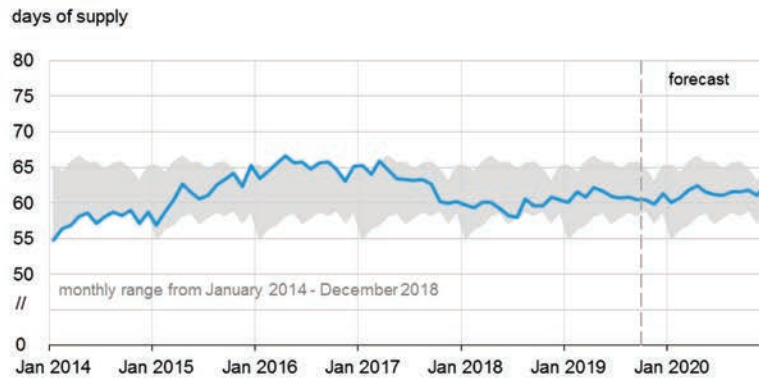
Figure 3. Estimated unplanned liquid fuels production outages



Source: Short-Term Energy Outlook, October 2019



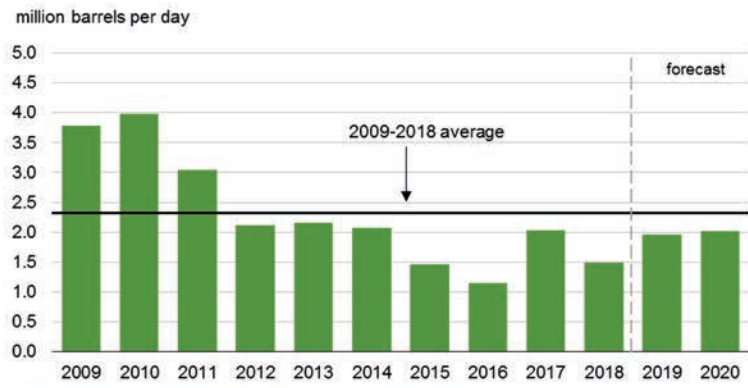
Figure 4. Organization for Economic Cooperation and Development (OECD) commercial inventories of crude oil and other liquids



Source: Short-Term Energy Outlook, October 2019



Figure 5. Organization of the Petroleum Exporting Countries (OPEC) surplus crude oil production capacity



Note: Black line represents 2009-2018 average (2.3 million barrels per day).

Source: Short-Term Energy Outlook, October 2019



The CHAIRMAN. Thank you, Administrator.
Assistant Secretary Winberg, welcome.

STATEMENT OF HON. STEVEN E. WINBERG, ASSISTANT SECRETARY FOR FOSSIL ENERGY, U.S. DEPARTMENT OF ENERGY

Mr. WINBERG. Thank you, Chairman Murkowski, Ranking Member Manchin and member of the Committee, Senator Cassidy.

I appreciate the opportunity to be here today with you to discuss the SPRO and related U.S. energy security matters. The mission of the SPRO is to protect the United States economy from severe petroleum supply interruptions through the acquisition, storage, distribution, and management of energy petroleum stocks.

With the Department's dedicated workforce, the SPRO stands ready to respond to a petroleum supply disruption if a release from the SPRO is ordered by the President or if a collective action is initiated by the International Energy Agency, to which the U.S. is a signatory member. And it's important to note that under an IEA collective action, that would also require the President's approval.

So, following recent attacks in Saudi Arabia, which temporarily reduced the world's supply of oil and caused a short-term price surge, when that happened, President Trump authorized, if needed, the use of oil from the Strategic Petroleum Reserve. In addition, within hours after the attack the SPRO leadership verified that all of the SPRO sites were drawdown ready. Further, the SPRO coordinated with oil refiners in the Gulf Coast to determine the impacts, if any, on their crude oil supply, and also made sure that these refiners understood the process for crude oil exchanges going into the future.

At this time, there has been no release from the SPRO in connection with the recent attacks in Saudi Arabia, nor is there expected to be; however, the attack did highlight the vulnerability of critical world energy resources, and points to further efforts to increase oil supply chain resiliency. The SPRO has played a leading role in this for the past 40 years. A major factor in the attack not having a profoundly negative impact on global oil supplies is that the U.S. oil production growth has recently and significantly contributed to high levels of global crude oil inventory.

And, with respect to the SPRO, if the United States had been or is called on to fill a supply gap left by the attack, the SPRO is well-positioned to play a key role in maintaining a stable global oil supply. The SPRO's 645 million barrels of oil and similar stockpiles in other nations is a disincentive to any actor looking to disrupt the world's supply of oil and is a moderating factor to keep prices for products such as gasoline, diesel fuel, and jet fuel from rising higher than they would otherwise in supply disruptions such as the recent attacks.

In addition to protecting the United States from severe petroleum supply disruptions, the SPRO enables the United States to carry out its treaty obligations under the International Energy Program as implemented by the IEA. In the event of an international oil supply disruption, significant enough for the President to authorize a release from the SPRO, U.S. domestic conventional and unconventional production alone would likely not be able to ramp

up quickly enough to make up for the lost barrels in a crisis. Thus, the SPRO maintains the ability to drawdown and deliver crude oil within 13 days of a Presidential finding to bridge the months it would take for domestic production to ramp up. The SPRO remains 100 percent drawdown ready if the President orders a release to protect the United States from petroleum supply disruptions or to fulfill our nation's IEA treaty commitments. The recent attacks in Saudi Arabia serve as a reminder of the importance of the SPRO as a national security asset.

Chairman Murkowski, the DOE deeply appreciates your commitment and the commitment of this Committee to the SPRO and its mission to protect the United States economy from severe petroleum supply interruptions through the acquisition of storage distribution and management of energy petroleum stocks. I appreciate the opportunity to be here before you today. I'm pleased to answer any questions you have.

And finally, I want to thank my wife, Anne, for joining me here this morning.

The CHAIRMAN. We welcome her.

[The prepared statement of Mr. Winberg follows:]

**Statement by Steven E. Winberg
Assistant Secretary for Fossil Energy
U.S. Department of Energy**

**Before the
Senate Committee on Energy and Natural Resources
Hearing on Energy Security and the Strategic Petroleum Reserve**

October 17, 2019

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

The mission of the SPR is to protect the United States economy from severe petroleum supply interruptions through the acquisition, storage, distribution, and management of emergency petroleum stocks. With the department's dedicated workforce, the SPR stands ready to respond to a petroleum supply disruption if a release from the SPR is ordered by the President and/or a collective action is initiated by the International Energy Agency (IEA), to which the US is a signatory member – which is also subject to Presidential approval.

Following recent attacks in Saudi Arabia, which temporarily reduced the world's supply of oil and caused a short-term price surge, President Trump authorized, if needed, the use of oil from the Strategic Petroleum Reserve (SPR) and SPR leadership validated that all of the SPR's sites remained drawdown ready. Further, the SPR coordinated with oil refiners in the Gulf Coast to determine the immediate impact, if any, on their crude oil supply, and to ensure they understood the process for crude oil exchanges. At this time, there has been no release from the SPR in connection with the recent attacks in Saudi Arabia, nor is there expected to be.

The attack highlighted the vulnerability of a critical world energy resource, and points to further efforts to increase oil supply chain resiliency. The SPR has played a leading role in this for the past 40 plus years. A major factor in the attack not having a profoundly negative impact on global oil supplies is U.S. oil production growth has recently contributed to high levels of global crude oil inventory. And, with respect to the SPR, if the United States had been or is called on to fill a supply gap left by the attack, the SPR is well positioned to play a key role in maintaining a stable global oil supply.

The SPR's 645 million barrels of crude oil—and similar stockpiles in other nations—is a disincentive to any actor looking to disrupt the world's supply of crude oil and is a moderating factor to keep prices for products such as gasoline, diesel fuel, and jet fuel from rising higher than they would otherwise in supply disruptions such as the recent attacks.

SPR Background

In addition to protecting the United States from severe petroleum supply disruptions, the SPR enables the United States to carry out its treaty obligations under the International Energy Program as implemented by the IEA.

Even in today's energy landscape, the SPR, established by the Energy Policy and Conservation Act of 1975 (EPCA), remains a national energy security asset. Since the 1975 establishment of the SPR, changes in U.S. and global oil markets have led to changes in the SPR operational environment. At the SPR's inception, U.S. crude oil production was in decline and the spot market for oil, which provides a global pricing mechanism, was in its infancy. Since then, U.S. oil production has increased dramatically, the United States has reduced its dependence on oil imports, and according to the U.S. Energy Information Administration (EIA), the United States is expected to become a net exporter of petroleum by 2020, thereby obviating the IEA stockholding commitments noted below. The IEA also projects the United States will lead the world in petroleum exports by 2024.

As a member of the IEA, the United States has two primary obligations:

1. First, as a net importer of oil, comprising crude oil, natural gas liquids and refined products, the United States must maintain oil stock inventories, whether held by industry or government, equal to at least 90 days of net oil imports. Of the 30 IEA member countries, 27 are net importers (including the United States) and have the same obligation. The remaining three members do not have a stockholding obligation because they are net oil exporters. According to the IEA, as of April 1, 2019, the United States held 379 days of net oil imports including both private and SPR stocks. However, by the end of 2020, the United States will likely no longer have this requirement by becoming a net petroleum exporter for a year.
2. Second, the United States must participate in an IEA collective action. This applies to all IEA member nations, including countries that are net petroleum exporters. An IEA member nation's contribution to an IEA collective action response is based on its final consumption during the most recent four quarters with a delay of one-quarter necessary to collect information. This obligation can be met by various measures a member nation may choose, including release of strategic or commercial stocks. According to the IEA, as of April 1, 2019, the U.S. share in an IEA collective action response is 41.9% of the barrels released. The U.S. government has relied on the SPR to meet this requirement, although commercial stocks may also contribute voluntarily.

In the event of an international oil supply disruption significant enough for the President to authorize a release from the SPR, U.S. domestic conventional and unconventional production alone would likely be unable to ramp up quickly enough to make up for the lost barrels in a crisis. Thus, the SPR maintains the ability to drawdown and deliver crude oil within thirteen days of a Presidential Finding, to bridge the months it would take for domestic production to ramp up.

SPR Drawdown Authorities

If the President determines a severe energy supply disruption exists, he may order the drawdown and sale of crude oil from the SPR, pursuant to Section 161 of EPCA.

- Drawdowns. If the President finds there exists a circumstance that “constitutes, or *is likely to become*, a domestic or international energy supply shortage of significant scope or duration” and “action taken....would assist directly and significantly in preventing or reducing the adverse impact of such shortage”, the Secretary can direct the SPR to drawdown and sell crude oil if there is no impairment to U.S. obligations under the IEP or national security. However, under this scenario, the release and drawdown is limited to less than 30 MMB, for no more than 60 days, and by statute there must remain at least 340 MMB at all times in the SPR. [Partial Drawdown Authority]
- Exchanges. Pursuant to Sections 159 and 160 of EPCA, the SPR may release oil to a producer or refiner in an Exchange. Under an Exchange, the producer or refiner would return to SPR the same quantity/quality of oil generally within 1-2 months, with a typical premium of 2.5%–3.0%. An exchange can be done within 48 hours after the Secretary of Energy approves the request as outlined in EPCA. Although there is no limit under EPCA on the number of barrels the SPR can exchange, SPR, as a source of last resort, limits exchanges to a reasonable supply to avoid being used by commercial firms for making additional profit outside of the normal free market system.

SPR Drawdown Practices

- Under an EPCA Section 161 directed drawdown, SPR crude oil is released to the highest qualified bidder(s) in a competitive sales process.
- Competitive Sales. Once directed by the President or Secretary to drawdown and sell crude oil, the SPR announces in a public Notice of Sale the amount and type of crude oil available, the release locations, and the timeline and procedures for submitting bids and taking delivery (if the bidder is successful). Once SPR receives and evaluates offers, it notifies apparent successful offerors, at which time the offerors submit their letters of credit and begin the process of scheduling deliveries.

○ *Typical Timeline for a Sale:*

<u>Day</u>	<u>Activity</u>
Day 1	Issue Notice of Sale
Day 5	Receive offers and bid guarantees
Day 7	Notify Apparent Successful Offerors (ASOs) Announce results to public
Day 8-13	Receive ASO performance guarantee, i.e., Letter of Credit (LOC)
Day 11-15	Award sale contracts
Day 13	Commence early deliveries, if requested
Day 15	Achieve maximum rate drawdown readiness
Day 30	Commence nominal delivery period and next sales cycle
20 th of the Month after Delivery	Funds submitted by Successful Offeror for delivered crude oil

- *Note:* The SPR recently conducted a congressionally-mandated sale of nearly 10 MMB of crude oil from three SPR sites (Big Hill, Bryan Mound, and West Hackberry). Deliveries began in early October and will be complete in late November.
- *Note:* Pursuant to Section 404 of the Bipartisan Budget Act of 2015, the SPR will conduct another crude oil sale in the second quarter of FY 2020. By law, that sale is constrained to a specific dollar amount for SPR facilities modernization, as opposed to a specific volume of crude oil. Section 501 of the Consolidated Appropriations Act of 2018 grants SPR the flexibility to sell an additional 5 MMB in FY 2020 (originally scheduled for, but not required to be sold, in FY 2021). SPR could expedite these sales to earlier in FY 2020 if conditions warrant.

Conclusion

The SPR remains 100 percent drawdown ready if the President orders a release to protect the United States from petroleum supply disruptions and to fulfill our Nation's IEA treaty commitments. The recent attacks in Saudi Arabia serve as a reminder of the importance of this national security asset. Chairman Murkowski, DOE appreciates your commitment to the SPR and its mission to protect the United States economy from severe petroleum supply interruptions through the acquisition, storage, distribution, and management of emergency petroleum stocks. I appreciate the opportunity to appear before you today and I am pleased to answer any questions the committee may have.

The CHAIRMAN. Thank you, we appreciate your testimony this morning.

Mr. Bordoff, welcome.

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

Mr. BORDOFF. Thank you. Good morning, Chairman Murkowski, Ranking Member Manchin and members of the Committee, thank you for the invitation to be here today.

I will summarize the longer written testimony that I've submitted for the record.

You'll hear a lot of agreement. I agree that the recent attack on key Saudi Arabian oil facilities serves as a reminder of America's continued vulnerability to global supply disruptions, even as we become far less dependent on imported oil. In that case, a confluence of factors both the state of the world oil market and the extraordinarily rapid, more rapidly than expected, recovery by Saudi Aramco, avoided a severe supply disruption this time. But next time we might not be so lucky. I think the attack revealed a vulnerability that the market didn't fully appreciate and obviously regional tensions continue to flare, and if another disruption were to happen, there's going to be a thinner buffer of spare capacity because Saudi Aramco is still in the process of undertaking repairs. The Abqaiq attack is important because we need to remember that any disruption that affects world oil prices hits Americans at the pump even if the U.S. is remarkably on the cusp of becoming a net oil exporter.

Despite the shale revolution, the U.S. is not energy independent. Even if we import no oil at all on a net basis, we are not energy independent. If by that we mean that we are still connected to a global integrated oil market and that means that a supply disruption anywhere causes prices to go up everywhere. That's why the requirement under the IEA agreement that you hold imports equal to 90 days of import cover, supply equal to 90 days of import cover was never the right metric in the first place. And don't forget that while the U.S. is about to achieve net zero oil imports, again, on a net basis that masks huge imports and exports including nearly a million barrels a day, still, of imports from the Gulf Arab region. So despite the shale boom and declining import dependence, the SPR remains a critical national security asset, in my view. But the risk against which it protects today is different than when it was created, when oil was not traded as a global commodity the way it is today.

Today the risk is not a physical inability to access barrels, but supply disruptions that cause oil prices to go up everywhere. And private companies don't bear the full social costs of those price spikes, so they lack adequate incentives to safeguard against them.

It's true that the shale boom helps with oil security by delivering huge new volumes of that, loosen markets and bring prices down by shaping market expectations of future abundance by forcing OPEC countries to cut production which actually creates a little bit

of a larger buffer of spare capacity and by reducing the macro-economic impacts, not the impacts at the pump, but the macro-economic impacts of price shocks because increased consumer spending flows to U.S. producers rather than overseas. But again, drivers still do get hurt at the pump, even though shale can be ramped up much more quickly than conventional supply. It's not spare capacity that can be brought to the market in a matter of weeks.

Some argue that the SPR is less needed because the oil age will end soon thanks to climate action and trends like electric vehicles. And I want to be very clear, we need to be acting much, much more urgently to deal with the threat of climate change. But even if we do that, oil demand is going to persist for some time and even if oil were to peak and start to decline sooner than people think, actually the SPR may be more needed not less because I think that process of transition would be one that's enormously uncertain, messy. It's going to send mixed signals to the market with potential periods of both overinvestment and underinvestment as investors, potentially, turn away from an industry they perceive to be in decline. So that could lead to more price volatility that actually turns the SPR into more of a tool to smooth a process of energy transition.

We shouldn't forget that the SPR, as useful as it is, is also just for short-term, temporary fixes. Our vulnerability to global oil price spikes is a reflection, again, not of how much we import, but how much we consume, so the best way to protect consumers and the economy from inevitable price spikes is to reduce how much oil we use in the first place and higher fuel economy standards are one smart and effective way to do that.

Let me start—let me conclude, rather, with just a word about SPR management. The SPR needs to be modernized, and I know that's been a priority for you, Madam Chairman, and others on the Committee. I think, frankly, that needs to happen faster. The nearly 6 million barrel a day disruption in Saudi Arabia brought into sharp relief the concerns that exist right now among observers about whether the SPR could actually get to the purported release rate of 4.4 million barrels a day. And then beyond modernization, the SPR also needs continued strategic review. To date, I think, that has focused too much on the optimal size. The size today, honestly, is a reflection as much of political compromise as it is any sort of precise analysis and the optimal size is determined not just by cost benefit analysis but by judgments than by how large an insurance policy we want to take out. So the SPR, you could say, is either way too big or way too small depending on what we want it to do. So I think a strategic review needs to look, not just at the optimal size but think more about the SPR's rational, purpose, composition and the theory of use we have for it given how things have changed.

People can reach different conclusions about that, of course, but what I hope we can all agree on, as the Chairman has said, is that making the decision to sell the SPR to fill short-term budget holes, is not wise. In my view, given the uncertainties and the risks, the burden of proof should be on those who want to sell off a strategic

asset we've held for nearly half a century before we decide to go down that road.

Thank you, members of the Committee, for inviting me here today, and I look forward to answering any questions you might have.

[The prepared statement of Mr. Bordoff follows:]

CONGRESSIONAL TESTIMONY OF JASON E. BORDOFF

Founding Director, Center on Global Energy Policy, and Professor of Professional Practice in International and Public Affairs, Columbia University School of International and Public Affairs

BEFORE THE COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE 1ST SESSION, 116TH CONGRESS

Chairman Murkowski, Ranking Member Manchin, and Members of the Committee, thank you for inviting me here today to discuss the status of the Strategic Petroleum Reserve and related energy security issues. In my testimony today, I would like to make the following seven points:

- First, the recent attack on key Saudi Arabian oil facilities serves as a reminder of America's vulnerability to global supply disruptions, notwithstanding the dramatic decline in U.S. net oil import dependence. While fortunate to avoid a sharp price spike as a result of those attacks, significant risks to oil supply persist around the world.
- Second, although the U.S. is on the cusp of becoming a net oil exporter—a stunning turnaround from our import dependence just a decade ago—that does not mean America is energy independent. Oil is priced in a global market, so prices in the United States move with the world price whether we import or not.
- Third, despite the shale boom and declining import dependence, the Strategic Petroleum Reserve (SPR) remains a critical national security asset. While the shale revolution does not insulate U.S. drivers from global supply shocks, it does offer an important buffer.
- Fourth, while the U.S. must act to reduce oil use more quickly to address the urgent threat of climate change, the U.S. will use oil for a long time; indeed, a clean energy transition period that is messy, unpredictable, and volatile increases, rather than decreases, the need for the SPR as a tool of transition.
- Fifth, the SPR only serves as a short-term, temporary fix to price spikes. In parallel, it is also necessary to encourage structural reduction in oil use. The best way to protect American consumers from the impact of inevitable global oil price spikes is to reduce how much oil we use in the first place. Higher fuel economy standards are one smart and effective tool.
- Sixth, SPR modernization is necessary to ensure its continued effectiveness, and more rapid progress needs to be made to achieve this.
- Finally, strategic review of the SPR remains needed and should extend beyond just the optimal size of the SPR to include its purpose, composition, and use. In some sense, the SPR is either way too big or way too small, depending on what risks it is intended to guard against. Rather than endeavor to identify its optimal size through cost-benefit analysis, the SPR should be viewed as a tool of risk mitigation and insurance.



Background

Congress authorized the creation of the Strategic Petroleum Reserve (SPR) in the Energy Policy and Conservation Act (EPCA) of 1975 in the wake of the 1970s Arab Oil Embargo as a way to insulate the United States from future petroleum supply disruptions.

As a member of the International Energy Agency (IEA), another byproduct of the 1970s oil crisis, the U.S. is required to hold stocks of crude oil and/or petroleum products equivalent to 90 days of net imports for use in emergency situations.¹ These stocks can be held either in private inventories or directly by the government. As of July 2019, the SPR contained the equivalent of 440 days of net petroleum import cover.² That figure has risen in recent years in response to surging oil supply, dramatically reducing the nation's dependence on imports.

The global oil market has evolved considerably since the 1970s. The conditions that prevailed at the time of the creation of the SPR no longer exist. Oil markets have matured and become more globalized and sophisticated than could have been imagined nearly a half century ago. Physical trading is no longer confined to long-term bilateral supply agreements but include spot deals and term contracts, both of which are backed by a deep, highly liquid futures market that did not exist in the 1970s.

Presently, the SPR holds 645 million barrels of crude oil in salt caverns at four sites in Louisiana and Texas. It has capacity to hold 713.5 million barrels. In addition to the SPR, the U.S. government maintains emergency reserves of one million barrels of heating oil and one million barrels of gasoline, both located in the Northeast.³

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

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

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

In recent years, Congress has authorized sales of the SPR totaling nearly 260 million barrels by FY2027, leaving fewer than 400 million barrels remaining.⁶ Nearly all of this has been to fund other priorities unrelated to energy security. An additional \$2 billion worth of oil was authorized for sale to fund modernization efforts for the SPR to ensure it can function at its full release capacity. The support for selling off SPR barrels was bolstered by a perception that



because of the surge in domestic oil production, and concomitant decline in imports, the U.S. is less vulnerable to supply disruptions today.

I disagree. “The SPR should not be used like an ATM,” I testified before this committee in 2015. “The SPR has served as a critical piece of our nation’s energy security strategy since the oil crisis of the 1970s, and it remains so today, despite the sharp reduction in U.S. oil import dependence.” That remains as true today as then.

The recent attack on key Saudi Arabian oil facilities serves as a reminder of America’s vulnerability to global supply disruptions

On September 14, oil processing facilities in Abqaiq and Khurais in eastern Saudi Arabia suffered a massive attack—allegedly conducted by Iran, although claimed by the Houthi rebels in Yemen. The Abqaiq plant is perhaps the world’s most critical piece of oil infrastructure, with the capacity to process 7 million barrels per day. In response to the sophisticated attacks, Saudi Arabia shut down nearly 6 million barrels per day of production—the largest oil supply disruption on record.⁷

When trading opened after the attacks, oil prices soared 20 percent.⁸ They quickly pared back more than half of those gains after Saudi Energy Minister Prince Abdulaziz bin Salman and Saudi Aramco CEO Amin Nasser held a press conference on September 17 at which they indicated production capacity would be brought back online quickly and crude exports from the kingdom would suffer only minimal disruption.⁹ Saudi Arabia’s ability to bring back production more quickly than expected helped avoid a lasting price spike. Oil prices returned to their pre-attack level within two weeks.

In retrospect, it is remarkable that oil prices were so little impacted, even without a release from the Strategic Petroleum Reserve, by the largest oil supply disruption in history. The minimal impact on price can be attributed not only to Saudi Arabia’s quicker-than-expected recovery, but also to bearish market fundamentals, notably a weaker macroeconomic and oil demand outlook, rising non-OPEC production, and healthy inventory levels.

Yet this combination of lucky factors that muted the price impact of the Saudi attacks this time should not lead to complacency. Had the attacks led to a more sustained supply outage, especially in a tighter market, an oil price spike would likely have persisted far longer. In such a scenario, an SPR release, in coordination with our other partners in the International Energy Agency, would have been both likely and justified to stem the oil price spike. Indeed, a large and temporary oil supply shock, in this case resulting from geopolitical tensions, is precisely the sort of risk the SPR was created to protect against, giving the private sector time to respond while smoothing the adverse price impact on consumers.

The continued risk to global oil supply is very real. The attack on Abqaiq and Khurais revealed vulnerabilities to Saudi oil facilities that previously were not fully appreciated. There is no reason to believe Iran or its proxy agents could not strike these or other facilities again. Indeed, Iran has targeted oil-related infrastructure in recent months in response to the economic pressure it feels from the renewed U.S. sanctions on its oil exports following America’s withdrawal from the Iran nuclear agreement.

Moving forward, as I wrote recently in *Foreign Policy*, “With little prospect of a negotiated



settlement and facing maximum pressure on its economy at home, it would not be surprising if Iran felt it had no choice but to escalate militarily. The president has proven sensitive to oil prices and their domestic effects. Setting in motion a price increase may therefore be seen by Iranian leaders as the best way of matching the U.S. pressure campaign. As with the attacks on tankers transiting the Persian Gulf earlier this summer, the Iranians have demonstrated that they understand very well the global nature of the oil market.”¹⁰

Not only is a further attack that disrupts global supply a real risk, but its impact on the oil market may well be greater next time. Any further disruptions to global oil supply would occur in a market with a very thin buffer of spare capacity, as Saudi Arabia has drawn on its existing spare capacity to respond to the Abqaiq attacks.

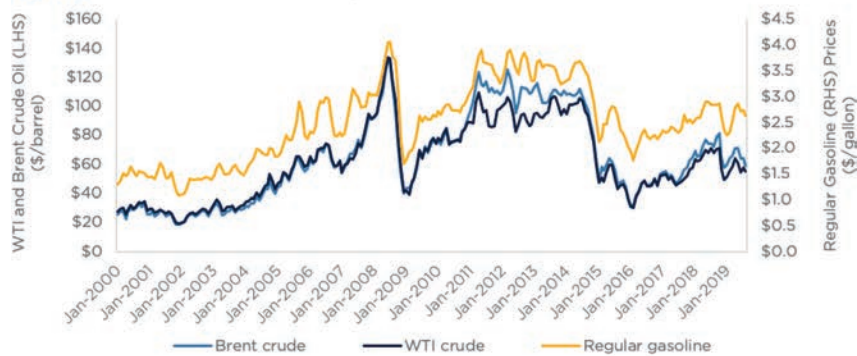
America is not energy independent

As a result of the shale revolution, the United States is on the cusp of becoming a net oil exporter—a stunning turnaround from the country’s foreign-oil dependence dating back to the Arab oil embargo of 1973. Nonetheless, U.S. drivers are still very much vulnerable to global supply disruptions such as Abqaiq.

In 2006, the United States imported 60 percent of its oil. As a result of the shale boom, it will be a net exporter of oil annually by next year. While this brings important economic and geopolitical benefits to the U.S., it does not mean we are “energy independent.”

Oil is priced in a global market, so prices in the United States move with the world price, whether we import or not. U.S. gasoline prices reflect world oil prices, as figure 1 shows. In an integrated global oil market, the consequence of a supply disruption anywhere is a price increase everywhere—regardless of how import-dependent a consuming nation is.

Figure 1: U.S. Gasoline Prices Still Set by World Oil Price



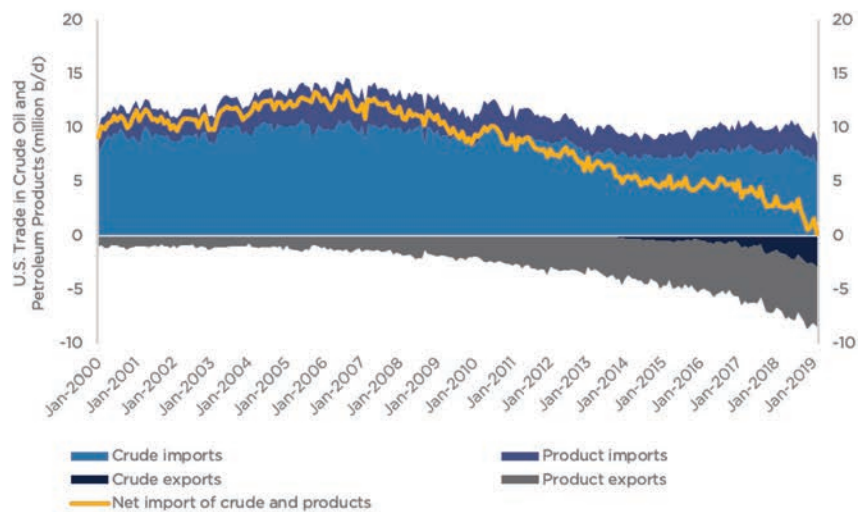
Source: U.S. Energy Information Administration, 2019



Had the price spike following the Abqaiq attack persisted, drivers would have felt the impact at the pump, even though the U.S. imports almost no oil on a net basis any longer. Global supply disruptions, including geopolitics in the Gulf Arab states or OPEC production cuts, still affect U.S. consumers economically.

Moreover, while the United States may not import oil on a net basis, it still imports a vast amount of oil even as it exports growing volumes of crude oil and petroleum products (figure 2).

Figure 2: Net Zero Imports Include Large Gross Imports and Exports



Source: U.S. Energy Information Administration, 2019

U.S. imports of oil from the Gulf Arab region, a focus of American energy security concerns since the Arab Oil Embargo, have fallen, but only modestly, to just below 1 million barrels per day last year (figure 3).



Figure 3: U.S. Oil Imports from the Persian Gulf Have Declined, But Are Still Large

Source: U.S. Energy Information Administration, 2019

The SPR remains a critical national security asset

The stunning surge in U.S. oil production and decline in net imports is not a rationale for selling off the SPR, for several reasons.

First, import dependence is the wrong metric by which to assess U.S. vulnerability to an oil-supply disruption. Unlike in the 1970s, today there is an integrated global oil market with spot cargoes moving around the globe and a robust futures market. As a result, the consequence of a supply disruption anywhere is a price increase everywhere, regardless of import levels. Gasoline prices in the U.S. still reflect world oil prices, so America's vulnerability to global oil supply shocks is determined by how much oil we consume, not how much we import. The risk against which the SPR needs to guard today is a global disruption to crude supply that causes domestic prices to spike, regardless of whether U.S. refineries import from the disrupted countries.¹¹ Indeed, as of next year, when the U.S. becomes a net oil exporter, we will technically have no obligation to hold strategic stocks. Yet the recent attacks in Abqaiq serve as a reminder that global supply risks still threaten U.S. pump prices.

Second, the underlying logic behind holding public oil stocks remains intact, despite the recent production boom. In theory, private stocks can fulfill our IEA obligation and help cushion global disruptions. To some extent, the government's holding of strategic stocks crowds out private sector incentives to hold inventory. But the full social costs of oil supply disruptions are not borne by companies, and thus they lack adequate incentives to safeguard against them—a market failure that justifies a continued role for government in offsetting supply disruptions. While the government's role is not to guarantee price stability, emergency stocks can smooth economically harmful price spikes until markets are able to adjust.

Third, although the shale revolution continues to deliver remarkable supply increases, many

questions remain about its ultimate magnitude and duration. Shale can be brought to market more quickly, but the flip side is that shale requires continued drilling to maintain, not to mention grow, production. If the resource base begins to decline, technological innovation and productivity wane, or drilling rates slow, shale output could decline in the future as well. It would be shortsighted to sell off a strategic asset the U.S. has held for nearly half a century based on the performance of shale over the past decade.

Finally, even if the SPR is not used, its existence and potential use also affect market expectations and temper price spikes resulting from a disruption.¹² Shortly after the Abqaiq attacks, President Trump stated clearly that he stood ready to use the SPR if it proved necessary, which contributed to the retreat of oil prices. I saw this same dynamic play out when I served in the Obama administration, which ordered an emergency release from the SPR following the Libyan civil war in 2011, which disrupted roughly 1.5 million barrels per day. The following year, in 2012, the impact on the world oil price of sanctions to limit Iranian oil sales and other geopolitical fears was tempered, at least in part, by a perception in the market that the U.S. and perhaps other IEA members might release the SPR if prices rose too far.¹³ In the summer of 2012, both the G-20 and G-7 issued statements intended to signal they might tap strategic oil stocks if necessary.¹⁴ Policymakers sent numerous other signals to this effect as well, such as the reported conversation in March 2012 between President Obama and U.K. Prime Minister David Cameron about using strategic oil stocks.¹⁵ As a result, numerous analysts cautioned that the Obama administration might release SPR crude if oil prices rose above roughly \$120 per barrel.

While the shale revolution does not insulate U.S. drivers from global supply shocks, it does offer an important buffer

By offering a reminder that America is still connected to a global oil market, the Abqaiq attack belied claims that because of the shale oil boom, what happens in oil-producing countries in the Persian Gulf no longer matters to the United States.

Moreover, while shale is also a short-cycle source of supply that can come to market far more quickly than conventional crude oil production, it still takes 6-12 months.¹⁶ Shale is not spare capacity, which can be brought to market in a matter of weeks and can quickly replace lost oil supply. Saudi Arabia is the only country in the world that holds true spare capacity to any meaningful extent.

That the U.S. is still part of the global oil market and not a source of spare capacity, however, does not mean shale has no impact in protecting America from global supply disruptions. The shale revolution tempers the impact of oil supply disruptions on global oil prices in at least five ways. Furthermore, by eliminating U.S. net oil imports, shale also reduces the harm to the U.S. macroeconomy of global price spikes.

First, the massive increase in U.S. oil production over the last 10 years, the largest addition to global supply over that period of time in history, has loosened the oil market. In response to rising non-OPEC supply, of which shale was by far the greatest source, global inventories swelled above their historical averages, contributing to the oil price collapse of 2014 and forcing OPEC countries to come together to cut production in an effort to bring oil inventories



back down to their historical range. OPEC's ability to do that has also been undermined, as the growth of shale plus other non-OPEC supply has reduced OPEC's share of the global oil market from 70 percent in 1980 to 40 percent in 2018.

Of course, had the shale revolution not occurred, oil supply investment would have flowed elsewhere and other countries would have contributed greater volumes to global supply. But to the extent those other sources of supply are higher cost—otherwise they would have been developed before shale—the total increase in global supply would presumably have been lower than shale provided. Because of shale, any given disruption now represents a marginally smaller share of total global production, so the price impact of disruption would be slightly lower.

Second, oil prices today are likely lower than they would be absent the shale revolution, so any loss in supply is easier for consumers to absorb than it would be if they were already coping with historically high fuel prices. While shale was previously believed to be high-cost supply, technology improvements have brought down the cost of shale supply remarkably and contributed to a decline in the average per barrel cost of finding and developing oil from \$30 in 2015 to \$15 in 2018. (On the flip side, to the extent shale's supply surge lowered prices, they also led to higher global oil demand, which increases vulnerability to global oil price fluctuations.)

Third, oil prices reflect market expectations of future supply as well as current supply levels, and shale's rapid growth rate—1.6 million barrels per day last year alone—has shifted the market outlook from scarcity to abundance. The impact of a large supply loss on price is lower than it would otherwise be if the market were not anticipating such a rapid increase in production. To be clear, this is a function of shale's rapid rate of growth, not the total level of shale production, and that is a temporary phenomenon. It is unclear how many more years shale can grow at such a robust rate—the outlook for growth next year has recently been downgraded from 1.0 to 0.9 million b/d by the IEA. In the past, producers outspent their free cash flow and focused on production growth. But two years ago, investors started demanding capital discipline, and most publicly reporting producers are now focusing more on returns. Once the rate of growth stagnates, as EIA data is already showing, even if shale production levels remains very high, the effect of rapid growth on future market expectations will abate.

Fourth, the surge in shale production over the last decade, the primary contributor to the oil price collapse of 2014, forced OPEC countries to partner with non-OPEC countries, namely Russia, to cut production to prevent a price collapse. OPEC production cuts, in turn, create a larger buffer of spare capacity to offset a supply loss like Abqaiq and Khurais.

Fifth, because shale is short-cycle and can be ramped up quickly, it reduces the extent to which global supply shocks increase forward oil prices (the price of oil the market anticipates as reflected in the futures curve), which in turn helps bring spot prices down. When oil prices spike, recent experience shows that shale producers hedge their production, locking in the future price at which they can sell their oil. That increases the market's expectation of how much shale oil will be produced in the future. The effect of shale is thus to push the futures curve into steeper backwardation when oil prices spike, keeping the future price of oil from rising as much, even as current prices rise. A more backwardated futures curve creates incentives for commercial participants to use crude stockpiles rather than store them, and that increased supply helps cushion the immediate price impact of a supply shock.



Finally, while gasoline prices that drivers pay still rise and fall with world oil prices, the adverse impact of an oil price shock on the U.S. economy as a whole decreases as our import dependence falls. As the White House Council of Economic Advisers explained during the Obama administration, “the resilience of the economy to international supply shocks—macroeconomic energy security—is enhanced by reducing spending on net petroleum imports and by reducing oil dependence.”¹⁷ When the U.S. is a net-zero importer, oil price spikes mean that the increased oil spending flows from U.S. consumers to U.S. producers rather than overseas. This still raises concerns about distributional equity, but the macroeconomic harms are mitigated—although not eliminated, given consumers have a higher propensity to spend. For example, based on historical experience, the oil price collapse of 2014 would have been expected to boost U.S. GDP by nearly one percentage point, but in reality, the U.S. economy saw little benefit from the oil price collapse because the boost in consumer spending was almost entirely offset by a reduction in oil-related investment.¹⁸ Indeed, in several years, when the U.S. is projected to be a large net exporter of oil, higher oil prices may well be better for the U.S. macroeconomy than lower oil prices.

The end of the Oil Age is neither imminent nor a rationale for reducing the SPR

Beyond the rise of shale and fall in net imports, another argument that the SPR is less needed is because the end of the oil age is in sight, thanks to climate action and trends like vehicle automation and electrification. To be very clear, we need to much more urgently reduce carbon emissions and address the threat of climate change. But U.S. oil demand is at its highest level since 2007, and demand growth is projected to continue. Even if demand peaks sooner than expected, the U.S. economy is likely to remain dependent on oil for some time. In a scenario consistent with limiting temperature rise to two-degree Celsius, U.S. oil demand is projected to fall but still be about 14 million barrels per day in 2030, according to the IEA.¹⁹

Moreover, if oil demand were to peak and begin declining, that would counterintuitively increase rather than decrease the need for the SPR as an energy transition tool.²⁰

The transition away from the oil economy is likely to be a period of great volatility in oil markets. Expectations of peak oil demand are already causing shifts in investments in the energy sector. Concerns over stranded assets are leading some major institutional investors to move away from the oil sector altogether. Oil companies themselves are reexamining their portfolios and redirecting investment flows at the expense of long-cycle investments in new oil supply capacity.

While a transition away from oil, were it to occur, would necessarily involve less investment in oil over time, the transition itself will be disruptive and uncertain. Currently, global oil supply declines at a rate of roughly 5 percent of world production per year. That means trillions of dollars of *new* investment is needed to bring 5 million barrels per day of new supply to the market even if oil demand does not grow at all. However, expectations of declining oil demand and uncertainty about the pace of the energy transition may well deter investors.

Suppose oil demand growth is flat next year—and the year after and the year after that. There will be breathless headlines around the world about how peak oil demand has been



reached and projections about oil's impending decline. That may be true, but there will still be a huge amount of uncertainty about oil's demand path. The transition may well be messy and volatile. Growth may stagnate and then resume again—just as global greenhouse gas emissions did over the past five years. Demand may rise at times through periods of growth and then decline, even if the longer-term trend turns down. Yet that may mean periods of both oversupply and undersupply on the path away from oil over time. Uncertainty—and possibly excess hype—about the pace of oil's decline, along with investor pressure, may cause an excessive pull-back in investment.

Moreover, the IEA projects that even in a two-degree scenario, more than \$13 trillion of investment would still be needed to meet the world's gradually declining oil demand, compared to \$21 trillion of investment that will be needed in the oil and gas sector given the current outlook.²¹

Yet the change in perception from a growing to a dying industry may mean a sharp cutback in investment, falling oil firm equity values, and higher cost of capital. If not properly managed, that underinvestment relative to demand could lead to periods of undersupply, tight markets, and price spikes during the energy transition. The SPR's value in a period of uncertainty and transition is thus likely to be enhanced even if the longer-term trend is toward lower demand. As a result, there is a risk that the industry will divest faster than the energy system can transition away from oil-based fuels, leading to disruptive shortfalls. Expectations of peak oil demand could become disruptively self-fulfilling.

The energy transition could also heighten the risk of instability in key producer countries, leading to dramatic supply shortfalls. On the face of it, OPEC countries, by virtue of being the lowest-cost producers, should be better able to withstand the effect of reduced demand than others. This, however, does not take into account their social spending requirements, which more often than not can be met only through oil export revenues. Should high-cost producers be driven out of the market by reduced demand, there is a risk that oil prices would fall to a level that would undermine the social stability of low-cost producers and disrupt their production, leading to supply shortfalls and volatility.

Far from being made obsolete by the energy transition, therefore, strategic reserves are, in fact, a critical transition tool.

The best protection against global oil supply disruptions is to reduce oil consumption

Because oil is priced in a global market, and gasoline prices reflect world oil prices, the best way to protect drivers from inevitable oil price spikes is not to import less but to use less. Reducing the oil intensity of the U.S. economy lowers its exposure to inevitable oil price spikes and reduces the vulnerability of drivers at the pump to higher gasoline prices. Along with a robust SPR, therefore, policies that reduce oil demand, such as higher fuel economy standards, also help protect American consumers against global oil supply disruptions.

SPR modernization is necessary to ensure its continued effectiveness

In response to a sustained, large-scale supply outage, like Saudi Arabia's 5.7 million barrels per day disruption, the SPR needs to be able to put large volumes of oil on the market to offset the supply loss. The SPR's reported maximum release rate is 4.4 million barrels per day. Experts and analysts widely believe the actual SPR release capacity is far smaller, perhaps 1.5 to 2.5 million barrels per day.²² This is a severe limitation on the SPR's effectiveness that must be remedied.

The SPR's outdated infrastructure needs to be modernized to ensure that it can remain effective in the event of an emergency by delivering additional and incremental barrels to the market. First, the SPR's equipment and infrastructure is aging and needs to be replaced.

Additionally, the changes in the use of U.S. oil infrastructure, such as ports and pipelines, to accommodate the shale boom have impeded the ability of the SPR to deliver incremental barrels of crude oil to refineries in the event of an SPR release. Moving SPR oil to refineries in the Midwest, as historically has been the case, no longer frees up imported barrels because non-Canadian and Gulf Coast crude has been largely backed out of inland refineries by the unconventional oil boom. That means that SPR crude would need to be moved by ship to East and West Coast refineries. Yet, as a result of the surge in U.S. oil supply, Gulf Coast marine facilities are operating at high capacities. If those dock facilities were used to load SPR crude in an emergency, the result would thus be to crowd out commercial supplies that would have otherwise been loaded, and thus the SPR supplies would not be incremental.²³

Congress authorized sales of \$2 billion worth of SPR crude for the purpose of SPR modernization. To date, the Department of Energy has not made much visible progress. According to the Government Accountability Office, SPR modernization will cost up to \$1.4 billion, and according to officials, the agency had spent \$22 million as of the end of February 2018.²⁴

In addition to modernizing the infrastructure, a recent study by the Center on Global Energy Policy evaluated ways in which improved management techniques could further cut SPR costs.²⁵ While the benefits of the SPR (in terms of preventing a supply disruption or blunting its impact) are hard to quantify and partly intangible, its current costs are easier to assess. Maintenance and operational costs associated with the SPR, as well as the opportunity cost of locking up large amounts of capital in oil reserves, have spurred calls to reduce this burden by cutting the reserve down to size. Yet since the creation of the SPR, the growing depth, breadth, and sophistication of the global oil market has provided governments with the market tools to lower these expenditures. Better still, the U.S. SPR is a formidable asset that could, under the right conditions, be turned into something of a profit center. Insufficient attention has been paid to the opportunity to reduce SPR operating costs and increase SPR benefits through upgraded inventory management practices and other innovations.

Strategic review of the SPR remains needed and should extend beyond size to include purpose, composition, and use

Changes in both the international oil market and the U.S. energy landscape warrant a thorough reexamination of the rationale, purpose, composition, and use of the U.S. SPR. The



decision about whether to reduce (or increase) the size of the SPR should be based on a prudent analysis, not driven by an imperative to fill a budget hole, no matter how meritorious the intended use.

A recent study by the Center on Global Energy Policy examined past SPR releases and what lessons could be learned about the size and management of the SPR.²⁶ It found that the experience of past emergency releases is, frankly, mixed. This finding is consistent with recent research by economists Lutz Kilan and Xiaoqing Zhou, who find that SPR releases have worked to bring down prices, although by less than often claimed.²⁷ But a lesson that comes across clearly is that in order to be effective, SPR releases should be rapid and the mix of petroleum released should be targeted to the nature of the disruption.

Moreover, any analysis of the SPR's optimal size must consider the evolving purposes of the SPR. Historically, the SPR was aimed at global oil supply disruptions, but increasingly strategic stocks, at home and abroad, may be tapped to address disruptions resulting from severe weather. In recent years, some of the most severe supply disruptions suffered by the United States have come not from abroad but from extreme weather events and their effects on the domestic upstream, midstream, and downstream oil sectors. The 2005 hurricane season, with its crippling impact on U.S. Gulf of Mexico crude oil production and, more importantly, on the Gulf Coast refining and pipeline system, is a case in point.

Climate science is clear that the incidence of extreme weather events will increase due to a temperature rise that causes changes in sea level and shifts in ocean currents and wind patterns.²⁸

Recent SPR reviews have focused on the need for the DOE to conduct analysis to determine the optimal size of the SPR.²⁹ In our study, we acknowledge the inherent limitations of such an exercise. Before assessing the SPR's optimal size, it is necessary to agree on what the purpose of the SPR is and what risks it is expected to protect against.

To a certain extent, the SPR is either far too big or far too small, depending on what risks the federal government is looking to insure against. The SPR need not contain 500–700 million barrels to mitigate a weather-related or other localized disruption of one to two weeks in duration. At the same time, 500–700 million barrels, even in partnership with other IEA countries, may be inadequate to replace the loss of a major oil-producing country or a blockade of the Strait of Hormuz for weeks or months. Moreover, how large the SPR should be depends on one's view about when the SPR should be used—namely, how large a disruption and how large a price spike would justify a release versus letting market forces respond on their own?

Right-sizing the SPR is thus a tricky exercise. While assessing the costs of the SPR is relatively straightforward, measuring its benefits is more difficult. The current size of the SPR is more a result of political compromise than any precise analysis. But given the changes to the global oil market and prevailing risks, in my view, the burden should be on those who wish to sell off a strategic asset the U.S. has held for nearly half a century before the U.S. commits to that course of action.

The truth is that the SPR does not lend itself easily to rigorous cost-benefit analysis and optimization. From a public policy point of view, the SPR is more akin to an insurance policy,

where a fixed payment is made to avoid a small probability of a significant loss in the future.³⁰ Just like with insurance, the costs of the policy are known and relatively certain, but the benefits only accrue if a loss event actually occurs. The decision of what type of insurance—if any—the United States needs against oil supply disruptions and price shocks should depend entirely on our risk tolerance and preferences as a society and will ultimately have to be a public policy decision.

Moreover, the effectiveness of the SPR depends on far more than simply its size. It needs to have the right mix of crudes and products. It needs to have the necessary infrastructure so that releases can impact the global market. And it needs to have a clearer and more analytically based usage policy. Today, policymakers—often without detailed knowledge of or experience in oil markets and without the ability to consult those with such expertise because of the market-sensitive nature of SPR deliberations—are left to evaluate whether to release the SPR without clear metrics to assess the rationale for a release. The lack of a clear analytical framework also exacerbates the risk that political considerations play an outsized influence in SPR releases.

Conclusion

Recent attacks in Saudi Arabia serve as a reminder that the SPR remains an important national security asset to protect against global supply disruptions and concomitant gasoline price spikes here at home. The stunning turnaround in U.S. oil output and import dependence helps cushion the U.S. macroeconomy against oil price spikes, but the U.S. is not energy independent. It remains connected to an integrated global oil market and thus world oil price spikes still lead to higher prices for U.S. drivers at the pump. The best way to protect the U.S. economy and consumers from inevitable oil price spikes remains to reduce how much oil we use in the first place.

SPR modernization remains a critical and neglected priority. Moreover, the continued efforts by policymakers to determine the optimal size of the SPR remain too narrow a focus, as that question cannot and should not be answered in isolation. Rather, the size, purpose, composition, and use of the SPR needs to be strategically reconsidered given the rapidly changing landscape—including a shift in the U.S. energy outlook from scarcity to abundance, the evolution of the global oil market, rising risks of oil disruption from climate-related events, and potential long-term reductions in oil demand to achieve decarbonization goals. But it would be wrong to conclude based on these trends that the SPR is no longer needed. Indeed, the SPR can serve as a helpful tool of transition and may actually be too big or too small depending on what risks it is supposed to protect against.

Appendix³¹

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

Full drawdown: The president can order a full drawdown of the Reserve to counter a “severe energy supply interruption.” EPCA defines this as “a national energy supply shortage which



the President determines –

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

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

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

Limited drawdown: If the president finds that –

- (A) a circumstance, other than those described [above] exists that constitutes, or is likely to become, a domestic or international energy supply shortage of significant scope or duration; and
- (B) action taken ... would assist directly and significantly in preventing or reducing the adverse impact of such shortage” then the secretary may drawdown and distribute the Strategic Petroleum Reserve, although in no case:

“(1) in excess of an aggregate of 30,000,000 barrels ...

(2) for more than 60 days ...

(3) if there are fewer than 500,000,000 barrels ... stored in the Reserve.”

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

Notes

1. International Energy Agency, *Energy Supply Security: Emergency Response of IEA Countries*, 2014, https://www.energy.gov/sites/prod/files/2018/08/f54/IEA%20Emergency%20Response%20of%20IEA%20Countries_2014.pdf.
2. Calculated based on July 2019 monthly data from the Energy Information Administration by dividing total strategic petroleum reserve volume by net crude oil and petroleum



- product imports, U.S. Energy Information Administration, "U.S. Net Imports of Crude Oil and Petroleum Products," <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=p&s=mtntus2&f=m>; U.S. Energy Information Administration, "Weekly Stocks,"
3. U.S. DOE Office of Fossil Energy, "Northeast Home Heating Oil Reserve," <http://energy.gov/fe/services/petroleum-reserves/heating-oil-reserve>; U.S. DOE Office of Fossil Energy, "Northeast Gasoline Supply Reserve," <http://energy.gov/fe/services/petroleum-reserves/northeast-regional-refined-petroleum-product-reserve>.
 4. Energy Policy and Conservation Act, Public Law 94-163, December 26, 2013, <http://legcounsel.house.gov/Comps/EPCA.pdf>.
 5. U.S. Senate Committee on Energy & Natural Resources, "A Turbulent World: In Defense of the Strategic Petroleum Reserve," 2015, p.2, http://www.energy.senate.gov/public/index.cfm/files/serve?File_id=a5d94825-02f3-4e62-9eb3-2b9f36201e65.
 6. Robert Pirog, "Strategic Petroleum Reserve: Mandated Sales and Reform," Congressional Research Service, October 1, 2019, <https://fas.org/sgp/crs/misc/R45577.pdf>.
 7. International Energy Agency, "Oil Market Report," October 11, 2019, p.19.
 8. Amrith Ramkumar and Joseph Wallace, "Crude Prices Soar After Attack on Saudi Facilities, Threatening Global Growth," *The Wall Street Journal*, September 16, 2019, <https://www.wsj.com/articles/oil-prices-soar-after-saudi-attack-11568585160>.
 9. Yun Li, "Oil drops 5% one day after historic surge as Saudis signal output to return to normal soon," *CNBC*, September 17, 2019, <https://www.cnbc.com/2019/09/17/oil-slips-following-the-biggest-climb-in-history-after-saudi-attacks.html>.
 10. Jason Bordoff, "The Myth of U.S. Energy Independence Has Gone Up in Smoke," *Foreign Policy*, September 18, 2019, <https://foreignpolicy.com/2019/09/18/the-myth-of-u-s-energy-independence-has-gone-up-in-smoke/>.
 11. Jason Bordoff, "Testimony before the Senate Committee on Energy and Natural Resources," October 6, 2015, https://www.energy.senate.gov/public/index.cfm/files/serve?File_id=6ffc0bd9-49b8-485d-b961-439ac6b38bd2.
 12. See, e.g., Blake Clayton, "Is the White House the New Federal Reserve of Oil?," *Forbes*, October 12, 2012, <http://www.forbes.com/sites/blakeclayton/2012/10/12/is-the-white-house-the-new-federal-reserve-of-oil/>; Izabella Kaminska, "SPR talk as QE3 expectation management," *Financial Times*, September 3, 2012, <http://ftalphaville.ft.com/2012/09/03/1142871/spr-talk-as-qe3-expectation-management/>.
 13. See, e.g., Richard Swann, "G7 urges oil supply boost, says ready to call for IEA action," *S&P Global*, August 29, 2012, www.platts.com/latest-news/oil/london/g7-urges-oil-supply-boost-says-ready-to-call-8674832; G20 says vigilant on oil, ready to take measures, *NDTV Profit*, June 19, 2012, <http://profit.ndtv.com/news/corporates/article-g20-says-vigilant-on-oil-ready-to-take-measures-306458>.



14. See, e.g., Richard Swann, "G7 urges oil supply boost, says ready to call for IEA action," *S&P Global*, August 29, 2012, www.platts.com/latest-news/oil/london/g7-urges-oil-supply-boost-says-ready-to-call-8674832; "G20 says vigilant on oil, ready to take measures," *NDTV Profit*, June 19, 2012, <http://profit.ndtv.com/news/corporates/article-g20-says-vigilant-on-oil-ready-to-take-measures-306458>.
15. Guy Chazan et al., "Crude Tumbles as Leaders Discuss Supplies," *Financial Times*, March 15, 2012, <http://www.ft.com/intl/cms/s/0/20e8687a-6ebd-11e1-afb8-00144feab49a.html#axzz3nVdtfjsk>; Matt Falloon and Jeff Mason, "Obama, UK's Cameron Discussed Tapping Oil Reserves: Sources," *Reuters*, March 15, 2012, <http://www.reuters.com/article/2012/03/15/us-obama-energy-spr-idUSBRE82E00P20120315>.
16. Jason Bordoff, Antoine Halff, and Akos Losz, "New Realities, New Risks: Rethinking the Strategic Petroleum Reserve," Center on Global Energy Policy, Columbia University, May 2018, p.26, https://energypolicy.columbia.edu/sites/default/files/pictures/CGEP_Rethinking_the_Strategic_Petroleum_Reserve_June2018.pdf.
17. Council of Economic Advisers, "The All-Of-The-Above Energy Strategy as a Path to Sustainable Economic Growth," 2014, p.3, https://obamawhitehouse.archives.gov/sites/default/files/docs/aota_energy_strategy_as_a_path_to_sustainable_economic_growth.pdf.
18. Christiane Baumeister and Lutz Kilian, "Lower Oil Prices and the U.S. Economy: Is This Time Different?" *Brookings Papers on Economic Activity*, Fall 2016, <https://www.brookings.edu/bpea-articles/lower-oil-prices-and-the-u-s-economy-is-this-time-different/>.
19. International Energy Agency, "World Energy Outlook," November 2018, p.534-535.
20. Jason Bordoff, Antoine Halff, and Akos Losz, "New Realities, New Risks: Rethinking the Strategic Petroleum Reserve," Center on Global Energy Policy, Columbia University, May 2018, p.31-32, https://energypolicy.columbia.edu/sites/default/files/pictures/CGEP_Rethinking_the_Strategic_Petroleum_Reserve_June2018.pdf.
21. International Energy Agency, "World Energy Outlook 2018," November 2018, p.150.
22. See, e.g., Brian Scheid, "Insight from Washington: Oil market shifts have diminished potential SPR role," *S&P Global*, October 1, 2019, <https://blogs.platts.com/2019/10/01/oil-market-spr-role-washington/>.
23. Quadrennial Energy Review, 2015, Chapter IV, p. 6 <http://energy.gov/sites/prod/files/2015/08/f25/QUER%20Chapter%20IV%20Energy%20Security%20April%202015.pdf>.
24. Frank Rusco, "Statement before the Subcommittee on Energy, Committee on Energy and Commerce: Strategic Petroleum Reserve: Observations on the Emergency Stockpile," United States Government Accountability Office, 2018, <https://www.gao.gov/assets/700/693334.pdf>.
25. Jason Bordoff, Antoine Halff, and Akos Losz, "New Realities, New Risks: Rethinking the Strategic Petroleum Reserve," Center on Global Energy Policy, May 30, 2018, <https://>

energypolicy.columbia.edu/research/report/new-realities-new-risks-rethinking-strategic-petroleum-reserve#_ftnref84.

26. Jason Bordoff, Antoine Halff, and Akos Losz, "New Realities, New Risks: Rethinking the Strategic Petroleum Reserve," Center on Global Energy Policy, May 30, 2018, <https://energypolicy.columbia.edu/research/report/new-realities-new-risks-rethinking-strategic-petroleum-reserve>.
27. Lutz Kilian and Xiaoqing Zhou, "Does Drawing Down the U.S. Strategic Petroleum Reserve Help Stabilize Oil Prices?" *Social Science Research Network*, July 30, 2019, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3428371.
28. Christopher B. Field, Vicente Barros, et al., IPCC Report, *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*, Cambridge University Press, 2012, https://www.ipcc.ch/pdf/special-reports/srex/SREX_Full_Report.pdf.
29. Frank Rusco, "Statement before the Subcommittee on Energy, Committee on Energy and Commerce: Strategic Petroleum Reserve: Observations on the Emergency Stockpile," United States Government Accountability Office, 2018, <https://www.gao.gov/assets/700/693334.pdf>.
30. David L. Weimer and Aidan R. Vining, "Cost-Benefit Analysis in a Bureaucratic Setting: The Strategic Petroleum Reserve," in *Policy Analysis: Concepts and Practice*, 4th edition (Upper Saddle River, NJ: Pearson Prentice Hall, 2005), p.7.
31. U.S. DOE Office of Fossil Energy, "SPR Quick Facts and FAQs," <http://energy.gov/fe/services/petroleum-reserves/strategic-petroleum-reserve/spr-quick-facts-and-faqs>.



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The CHAIRMAN. Thank you, Mr. Bordoff. We appreciate that. Mr. Brown, welcome.

STATEMENT OF PHILLIP BROWN, SPECIALIST IN ENERGY POLICY, CONGRESSIONAL RESEARCH SERVICE, LIBRARY OF CONGRESS

Mr. BROWN. Chairman Murkowski, Ranking Member Manchin, members of the Committee, good morning.

CRS appreciates the opportunity to testify about the Strategic Petroleum Reserve and in accordance with our enabling statutes, CRS takes no position on this policy or other legislation.

In response to the 1973 oil embargo, an event that contributed to rapidly escalating oil prices and petroleum product scarcity, the Energy Policy and Conservation Act (EPCA) was enacted in December 1975. EPCA authorized the creation of the SPR to hold reserves of up to 1 billion barrels of petroleum products.

As amended, the SPR section of the Code states that it is the policy of the United States to create an SPR to “reduce the impact of disruptions in supplies of petroleum products,” and “to carry out obligations of the United States under the international energy program,” the multilateral treaty that requires signatories to maintain emergency reserves equivalent to 90 days of prior year net imports. As of October 11th, 2019, SPR oil stocks totaled nearly 643 million barrels, approximately 274 days of net import coverage based on 2018 annual data.

With relatively little utilization in response to emergency supply disruptions, limited, although more frequent, oil exchanges in response to domestic supply disruptions such as hurricanes and decreasing net petroleum imports, Congress has recently enacted legislation that requires SPR oil to be sold in order to fund other legislative priorities.

Since 2015, seven laws have been enacted that mandate the sale of 271 million barrels of SPR oil during Fiscal Years 2017 through 2028. These mandated sales represent nearly 39 percent of SPR stocks held at the beginning of 2017. Congress has also authorized up to \$2 billion of SPR oil sales during Fiscal Years 2017 through 2020 to pay for SPR modernization. To date, 44.8 million barrels of mandated sales have either been delivered or have been awarded and 15.3 million barrels of SPR modernization sales have occurred, in total, nearly 60.1 million barrels. By the end of Fiscal Year 2028, SPR stocks are estimated to be 409 million barrels and could be lower should Fiscal Year 2020 modernization sales occur.

EIA reference case projections indicate that the United States could be a net petroleum exporter as soon as 2020 and remain so until 2049; however, other EIA cases indicate that the United States may continue to be a net importer. Should the reference case projections be realized, the International Energy Program reserve commitment for oil stocks, a quantifiable SPR statutory policy objective, may no longer be binding; however, the statutory policy to provide protection from the impact of supply disruptions, an objective that is difficult to quantify, would remain.

The United States is integrated with the global oil market and may continue to be exposed to price escalation that could result from supply disruptions. For example, U.S. refineries imported

7.8 million barrels per day of crude oil in 2018, and U.S. crude oil and petroleum product exports were 7.6 million barrels per day. Market integration means that supply disruptions anywhere will likely be reflected in domestic price levels; however, market integration also allows for the U.S. petroleum industry to contribute toward addressing disruptions and price impacts.

The September 2019 oil infrastructure attack in Saudi Arabia resulted in the largest single-day West Texas Intermediate price increase over the last 10 years. This effect on U.S. price levels from a temporary disruption in a foreign country illustrates the global nature of oil markets. Potential and actual economic dislocation that oil supply disruptions and rapid oil price increases are likely to create are among market conditions the SPR is intended to address. However, to date, an SPR drawdown in response to events in Saudi Arabia has not occurred and oil prices returned to near pre-attack levels within two weeks.

As SPR oil sales continue and should the U.S. become a net petroleum exporter, the future of the SPR is likely to be the subject of policy debates; however, determining an optimal SPR size and configuration that addresses a difficult-to-quantify statutory objective may be challenging due to several factors, including the uncertain nature of future supply disruptions.

Thank you for the opportunity to testify today. I will be glad to answer any questions from the Committee.

[The prepared statement of Mr. Brown follows:]

**Testimony of Phillip Brown,
Specialist in Energy Policy for the Congressional Research Service,
Before the Senate Committee on Energy and Natural Resources,
Hearing on the Strategic Petroleum Reserve
October 17, 2019**

Chairman Murkowski, Ranking Member Manchin, Members of the Committee, good morning. CRS appreciates the opportunity to testify about the Strategic Petroleum Reserve (SPR). My name is Phillip Brown, Specialist in Energy Policy for the Congressional Research Service. The focus of my testimony is the SPR policy framework, actual, awarded, and planned SPR mandated and modernization oil sales, and policy considerations regarding the SPR. In accordance with our enabling statutes, CRS takes no position on this policy or other legislation.

Background and Policy Framework

In response to the 1973 Organization of Arab Petroleum Exporting Countries (OAPEC) embargo on oil shipments to the United States, an event that contributed to rapidly escalating oil prices and petroleum product scarcity, the Energy Policy and Conservation Act (EPCA, P.L. 94-163) was enacted in December 1975. EPCA authorized the creation of the SPR to hold reserves of up to 1 billion barrels of petroleum products, among other provisions.

As amended, the SPR section of the U.S. Code (42 U.S.C. Chapter 77, Subchapter I, Part B) states that it is the policy of the United States to create an SPR to (1) “reduce the impact of disruptions in supplies of petroleum products,” and (2) “to carry out obligations of the United States under the international energy program.” The Agreement on an International Energy Program is a multilateral treaty (25 UST 1685) that includes a requirement for signatories to maintain emergency reserves equivalent to 90 days of prior year net imports of crude oil and petroleum products. Reserves may be held by the public sector and/or the private sector.

As of October 11, 2019, SPR oil stocks totaled nearly 643 million barrels, approximately 275 days of net import coverage based on 2018 annual data.

SPR Mandated and Modernization Sales

With relatively little SPR utilization in response to emergency global supply disruptions (for example, in response to instability and oil supply disruptions in Libya in 2011); limited, although more frequent, oil exchanges in response to domestic supply disruptions due to hurricanes and other circumstances (most recently in 2017 after Hurricane Harvey); and decreasing U.S. net petroleum (crude oil and products) imports, Congress has recently enacted legislation that requires SPR oil to be sold in order to fund other legislative priorities.

Since 2015, seven laws have been enacted that cumulatively mandate the sale of 271 million barrels of SPR crude oil during fiscal years 2017 through 2028. These mandated sales represent nearly 39% of SPR stocks held at the beginning of 2017. Congress has also authorized up to \$2 billion of SPR oil sales during fiscal years 2017 through 2020 to pay for SPR modernization activities. To date, 44.8 million barrels of mandated sales have either been delivered or have been awarded and 15.3 million barrels of SPR modernization sales have occurred—in total, approximately 60.1 million barrels.

By the end of fiscal year 2028, assuming no additional sales or acquisitions occur, SPR stocks are estimated to be 409 million barrels under existing law. SPR stocks could potentially be lower should additional modernization sales occur in fiscal year 2020. Legislation that requires up to \$450 million of modernization sales in FY2020 has passed the House (H.R. 2740) and has been reported by the Senate Appropriations Committee (S. 2470).

Policy Considerations

Energy Information Administration (EIA) reference case projections indicate that the United States could become a net petroleum exporter as soon as 2020 and remain a net exporter until 2049. However, other cases analyzed by EIA indicate that the United States may continue to be a net importer. Should the reference case projection be realized, the International Energy Program emergency reserve commitment for oil stocks—a quantifiable SPR statutory policy objective—may no longer be binding. However, the statutory policy to provide protection from the impact of supply disruptions—an objective that is difficult to quantify—would remain.

The United States is integrated, through trade, with the global oil market and may continue to be exposed to price escalation that could result from global supply disruptions. For example, U.S. refineries imported approximately 7.8 million barrels per day (bpd) of crude oil in 2018, and U.S. crude oil and petroleum product exports were approximately 7.6 million bpd. Global market integration means that supply disruptions anywhere will likely be reflected in domestic price levels. However, market integration also allows the U.S. petroleum industry to contribute towards addressing disruptions and mitigating global price impacts.

The September 2019 oil infrastructure attack in Saudi Arabia, which temporarily disrupted production and processing of approximately 6% of global oil supply, resulted in the largest single-day West Texas Intermediate (WTI, the U.S. domestic oil price benchmark) price increase over the last 10 years. This effect on U.S. domestic price levels from a temporary disruption in a foreign country illustrates the integrated and global nature of oil markets. Potential and actual economic dislocation that oil supply disruptions and rapid oil price increases are likely to create are among market conditions the SPR was intended to address. On September 15, 2019, President Trump announced that an SPR release was authorized if needed. However, to date, an SPR drawdown in response to events in Saudi Arabia has not occurred, and the WTI benchmark price returned to near pre-attack levels within two weeks.

As SPR oil sales continue, and should the U.S. become a net petroleum exporter, the future of the SPR is likely to continue to be the subject of policy debates. However, determining an optimal SPR size and configuration that addresses a difficult-to-quantify statutory objective may be challenging due to several factors, including the uncertain size, duration, and nature of future supply disruption events.

Thank you for the opportunity to testify today. I will be glad to answer any questions from members of the Committee.

The CHAIRMAN. Thank you, Mr. Brown.
Mr. Sadamori, welcome.

**STATEMENT OF KEISUKE SADAMORI, DIRECTOR, ENERGY
MARKETS AND SECURITY, INTERNATIONAL ENERGY AGENCY**

Mr. SADAMORI. Good morning, Chairman Murkowski, Ranking Member Manchin and distinguished members of the Committee. So thank you for the opportunity to appear before you today to present the International Energy Agency's view on Strategic Petroleum Reserves.

Let me start by conveying his best regards from our Executive Director, Dr. Fatih Birol, to members of the Committee. And also, we, at the IEA, have been delighted to have Chairman Murkowski as a member of the Global Commission for the Urgent Action on Energy Efficiency. Thank you.

Strategic oil stocks are the cornerstone of IEA's coordinated emergency response systems. IEA countries hold more than 2.2 billion barrels of emergency reserves. The recent attacks on Saudi Arabian oil infrastructure provides a vivid example of how the IEA emergency response system works and how the emergency oil stocks can be beneficial to supply security, even when these are not released.

Early reassurances by the U.S., Japan and the IEA that emergency oil stocks would be employed, if needed, were essential to help avoid a panicked market reaction. Ultimately, the quick recovery in Saudi production capacity made the use of emergency stocks unnecessary. Had the damage been more extensive or beyond the ability of the Saudis to quickly address, however, the use of emergency oil stocks would have been crucial in avoiding the substantial economic damage by bridging the supply gap. Had the same scenario played out in the absence of these robust levels of emergency stocks, the market reaction would have been quite different.

This underlines the importance of emergency oil stocks and is a reminder that the oil security matters, even when our energy systems transitions to cleaner and more sustainable fuel sources. Oil share in the global energy mix has been reduced from the 45 percent in 1974 to 31 percent today, yet oil still represents the largest share of any fuel source. Oil consumption is now over 100 million barrels and will continue to grow, will continue growth, to 2040 in the IEA's World Energy Outlook's May scenario.

Oil continues to be the dominant fuel for the transport sector. The petrochemical sector will also lead demand growth. And even in the scenario that meets the goals of the 2015 Paris agreement, there would still be an oil market over 67 million barrels per day in 2040 and that is comparable in size to the oil market of the early 1990s.

Oil security is not only an issue for net importers. Regional extreme weather events and terrorist attacks can affect all countries. In a global market, even in net exporting countries, oil consumers will be economically harmed by spiking oil prices and for net exporting countries, imports can still play a crucial role helping overcome crude quality issues and other issues. So achieving net exporter status shouldn't be seen as making strategic stocks no longer necessary. As highlighted by the IEA's recent in-depth re-

view of U.S. energy policy, released last month, should the U.S. further drawdown its SPR levels, there could be a challenge to the future effectiveness of the IEA stock systems. So we encourage the United States to maintain robust SPR volumes to uphold global energy security, even as it transitions to a net exporter of oil.

Involving major new members in the area of oil security is one of the IEA's highest priorities. The United States, as the largest IEA member, has a substantial role here. Efforts by the U.S. SPR to open up available storage for use by other countries are very welcome, as this can provide cost-effective options for countries wanting to build emergency stocks and it sets the example for countries to consider the benefits of a joint strategic stockpiling.

On behalf of everyone at the IEA, I wish to once again thank you for inviting me before your Committee, and I'll be happy to answer whatever questions you may have.

Thank you.

[The prepared statement of Mr. Sadamori follows:]

Keisuke Sadamori
Director, Energy Markets and Security
International Energy Agency

Written testimony
Hearing of the U.S. Senate Energy and Natural Resources Committee
October 17, 2019

Chairman Murkowski, Ranking Member Manchin, and distinguished Members of the Committee, thank you for the opportunity to appear before you today to present the International Energy Agency's view on strategic petroleum reserves. Let me start by conveying his best regards from the Executive Director, Dr. Fatih Birol, to members of the Committee. We at the IEA have been delighted to have Chairman Murkowski as a member of the Global Commission for Urgent Action on Energy Efficiency, which will hold its first meeting on December 4th, immediately before the IEA Ministerial Meeting in Paris.

As recent events in Saudi Arabia remind us, oil supply security is as critical as ever and today's discussion topic is both vitally important and timely.

Background

I would like to begin by first introducing the IEA. I know that you, Madam Chair, and many of your colleagues know the IEA and its work, but I also appreciate that not everyone here will be fully familiar with the IEA.

The strong relationship between the United States and the International Energy Agency goes back to the founding of the IEA in 1974. For more than 45 years the United States has played a critical leadership role in the IEA. The IEA was created upon the initiative of the Secretary of State at the time, Dr Henry Kissinger. Over the years, support for the Agency's work has come from the White House, the Department of State and the Department of Energy, as well as from this Committee and other parts of Congress. Outside of government, the Agency has good relations with many US research institutes, think tanks and companies.

The IEA was founded by the United States and 15 other countries in the wake of the 1973/1974 oil crisis to promote energy security, cooperation and stable markets. Since then the Agency's role has expanded alongside developments in global energy systems and we have become the world's leading policy advisor across the entire energy mix. However the core mandate for the Agency continues to be to monitor the oil market and to coordinate collective responses to major disruptions in the supply of oil.

The IEA was established under the umbrella of the OECD in Paris, but it remains an autonomous organization with its own budget and governance structure. While being an OECD member is a requirement to join the IEA, not all OECD countries are IEA members. Today, of the 36 OECD member countries, 30 are IEA members, and 2 of the remaining 6 countries are candidates for IEA membership.

Recently, working with its member governments, the IEA has adopted a modernization strategy. This has three pillars: opening the IEA's doors to emerging economies; broadening our energy security mandate to include natural gas and electricity; and in addition to our pole position on fossil fuels, also becoming the global hub for clean energy technologies including energy efficiency.

Strategic oil stocks

And now I turn to the matter at hand.

Strategic oil stocks, such as those held in the US SPR, are the cornerstone of IEAs coordinated emergency response system, which is designed to mitigate the negative economic effects of a sudden oil supply crisis by providing additional oil to the global market on a short-term basis.

Each IEA member country is required to have oil stocks, counting both crude oil and refined products, equivalent to at least 90 days of net imports, and have in place the procedures and framework necessary for swiftly contributing to an IEA collective action.

The IEA stockholding requirement is not a prescriptive one, and countries are able to choose a stockholding regime according to their national circumstances, where the total of dedicated emergency stocks, in addition to industry's commercial stocks, assure that the minimum 90-day level is met at all times. Consequently, the stockholding regimes vary across IEA member countries, reflecting differences in oil market structure, geography and national policy choices related to emergency response.

IEA countries today are holding a total of about 1.6 billion barrels of dedicated emergency oil stocks in government-controlled agencies, equivalent to about 15 days of total world oil demand. This is in addition to the substantial level of industry stocks held across IEA member countries, around 2.97 billion barrels as of the end of August 2019, a two-year high and which can cover more than a month of world oil demand. These industry stocks include about 650 million barrels of obligated emergency stocks, which can be made immediately available to the market when governments lower holding requirements of industry.

Collective action to release emergency oil stocks

Thus when taken together, the emergency reserves held by government controlled agencies and by industry under obligations, of more than 2.2 billion barrels, can bring ample additional supply to the global market when needed. Determining the need for a collective action is one of the IEA's critical roles, and the IEA has a permanent framework for constantly monitoring the global oil market. Our team of expert oil market analysts, assisted by our statistics experts and their extensive data gathering systems, provide monthly assessments of oil market fundamentals, published each month in our closely watched *Oil Market Report*. This analysis, together with a broad network of contacts in major producer and consumer countries as well as industry representatives, makes it possible for the IEA to provide on short order an assessment of a disruption's impact on the global supply and demand balance, and to advise IEA member governments on the use of emergency oil stocks. The IEA has a standing procedure for very rapidly developing a response plan and building consensus among all member countries. A response plan can be agreed within 48 hours, after which each country activates national emergency response measures to make additional oil available in amounts equal to their share of the collective action, which is based on oil consumption.

This has been the case on three occasions since the creation of the IEA: in the build up to the Gulf War in 1991; after Hurricanes Katrina and Rita damaged offshore oil rigs, pipelines and refineries in the Gulf of Mexico in 2005; and in response to the prolonged disruption of oil supply caused by the Libyan Civil War in 2011. Yet even in instances where supplies were disrupted but emergency stocks were not used, their mere availability can provide substantial benefit by helping to reassure the market and avoid panic reactions. We believe this was the case after the attacks on Saudi facilities on 14 September.

Recent attacks on Saudi oil infrastructure

The recent attacks on Saudi Arabian oil infrastructure provides a vivid example of how the IEA emergency response system works and how the emergency oil stocks can be beneficial to supply security even when these are not released. Already within hours of the attacks, our executive director was in contact with Saudi officials and several member countries; by Sunday evening, 36 hours after the attacks and ahead of markets opening in Asia, all IEA member countries received a situation report and a preliminary impact assessment, and the IEA issued a statement that for the time being markets would remain well supplied. The IEA continued to provide updates of its assessment in the days that followed.

The attacks struck at some of the world's most critical oil infrastructure, in what has been likened to a massive heart attack for the global oil market. The attack occurred in the context of a very well supplied market, with OECD commercial stocks above the 5-year average and at their highest level in nearly two years. Yet the magnitude and duration of outages to Saudi production was of critical importance for how the market would cope with the disruption, and with what economic impact. Early reassurances, by the US, Japan and the IEA, that emergency oil stocks would be employed if needed, were essential to help avoid a panicked market reaction.

Ultimately the exceptional resilience of the Saudi oil industry to bring production back on line so quickly has meant that the use of the emergency stocks has not been necessary. But this was not a foregone conclusion; had the damage been more extensive or beyond the ability of the Saudi's to quickly address, the use of emergency oil stocks would have been crucial in avoiding substantial economic damage by bridging the supply gap. At the same time, had the same scenario played out but in the absence of these robust levels of emergency stocks, I believe the market reaction would have been quite different, with potentially very economically damaging price spikes as the market speculated on how it would cope without the benefit of a safety net.

Trends in oil market will not lessen importance of emergency oil stocks

This dramatically underlines the important role that emergency oil stocks continue to have today, and is a reminder that while we are making great strides to transition our energy systems to cleaner and more sustainable fuel sources, oil security still matters.

Oil as a share of the global energy mix has been reduced from the 45% it represented when the IEA was created in 1974, to 31% today; yet oil still represents the largest share of any fuel source. In volumes, oil consumption has been growing every year, and it is now over 100 mb/d.

And oil will continue to matter in the foreseeable future; while a peak in oil use for passenger cars may be on the horizon, this is not the case for other areas of oil demand such as shipping, aviation, freight trucks. Oil continues to be the dominant fuel for the transport sector. The petrochemicals sector will also lead oil demand growth. We are on a path for global oil demand growth of around 1 million barrels per day on average each year to 2025, and around 0.25 mb/d on average each year after that. Even in a scenario that meets the goals of the 2015 Paris Agreement on climate change there would still be an oil market of 67 mb/d in 2040. That is comparable in size to the oil market of the early 1990s.

As the US moves ever closer to being a net oil exporter, I would like to stress that oil security is not only an issue for net-importers, and security concerns such as regional extreme weather events and terrorist attacks can affect all countries. In a global market, even in net exporting countries, oil consumers will be economically harmed by spiking oil prices, and if a disruption tips the world

economy into recession, the pain will be felt by exporting and importing countries alike. And even for net-exporting countries, imports can still play a critical role, helping overcome issues related to crude qualities, differences in refined product demand and domestic refining capacities, or geographical mismatches between production and consumption. So achieving net exporter status shouldn't be seen as making strategic stocks no longer necessary, and the Congressionally mandated sales for the coming decade have raised concern for just how far down the US SPR might be taken. As highlighted by the IEA's recent in-depth review of US energy policy released last month, should the US further draw down its SPR levels, there could be a challenge to the future effectiveness of the IEA stock system. This is particularly the case in a large disruption, as the US share in an IEA collective action, based on consumption, would be over 40% of the total. As such, we encourage the US to maintain robust SPR volumes to uphold global energy security, even as it transitions to a net exporter of oil.

Recent events also highlight another important trend in the oil market, as an increasing share of Saudi exports is destined for countries outside of the IEA, primarily in Asia. While oil demand continues to grow, and thus the need for increased stock levels, a growing share of the total is in developing countries outside the IEA. Once representing around 75% of global oil demand, IEA countries' current share of less than 50% of global demand is expected to decline to 25% by 2040. As this shows, it is essential that the IEA emergency response system be expanded to countries beyond the current IEA membership, and that these countries build up emergency reserves and join the IEA in its efforts to ensure global oil supply security.

As I mentioned earlier, opening our doors is one of the main pillars of our modernization strategy, and since 2015 we have admitted 8 Association members: China, India, Brazil, Indonesia, South Africa, Thailand, Morocco and Singapore. Today, the IEA countries together with our Association countries once again account for three quarters of global oil use, the same level as when the IEA was created. The IEA is making outreach in the area of oil security one of its highest priorities, sharing knowledge and best practices on strategic oil stocks, and including as many countries as possible in our trainings and emergency exercises. The US, as the largest IEA member, and in particular our colleagues in the SPR office, have a substantial role in this outreach work. Efforts by the US SPR to open up available storage for use by other countries are very welcome, as this can provide cost effective options for countries wanting to build emergency stocks, and it sets the example for countries to consider the benefits of joint strategic stockpiling.

Conclusion

I would like to conclude by underlining that, while the energy world has changed significantly in the 45 years since the IEA's creation, our founding mission to coordinate a collective response to major oil supply disruptions remains as relevant as ever. And even considering a greater emphasis on climate change policies around the world, oil will continue to matter as a critical economic commodity for the foreseeable future. The recent attacks in Saudi Arabia were a sharp reminder that the world can't take oil security for granted, even when markets are well supplied.

On behalf of everyone at the IEA, I wish to once again thank you for inviting me before your Committee. I am happy to answer any questions.

The CHAIRMAN. Thank you, Mr. Sadamori.

We are going to go ahead and begin with questions. I am going to defer to my colleague. Senator Cassidy, if you would like to begin questioning.

Senator CASSIDY. Thank you, Madam Chair. Thanks for holding the hearing.

Welcome to the witnesses. There are two of these sites in my state. So I have, kind of, a hometown interest in this as well.

Mr. Winberg, last year Under Secretary Menezes stated the Department supported legislation I introduced to authorize a pilot program for the Department to lease up to 200 million barrels of future, unused SPR capacity to meet commercial needs. Now you have the authority to lease to foreign governments but not to commercial markets. I understand as well the Department has been working on a SPRO post-sale configuration study to outline how we will maintain readiness in the future. What is the current status?

I will ask you all to be brief because I have lots of questions, and I want to get to the them.

What is the current status of this post-sale configuration study? When will it be published?

Mr. WINBERG. Thank you, Senator.

The post-configuration study will be complete by the end of this year. It's going through some initial internal review.

Senator CASSIDY. Let me ask you.

Mr. WINBERG. Yes?

Senator CASSIDY. Given the support of the Department for commercial leasing, to what extent does the study evaluate the potential for an associated cost and/or profit of commercial leasing?

Mr. WINBERG. That is indeed part of the study, both commercial leasing as well as leasing SPRO assets to other IEA countries.

Senator CASSIDY. Now can you tip your hand and give me a spoiler alert?

Mr. WINBERG. Well I can tell you that for commercial leasing it is going to require a fair amount of capital, because we need to have a brine drive system for commercial operations. I could talk to you about that offline, but it's fairly expensive.

Senator CASSIDY. Okay.

That is odd to me just because it seems as if you are merely using capacity currently used to store oil, but instead of storing it for Great Britain you are storing it for Conoco.

Mr. WINBERG. Right, except in a commercial play what would happen is the private sector would want to inject the oil and remove it on a very frequent basis and those caverns were not designed to do that because they're salt caverns. Every time that you remove oil with fresh water, which is how we do it right now, you start to dissolve around the cavern walls. So that's why the brine drive—

Senator CASSIDY. Is there a way to use a surrogate, for example, CO₂ or something else, to move that would not dissolve the salt?

Mr. WINBERG. Yes, sir, that would be a brine drive system.

Senator CASSIDY. I see what you are saying, but that is more expensive or it is just that you have to make the initial investment?

Mr. WINBERG. You've got to make the initial investment, so it's the capital.

Senator CASSIDY. I am going to ask you another question, but I am going to play off something that Professor Bordoff wrote that in evaluating the future, a cost-benefit analysis must include financial factors and market impacts of SPRO releases under different scenarios. I assume the study will include this sort of analysis as well?

Mr. WINBERG. Yes, absolutely.

Senator CASSIDY. So, Professor, you say that there needs to be an analytically-based usage policy and you, in your testimony, kind of, mention maybe we want to go from national security to how we, in effect, blunt price spikes. But it seems like that is what we are doing already. When the President just tipped and said, I think I am going to release, that calmed down the markets, even though he never released. So are you speaking of something more than what Presidents are doing intuitively, because I think other Presidents have done this as well? If you will, just use it almost as a hedge against price spikes.

Mr. BORDOFF. Well, I think, given how the oil market has changed, when the SPR was created—we didn't have, I mean, now oil is the, I think, one of, if not the most, globally traded commodity in the world—we didn't have that, sort of, liquid commodity market. So at the time, the potential for physical shortages was more real than it is today. Today disruptions manifest themselves as price spikes everywhere. So I think the way in which we are using it today is to smooth those price spikes.

I think it's a question more, there really is a lot of uncertainty and it's very different Administration to Administration. They have a lot of discretion to think about—

Senator CASSIDY. But it seems like they all want to avoid a spike in gas prices.

Mr. BORDOFF. Right.

Senator CASSIDY. And so, they all kind of say, wait a second, if it goes too high, I am going to release a little bit.

Mr. BORDOFF. Yeah, the question is how often one might think about using it. I mean, when we don't think about it as a federal reserve of oil where the government has a role to play.

Senator CASSIDY. So you are thinking of a more formal policy as opposed to, kind of, ad hoc?

Mr. BORDOFF. I think it would be helpful if there was a clearer understanding across Administrations about the rationale and purpose.

Senator CASSIDY. Now the only problem with that is the very fact that you can do it whenever you want to allows flexibility as to when you do it.

Let me ask you one more question real quickly, if I may, Madam Chair?

You also mention that the reserves we have may not be adequate for prolonged disruption implying that our shale play could not ramp up within 26 days, if we have a 26-day reserve independently of that which the refineries have. But I have a sense of shale plays and maybe Dr. Capuano, you could respond to this. They can gin up pretty quickly because, if nothing else, they can just re-frack something which has already been fracked. It is just a question of getting the equipment there.

Now again, you may have pipeline constraints, I gather that. But still, it seems like our swing producers can swing up pretty quickly. Is it not a matter of several weeks in which they could?

Mr. BORDOFF. I think there's a limited extent to which they could. There are drilled but uncompleted wells that may be able to be tapped quickly. I think otherwise you're talking 6, 9, 12 months to bring rigs in, to bring equipment in.

The producers increasingly are hedging production which is very good from the standpoint of their economics but actually makes them a little less elastic, less sensitive to oil price changes because they've had——

Senator CASSIDY. It is like most of those guys are so cash-flow intensive that if it blips a little bit, they are out there pumping.

Mr. BORDOFF. That's true. I think that's going to decline over time as we see more consolidation in the industry and you see players with larger capital——

Senator CASSIDY. Reserves.

Mr. BORDOFF. Ability and reserves that are dominating production.

Senator CASSIDY. I should stop here.

Thank you, Madam Chair, for indulging.

The CHAIRMAN. Thank you, Senator Cassidy.

Senator Manchin.

Senator MANCHIN. Thank you very much. Thank you all for being here.

I have a couple things you may be able to help clear up or explain better to me.

First of all, I noticed our strategic reserves are all located in the same locale as far as geographically. With the mindset of the world today being an upheaval, terrorist type things, also going back to the attack on Aramco, I was able to visit the site and see the precision that it was hit. I was thinking well, somebody has espionage capability and aren't you concerned about people, inside your own organization that may give all this information to the enemy? They looked at me and said, no, it was all Google. They were able to get everything off of Google maps.

We seem to have all our eggs in one basket. That is a concern. The one in Louisiana went down in '99 because of a sinkhole and water infiltration.

Then I am hearing a little bit about well, we can rent this out. I think we did for a budgetary act, one time in our past say that we could lease out to foreign entities if they wanted to store their oil but we don't do that to commercial. If it was a moneymaking scheme, I don't know what our purpose was at that time, policy wise, if someone has that answer?

And very important to me, who makes the decision when to buy and when to sell? It makes no sense to me. It is the stupidest thing I have ever seen and heard in my life. We buy high, sell low, take a loss. Does that go in the national debt? Does OMB score it that way? I mean, none of this makes sense. And the people start asking us how you run this place.

So you can start, whoever wants to start, wherever you want to start. Make sense out of this so we understand there is a purpose for what we do. Are we doing it in the most safe and secure way?

Steve?

Mr. WINBERG. Yeah, thank you, Senator Manchin.

Under my watch I have not bought oil.

[Laughter.]

Senator MANCHIN. Let's make that, for the record, real clear.

Mr. WINBERG. But anticipating somebody might ask the question, we went back and looked and our average price of purchased oil is about \$30.00 a barrel. Clearly, in the last several Congressionally-mandated sales that we've had, we've been significantly above \$30.00 a barrel.

Senator MANCHIN. But your mandated sales were based on budgetary concerns. I think most of your mandatory actions, coming from this body, have been based on budgetary concerns.

Mr. WINBERG. Yes.

Senator MANCHIN. Pay-fors.

Mr. WINBERG. Yes, and also to fund the life extension program. But we auction the oil and it goes to the highest bidder and that's whether it's—

Senator MANCHIN. Why does it take 13 days to get it moving?

Mr. WINBERG. Well, because we need to send out an auction notice. People have to put the bids back in to us. It takes a day or two to—

Senator MANCHIN. I don't mean to interrupt you, but because of time—

Mr. WINBERG. Sure.

Senator MANCHIN. —I want to make sure everybody gets in. But if it is a national emergency, it wouldn't take 13 days, would it? If you had to have it flowing because of a national emergency, would it still be a 13-day cycle?

Mr. WINBERG. Under the directive that we have right now in how we auction the oil off, it would take 13 days. However, under an exchange, if a refinery needed oil immediately, we could do that within a couple of days.

Senator MANCHIN. Okay.

Mr. BORDOFF. I would just add to that, that I think even though it might take 13 days, knowing it is coming, that alone will affect the price today.

So it does have an immediate impact on the price spike as we talked about before, that we're concerned with.

Senator MANCHIN. Do you think we have enough reserves? A 90-day reserve, is that adequate? I know you talked about that, Mr. Bordoff, a little bit and not in a complimentary way.

Mr. BORDOFF. I was making the point that I think, given the fact that what we are concerned about is an impact on oil prices around the world which are reflected in pump prices here at home, regardless of how much we import, that 90 days of import cover doesn't seem like the right metric to me.

The fact that we are about to be a net oil exporter, but the International Energy Agency is here today telling us not to sell our stocks, suggests they don't believe 90 days of import covers the right metric either.

Senator MANCHIN. What is the right metric? Do you all have a suggestion on the right metric we should be using for storage?

Phillip?

Mr. BROWN. We've discussed this at CRS and determining the right size of the SPR is a very difficult task because, as I mentioned in my opening remarks, you don't really know what the size and duration, the duration of a supply loss is a very important element here, and knowing that with any degree of certainty is very difficult.

There are approaches that have been used in the past to attempt to do that, but they're subject to assumptions in order to do that analysis and a lot of them are based off of probabilities that are very subjective in nature. And the other thing is that any small change to any of these assumptions that are used for this analysis are likely to cause pretty major changes to the analytical results.

And there are certain things that are not very easy to predict in the future, such as what commercial stock levels might be at the time of a supply disruption and how that might integrate into the response. And it's also uncertain today, exactly how much stock exists or how much stock might exist in non-OECD countries where we have a lot of information about. However, non-OECD countries it's a much more difficult task to assess the quantity of the reserves that they may or may not hold.

Senator MANCHIN. But you all are in agreement that 90 days is not enough?

Mr. BROWN. I don't have an opinion that 90 days is good or not. I just, I'm not sure exactly how you assess what may or may not be good.

Senator MANCHIN. Mr. Sadamori?

Mr. SADAMORI. From the IEA perspective, as I said, that even for the net exporting countries, the oil security continues to be a very important problem. It is a very important issue.

And if, and I understand that the U.S. spare size is not only determined by the 90 days of net imports. I mean, there's other requirements as well. And in case of actual strategic release actions, when we determine the allocation of the oil stocks be released, it's basically determined based on the size of the consumption of the country. So, in that respect, the U.S. continues to be the largest consuming country among the IEA member countries. So we expect the United States to maintain a substantially robust amount of SPR.

Senator MANCHIN. Go ahead.

Mr. BORDOFF. I was just going to add one additional point which is, I think, when we ask this question and think about what the answer is, we really take a long-term view of that answer, accounting for huge amounts of uncertainty.

So, you know, part of the reason global disruptions have less of an impact on price now is because shale is not only large, but growing very quickly. Shale grew at 1.6 million barrels a day. This next year it will be about 1. At some point we think shale growth will plateau, maybe it will start to decline, we don't know. This is only a ten-year phenomenon.

So I just think we want to account for the uncertainty and not make decisions based on what the world looks like today because we didn't see the shale revolution coming. Things might look different in a decade, and we don't want to wake up and regret action we took today because we didn't see where things were headed.

Senator MANCHIN. Do other countries do the same as we do? Do they have strategic reserves? China? Russia? Saudis? Middle East? Does anybody know that?

Mr. SADAMORI. Even among the IEA member countries, there are various ways to meet the obligations.

So the U.S. depends on the SPR system, nationally-owned systems, but some countries depend on the obligation through the industries to hold certain size of the extra reserves. Some countries, like my home country, Japan, they have both. They have both a national SPR system and the industry obligation. So it depends.

And also, as for China, they have built up a substantial scale of SPRs, but as the previous speaker said, they have not disclosed the full information. So at this moment, there is a kind of uncertainty in terms of how large they own.

The CHAIRMAN. Thank you.

I think this conversation about what is the right metric is really important.

Mr. Bordoff, you mentioned in your comments that it is important for us to really determine what it is that we want the Strategic Petroleum Reserve to do, what is its purpose? Again, recognizing that what we have structured today might not be what we need 20 years from now.

I am going to go ahead and again defer to colleagues here. So, Senator Hoeven, if you would like to join the conversation?

Senator HOEVEN. Thank you, Madam Chairman.

Secretary Winberg, thanks for coming out to North Dakota recently and for your work on CarbonSAFE.

And as we talked, DOE really does need to play a major role in helping our coal-fired electric industry capture and sequester CO₂. And as you know, the key there is partnerships, getting private industry and the states to participate with DOE and get this done.

And it really is, it is just like we are talking about the shale revolution. We cracked the code on the shale play for oil and gas, and it has paid unbelievable dividends.

We have that same kind of opportunity in terms of cracking the code, but we need DOE's help to do it. And in that regard, one of the concerns I have is keeping the process moving. I am concerned about the length of time it takes between these award rounds in terms of slowing the process down, getting this done, everything from the standpoint of even qualifying for the tax credits, 45Q, for example, prior, you know, you have to have construction substantially complete by the end of 2023 in order to qualify for that tax credit.

Can you explain to me DOE's thought process on the timeline for project selection and award funding for Phase III of CarbonSAFE? And explain it to me from the standpoint I think we need to accelerate it. I want to make sure it is done the right way, but I am concerned about the length of time. Can you address that?

Mr. WINBERG. Absolutely.

And Senator Hoeven, thank you for hosting me out in North Dakota. Thank you for your support, of not just storage, but also the carbon capture. We had a great meeting a couple months ago up in your state. And not only your support, but the state's support.

With respect to the CarbonSAFE project, it's right now we've released the request for proposal so it's very procurement sensitive. We made a decision that we wanted to give people additional time to pull together the proposals, and so that is what led us to the proposal timeline that I believe you're referring to. And so, it is, right now, procurement sensitive. So I can't talk about that, but what I can talk about and would like to talk about is the 45Q, which you mentioned.

I could tell you that we are working very closely with Treasury on 45Q and certainly the Department of Energy and Treasury understand the importance of getting 45Q out, getting regulations, at least guidance written, so that industry can take advantage of that tax credit.

Senator HOEVEN. Well, and as you know, we have technological viability. We need commercial viability. And so, there are all kinds of things that go into that including tertiary oil recovery and all that kind of stuff, but you have to match both the ability if you are partnering with these grant rounds and CarbonSAFE with the tax credits, substantial completion, all these other things. So there are a lot of moving parts.

You have a pretty long submission window on this next round which I understand you are being very careful with that. That is fine. But what about compressing the five-month review and selection process afterwards? Does it really take—once you have all the applications, you have a limited number of players you know that are going to come in. Obviously, you have a long submission window so anyone that wants to can get into the queue. Is there any way to compress that selection window then from the five months that you have allocated?

Mr. WINBERG. Again, it's procurement sensitive.

Senator HOEVEN. Well, maybe you could just, again, could you commit to look at the opportunities to expedite the process while still being sensitive to all the requirements that you have to make sure it is done properly, openly, transparently and comprehensively?

Mr. WINBERG. Yes, I can do that.

Senator HOEVEN. Okay, that would be greatly appreciated.

And then, I just wanted to ask about the SPRO.

Mr. Bordoff, if you were running our Strategic Petroleum supply and you could run it just the way you wanted, of course, with the blessing of our Chairman. Seriously, what would you do? How would you set it up? What changes or reforms would you make? What would you do in regard to our Strategic Petroleum Oil Reserve that we, maybe, are not doing right now? What should we consider? You know, like the one, the couple key things we need to have with that reserve.

Mr. BORDOFF. I think that we do need to make sure it's fit for purpose. And so, that means first having a conversation among policymakers across the aisle to make sure we have a clear sense of what the purpose is.

I think there should be a bit more guidance and understanding within Administrations about when it is appropriate to use. Is it in response to hurricanes that take out, you know, a bit of supply here and there, or is this a once in a generation tool that we're sup-

posed to really never break glass in case of emergency? That's very dependent on individual judgment calls now. And once we know that, I think we can make some decisions about how it should be adjusted.

I think we should think more, as has been done recently, about where and when it may make sense to think about the composition of the crude, both in terms of the quality of the crude and then also whether some of that should be in product stocks.

And then in addition, the modernization efforts, I mean, we've seen just your state has been at the center of it, the dramatic changes in which the energy system in the U.S. has changed as a result of the shale revolution. The SPR was designed to deliver crude to Midwest refineries. It needs to do something different now if we want this oil to have an impact on the global market, like getting it on to the water or getting it to the East and West Coast. So that need requires infrastructure investments as well as just modernizing aging infrastructure. That's really important.

Senator HOEVEN. I think you ended up on a very important note. We need infrastructure, and we need to be able to build infrastructure for all energy whether it is traditional or renewable, whether it is pipelines or transmission lines. We have to be able to upgrade this infrastructure. So I think you really ended up on an important point.

Thank you.

The CHAIRMAN. Thank you, Senator Hoeven.

Senator Cortez Masto.

Senator CORTEZ MASTO. Thank you.

Let me follow up on that because I know there was a GAO report, I think it was in 2018, that talked about most of the critical infrastructure for moving SPR oil has exceeded its serviceable life which has led to increasing maintenance costs and decreasing system reliability. And I believe there was discussion about how we modernize our infrastructure there in the SPR with utilizing new technologies. I also understand the DOE had previously estimated the total cost for the SPR's modernization is up to \$1.4 billion.

I guess, Mr. Winberg, my question for you is are there concerns about this maintenance backlog? What are you doing? How are we using new technology or how far have we come in that modernization?

Mr. WINBERG. Yes, thank you, Senator.

Let me start off with the money that is appropriated to us. It's about \$200 million a year for maintenance and operation of the unit.

And I can tell you that the crew, the staff at the SPRO, they're expert in what they do and so, they manage that very well and maintain the system.

Now, having said that, it's over 40 years old so this will be the second life extension program that we're doing which will allow us to continue operating for the next 25 years or so. These are pipes, pumps, loaders. It's not terribly esoteric equipment, but it's very necessary equipment.

And so, we will complete the project design at all four sites in FY20. We're currently budgeted at \$1.4 billion. We have received approval for \$82 million for some long lead time items, and we are

on track to receive final DOE approval on another \$98 million. And these are long lead time items that we need to get on the sites so that when we move into the life extension program, we have the equipment there necessary to move the LE2 program forward. We will begin construction in FY21-22, and we should complete in FY25.

So I'm very confident that over the next year or so we're going to get to a point where we'll have a project baseline put together, and we will also have an independent cost estimate done prior to beginning the construction. So I think we're on track and we're going to be able to manage this LE2 program while we keep the system discharge ready.

Senator CORTEZ MASTO. Thank you, and I appreciate that. I would hope that whatever assistance that you need, that we play a role, that you would reach out to us.

I also understand the Chairwoman has been on top of this issue for purposes of the modernization and making sure you have everything you need. So thank you for that.

Let me jump back to another topic of conversation. Obviously this is something for when we have emergencies and drawdowns. That is not something you can plan or prepare for.

I understand of the previous drawdowns, two of them are related to a foreign conflict, but one was based on a weather event and that was Hurricanes Katrina and Rita in 2005.

Coming from Nevada, I also recognize we are having more and more extreme weather patterns, right? We are seeing more frequent rising threats of climate change.

I guess my question for the panel is, what are we doing in preparation as we see these weather patterns changing? Should we be doing something or what can we do to ensure that we are planning for this in the future, particularly these extreme hurricanes that we are seeing coming through? And I am just curious, is this something that is a thought and part of the planning process to protect this infrastructure?

Please.

Mr. WINBERG. The four sites that we have for SPRO are down in Texas and Louisiana, often called Hurricane Alley.

Senator CORTEZ MASTO. Yes.

Mr. WINBERG. So over the last 42 years, again, our staff is extremely proficient at preparing in the event of adverse weather.

And by way of example, the Big Hill site, under Hurricane Harvey we had 60 inches of rainfall. We had our storm crew onsite, and it was discharge ready through all of that.

We also had a Tropical Storm Imelda where we had somewhere between 30 and 40 inches. So with respect to the SPRO, because it's in an area that has traditionally gotten severe weather, the system was designed for that, the system is maintained for that. And most importantly, our people understand how to manage it and manage it safely.

Senator CORTEZ MASTO. Is there anything that we should be prepared for if we are having these consistent weather events? I mean, these were sporadic at one point in time, but now they are consistent and you are prepared for that or planning for that should they become these consistent weather events?

In other words, listen, I come from Nevada, wildfires used to be an irregular pattern, now they are all the time. And so, I guess my question to you, is that what you are anticipating, these hurricanes or these weather events, extreme wet weather events, are happening all the time?

Mr. WINBERG. Well, again, down in that part of the country hurricanes are reasonably frequent so——

Senator CORTEZ MASTO. So you are prepared?

Mr. WINBERG. Yeah, we're prepared.

Senator CORTEZ MASTO. Perfect. That is all I need to hear. Thank you.

Mr. BORDOFF. May I comment?

Senator CORTEZ MASTO. Yes, please.

Mr. BORDOFF. I was just going to say, I think one question is how to make sure the SPR is resilient against severe weather events. The other is what I said which is the use case for the SPR and we are increasingly going to use the SPR, not only for global supply disruptions but for weather-related disruptions to the oil market which will increase with the impacts of climate change.

I think, first of all, that means taking action to reduce those impacts and address climate change, build up resilience and adaptation. When we see those weather events it also is the case that we're often not tapping our own SPR, we're relying on the international agreement we have with countries with IEA partners and we're bringing those supplies in which help us. I think that's why the cooperation we have with those countries continues to be important.

Senator CORTEZ MASTO. Thank you.

Please.

Mr. SADAMORI. Preparedness against the extreme weather events is now limited to, kind of, single fuel source. In the past cases the oil, the service stations became unfunctional, not because of the lack of oil, but because of the lack of electricity. So the overall electricity systems should be designed more in anticipation and the preparedness for this, the possible extreme weather events.

Senator CORTEZ MASTO. Thank you.

Thank you, Madam Chair.

The CHAIRMAN. Yes, that is a good reminder at the end. It is not just about having the resource, it is how do you get the resource to where it needs to be effective.

This is where I want to go back to you, Mr. Winberg. I appreciate the update that you gave Senator Cortez Masto on the modernization, what is happening with the funding, the allocations, your estimate that you are going to commence the work, FY21–22 with completion in FY25.

You have indicated in your comments this morning that we are at 100 percent drawdown ready. If the President says so, we are ready to go. You talked or walked Senator Manchin through the 13 days and what has to happen with all of that. Are you concerned at all as we move toward this modernization of your ability to be 100 percent drawdown ready? If you are in the midst of this life extension project, is that going to impact our drawdown readiness?

Mr. WINBERG. No ma'am, it will not.

And that has been part of this planning process to do the life extension program to make sure that as we're replacing pumps and valves and pipes and so forth and control systems, that we're doing it in a way that the system still remains 100 percent drawdown ready.

The CHAIRMAN. Okay. That is part of your proposal moving forward there?

Mr. WINBERG. Absolutely.

The CHAIRMAN. With the sales that we have seen or the drawdowns that we have recently had, have we been able to demonstrate what we advertise which is basically that we have a 4.4 million daily drawdown capacity? Have we proved that out or is this just what we think we can do on paper?

Mr. WINBERG. We have not had the need recently to discharge 4.4 million barrels a day, but we are, across the four sites, we have discharged through Congressionally-mandated sales. In fact, we have a 10 million barrel sale underway right now. And so, the equipment is being tested, if you will, it's being operated, it's being utilized. So our confidence level is quite high.

Also, we take a look at this every year when we do an internal study to make sure that the systems are ready to operate as they're called on to do.

The CHAIRMAN. Well, let me ask about the systems and then I would ask for feedback from others on this because it is not just, do we have the actual commodity in the reserve, it is how we move it. It, kind of, goes a little bit to what Senator Cortez Masto and what you, Mr. Sadamori, ended with in terms of, you have to have the electricity if you have an extreme weather event. It is not just having the reserves. It is how do you move it. And we know we have significant infrastructure limitations in many of these areas, whether it is port capacity to move the product or whether it is pipelines that are already at their full capacity that could affect the efficient drawdown. That is why I asked the question whether we have actually been able to demonstrate, because it is one thing to just theoretically turn the valve and say, okay, we are ready to go. It is another thing to see it move through the system.

I would ask any of the rest of you to comment on this. Mr. Winberg is expressing a fair degree of confidence that we can do this but do we have, whether it is infrastructure, bottlenecks or other bottlenecks that cause, give you concern or pause in the representation that we are truly ready.

I will let you go, Mr. Winberg, and then we will turn to the others.

Mr. WINBERG. Okay, thank you.

I think there's two different issues here. One, is the equipment physically ready to start a drawdown?

The CHAIRMAN. Right.

Mr. WINBERG. And that I have very high confidence about.

The CHAIRMAN. Right.

Mr. WINBERG. You touched on another issue which is that with the significant increase in oil production in the United States taking us to a net exporter, the system which is the heart of it is down in the Gulf of Mexico. So the pipes and the terminals, they're full. Now some people would say, if you want to look at this negatively,

you'd say, well if the system is full then the SPRO can't discharge. And that's true. However, if the system is full, the SPRO doesn't have to discharge. And as the system starts to become less full, as crude oil is moved either offshore to where it's needed or to refineries or around the world, then the SPRO can backfill to keep the system full.

And so, when we had the attack in Saudi Arabia, that's one of the first things we looked at is how are we going to manage this if we're, the United States, now is starting to move crude oil to other parts of the world and what role does the SPRO play and the SPRO simply backfills and keeps the system full so it can continue to distribute.

The CHAIRMAN. I appreciate that.
Other comments?

Mr. Bordoff.

Mr. BORDOFF. I'd just make one comment.

The impact of the SPRO on restraining oil price spikes is not only because of the physical barrels that reach the market, it's because of the impact the SPR has on market perception and on the activities and behaviors of commercial and financial participants in the market. And that's why, I think, the question you're raising is so important.

After the attack at Abqaiq, if you read the media reporting, you saw there was a huge amount of skepticism among market participants about whether we could actually get to 4.4 million barrels a day. So I hope that we can. And I think it would be important to demonstrate that in order for the SPR to have its maximum potential impact.

The CHAIRMAN. Mr. Sadamori, would you agree that that would be helpful if it was to be fully demonstrated or is it necessary?

Mr. SADAMORI. Of course, the market expectation is very important in terms of the impact on the market in the case of actual disruptions but, of course, I believe that it's up to the Department of Energy in terms of how to implement that.

The CHAIRMAN. We appreciate that.

Let me turn to Senator Lee.

Senator LEE. Thank you very much, Madam Chair. It is a pleasure to be with all of you.

I want to start with Mr. Brown, if possible.

The conversation this morning, from what I have been informed, has been focused on arguments about the Strategic Petroleum Reserve's ability to serve as an effective deterrent against oil embargoes.

That was the intent behind the SPR and its creation in the first place back in 1975. However, we cannot discuss the SPR without talking about how the Reserve has been abused by Congress as a, sort of, piggy bank to fund a variety of programs, a variety of programs completely unrelated to maintaining our country's energy security. How many times has Congress used the SPR as a pay-for in recent years?

Mr. BROWN. Senator, there have been seven bills since 2015 that mandate the sale of crude oil.

One of those, the Bipartisan Budget Act of 2015 also included a provision that authorizes up to \$2 billion of crude oil sales from the

SPR in order to pay for the modernization program. And right now, about \$900 million of that has been sold and there is a bill that currently would allow another \$450 million to be sold in Fiscal Year 2020.

Senator LEE. So when you add all those up, you say that one of those alone, the bill in 2015 that you referenced, amounted to about \$2 billion?

Mr. BROWN. That was one of two SPR-related provisions in the bill and it authorized up to \$2 billion between Fiscal Year 2017 and Fiscal Year 2020. And if the bill that has passed the House and has been cleared through Committee in the Senate, if that passes the full Senate and is enacted, the total sales will be around \$1.4 billion. So it will be less than the \$2 billion authorized.

Senator LEE. Okay.

But how much overall, when you add up all these provisions, how much money has this amounted to?

Mr. BROWN. Let me see, I think I actually—

Senator LEE. But we are talking about billions.

Mr. BROWN. Oh, yes, yes, it is.

So in terms of the, you know, I actually don't have the dollar value for the mandated sales.

Senator LEE. That is okay.

Mr. BROWN. We simply have the dollar value for the modernization sales.

Senator LEE. Got it.

Mr. BROWN. But we can track that balance for you.

Senator LEE. Would you say that this is on the increase, though? Has Congress been using it more frequently in recent years than it had in the past?

Mr. BROWN. It's a bit difficult to say. I mean, of the seven bills since 2015, three were in the 114th and four were in the 115th Congress.

Senator LEE. Do you think Congress' use of the SPR as an unrelated pay-for has the ability to undermine the SPR and undermine the SPR's ability to play the role it was intended to play in foreign policy?

Mr. BROWN. Unfortunately, Senator, I'm not really able to comment on that particular question.

The SPR has simply been, is being drawn down. One of the stated statutory objectives in the code is to provide or participate in the international energy program which is a net import metric and it's clearly covering that. But the other provision to protect from supply disruptions still remains. So there's still a reason or a statutory reason to have it. The optimal size and configuration is a bit unknown at this point.

Senator LEE. Okay. I appreciate both your candor and your deference there.

I will state for the record, my view is that if we are going to have the SPR, we need to use it as such. If the SPR is too big, if it is bigger than what we need, or if we don't need it at all, we, as a Congress, ought to make that determination. But to say that we need it and to have it set up in the way that it is, but then continually draw it down sends the opposite message.

Mr. Winberg, it is my understanding that the SPR was created to protect the U.S. from foreign countries leveraging our need for imports against us. Is this correct?

Mr. WINBERG. Yes.

Senator LEE. Of course, it is not 1975 anymore. Bell bottoms aren't popular. A lot of things have changed, including the fact that the U.S. is poised to become, if things continue the way we want them to, a net petroleum exporter. If the 1975 assumptions that led to the creation of the SPR in the first place are no longer relevant, should Congress reconsider the need for an appropriate level of operations of the SPR?

Mr. WINBERG. I think that the appropriate level of the SPR is something that we, as a country, need to continually consider because, as you correctly pointed out, the world is changing. We are now a net exporter of oil.

However, it's still a world oil market, and I think that the attacks on Saudi brought people back to that point. We didn't need to discharge from the SPRO but had the attack been more severe or longer lasting, we may very well have had to.

Again, it's an insurance policy in some respects and it's hard to know exactly how much insurance you should buy, how many millions of barrels of oil we should be storing, but we have the asset and what I can tell you is that we are going to do everything we can to maximize the value of the asset to the taxpayer.

Senator LEE. Madam Chair, could I ask one additional follow-up to Mr. Winberg?

If you were emperor for a day and you could make the policy changes that you think need to be made, are there any particular changes you would make to the SPR or the way it is run if you were vested for a day with the authority to do that?

Mr. WINBERG. Well, that's a hypothetical question.

If I was emperor for a day I would probably try and speed up the life extension program.

Senator LEE. Okay.

Mr. WINBERG. Just so that we can get that completed.

Senator LEE. Great.

Thank you very much.

Thank you, Madam Chair.

The CHAIRMAN. Thank you.

That is why I think it is important that we be engaged in monitoring how you are coming with that, making sure that it is appropriately resourced and that the proposal for the modernization proceed as we have all assumed that it would.

I wanted to ask about the discussions about the SPRO locations that we always talk about being down in the Gulf. And Senator Cortez Masto pointed to the fact that with more extreme weather events you are seeing concern because you have these reserves, these strategic assets, that are located, oftentimes, right in the path of some of the worst of these events.

We all know that there have been discussions about the opportunity for additional SPRO locations whether they be on the West Coast, the East Coast or elsewhere. Nobody has really mentioned that as part of today's discussion and whether or not in order to

strengthen the SPRO to ensure for this level of security that we need to, kind of, spread the wealth around a little bit.

If I can have any of you speak to your thoughts on whether or not that is an important part as we look to the future of the Strategic Petroleum Reserve.

Mr. Winberg.

Mr. WINBERG. With respect to crude oil, the heart of petroleum production and shipping is in the Gulf of Mexico along the Gulf Coast there. So I think that the SPRO is positioned right where it needs to be positioned. Oil is flowing different directions than it was a dozen years ago, that's pretty clear, but the infrastructure is there, the pipes and the terminals. That's where it resides. And so, notwithstanding the fact that it's in Hurricane Alley, it has proven itself, the SPRO has proven itself to be worthy to the task, even under hurricane situations. So I do tend to think that it's positioned correctly. Also, because these caverns are built, the SPRO infrastructure is there, it's probably the least cost insurance—

The CHAIRMAN. How about for refined products then, refined product storage capacity? It is a different issue.

Mr. WINBERG. It is, and we've got the Northeast gas reserve and that's a very expensive reserve for us to have.

The CHAIRMAN. Are you suggesting that we don't need similar reserves in other areas?

What is your view on—

Mr. WINBERG. I think we don't. I think we don't need product reserves in other areas and for this fairly simple reason—when a hurricane comes in or a tropical storm or other weather event, people are leaving. So the roads, just practical issues, start to emerge. Roads are one-way roads because people are leaving that area. When the storm subsides or it goes away, then we need to refill the retail tanks at the local convenience store and gasoline store. The gasoline is available to do that.

What we're doing right now is we're leasing space, commercial space, for these gasoline reserves. So that space would be filled with gasoline in any event, whether the government was doing it or not. So I tend to think that the crude oil is, that's the pinch point. Refined products, generally, we're in pretty good shape there. That's my view.

The CHAIRMAN. Other views or comments on the regional aspect?

Mr. Bordoff.

Mr. BORDOFF. I'd just say on your first question about the location, I think that is a part of it. We are trying—in order for the SPR to be effective, we want those barrels to get into the global market and on to the water. I think I agree with Assistant Secretary Winberg, the Gulf makes sense. That's why we need to make sure the port capacity and the infrastructure and the modernization exist.

The second thing I would say is that in order for it to be—we should always remember that the SPR is not just a U.S. tool, it is an internationally-coordinated tool and that's when it works best, especially when we're trying to respond to something like hurricanes.

I was in the Administration when we released during Libya, and that took a long time. The Libyan oil outage was in February. We

didn't release until June because it took a really long time to coordinate with the other IEA partners. I think if you can do more diplomacy and more work in advance, so that happens quicker, that will make the SPR a more effective tool.

On the question of refined product reserves, I think the answer really is very location specific. There was a DOE draft study in 2011 that found net benefits from it, looking along the southeast where you have pipelines going up from the Gulf and several regions that, you know, were hit very hard when there was an incident in the Gulf, you could line up stocks along that pipeline.

But as we heard Mr. Sadamori say, these are only effective if the electricity is there. I mean, it really just depends on the location that you're talking about. It's a higher cost proposition to hold them and it potentially crowds out more private stocks than crude stocks do. So we need to look very specifically at where it might make sense and where it might not.

The CHAIRMAN. Yes. Mr. Sadamori, can you comment to Mr. Bordoff's point there about the ability to work with our international partners to make this more effective?

Mr. SADAMORI. And so, our, the IEA system is based on the concept of solidarity in case of emergencies and the many countries have different set mixes of reserves. Some countries obligate the industry to hold both the crude and products and the, kind of, system, the system requirement depends on the shape of the whole oil supply chain.

So if a country believes that their refining capacity is robust and the crude is the best way to keep it, then I think that's, kind of, a reasonable judgment. But some of the European countries, in particular, some, if you take a look at the specific countries, there are countries without the substantial capacity of refining, and for those countries, they need to keep oil in the form of products, not in the form of crude.

And also, it depends upon the, how the environment changes. So, for instance, Japan experienced a very, a difficult situation with lack of products because their refining capacity also went down with the earthquake. And based on that experience, they started rather limited product reserves controlled by the country. So I think that it all depends upon the requirement based on the shape of the supply chains.

The CHAIRMAN. That somewhat begs the question then about how much coordination.

You said that really the strength of the model here is the solidarity, everybody understanding, kind of, what the needs would be and how then you are best able to respond. Do we have that? Do we share fully the information from country to country? I mean, obviously, the issue of what is the real spare capacity out there. We know with some countries they are not necessarily an open book on that, but for the most part, do you believe that we have this level of transparency so that we are as effective as we can be?

Mr. SADAMORI. At least as far as the IEA members are concerned, we fully share the relevant data among the member countries.

So in the case of the actual disruptions, we can work together looking at what kind of reserves exist in terms of the qualities or the amount.

But the question is the share of the IEA member countries in the global market has been going down——

The CHAIRMAN. Right.

Mr. SADAMORI. ——and that's the reason why we are trying to reach out to non-member countries and they would like to get, kind of, more involvement cooperation with them. But there's, of course, kind of, a difficulty, in terms of the information sharing with non-members.

The CHAIRMAN. Can you expand a little bit on that in terms of the efforts to grow this membership? Are you being successful? Is there interest by these other countries to be a participant?

Mr. SADAMORI. Well, in 2015 at the IEA Ministerial Meeting, we started the status of what is called the association countries and that's based on the initiative of the current, the Executive Director, of what he calls the opening doors of the IEA to major emerging economies. And right now, there are eight association countries like China, Indonesia, India, Brazil and South Africa, you know, those major emerging countries are part of the IEA's family, the association. But of course, they're not the members, so we have been trying to evolve them in terms of the emergency response exercises and also undertaking the capacity building initiatives so that they have an understanding of the need of the systems and how they should work. Of course, this is not easy. This is very challenging. But we are trying to get them more involved.

For instance, in case of the actual disruption and at the time of the joint strike release, we hope that the association countries, at least, take a somewhat, kind of, consistent actions. So they may not be able to actually contribute the oil, but they can start building up or buying up the oil in the market. So we are trying to enhance this, kind of, the cooperative relationship with the non-member countries as well.

Thank you.

The CHAIRMAN. I appreciate that.

I want to end my questions with going back to a little bit of the conversation we had about metrics and different ways to measure supply security. I guess just an open question to any of you is whether, through the Department or whether EIA should be assessing supply security vis-à-vis the SPRO and given that we are moving considerably in this direction as an energy exporter, the IEA reserve requirements really are not, technically, applicable. Several of you have mentioned that. Are there other alternatives in terms of measurements that we should be focusing on?

Dr. CAPUANO. We're always—EIA will always entertain data that would be helpful.

Right now, we measure production. We know the pipeline capacities so we know where the production is moving into the pipelines. So we can provide that data to DOE to calculations and understand how to respond in the event of a disruption.

So we keep track of the available data in the United States plus we have a partnership with, as a member of IEA, we exchange data with them, provide them our data and they provide us the

data they get, but we also go to independent sources to be able to verify and validate what's going on. So we're very active.

I don't have something on the table that we want to ask for, but I'm very open to any suggestions from this group.

The CHAIRMAN. I guess it is, metrics are those, as you have outlined, the hard numbers, what is the production, what is the volume?

I am just wondering if we factor in less tangible matters like the political climate, some of the things that are really far more difficult to measure, but clearly have an impact on what is happening with world oil supply?

Mr. BORDOFF. I would just say I think the reason maybe we're struggling to answer, at least I am, is because it does tie back to a comment I made earlier about first understanding what we want the SPR to do. And if you intend the SPR to mitigate against, you know, a few days or a week of a weather-related disruption, you probably don't need 700 million barrels. If you want to deal with the Strait of Hormuz being blocked for a few months, you need a lot. It's either way too big or way too small, depending on what we want it to do and we need to think about it in an internationally coordinated context.

I think that's why I, sort of, tried to frame it by saying I think the burden of proof is on those who want to sell this down that we've held for a long time.

I think I, to Assistant Secretary Winberg's point, think of it as an insurance policy and I try to place a little bit higher premium on that and would be a little more risk averse and cautious, accounting also for the amount of uncertainty we have today about what the future is going to look like in terms of U.S. production or geopolitical risk, I think, and the amount of economic harm we're willing to absorb.

Of course, markets will respond to disruptions. So the question we have to ask ourselves is are we okay with consumers bearing that cost for weeks or however long it takes for the private sector to respond, and I think that's a collective decision we need to make. And I think, for me, a larger buffer probably makes more sense, but there's no quantitative way to precisely assess that.

The CHAIRMAN. I think this is part of our problem because people that do not sit on this Committee do not really pay much attention to the SPRO other than that they know that it is this reserve that we have back there. It is basically liquid money in the bank, so to speak. And since we are reducing our reliance on oil, globally, or at least, we are not doing it globally, but here in this country, okay, we don't need so much or we don't need to have an insurance policy that is as big as we have. So it is always a challenge for us.

Whether it is fending off other lawmakers who are looking to utilize it as a pay-for, for very valid causes, curing cancer, or whether it is an Administration that is trying to take some of the political sting out of rising prices at the pump, we who are informed about this need to have something that we can, kind of, cite to, to say no, this is a dangerous direction to go.

In Senator Lee's query to you, Mr. Brown, about how much have we seen drawn down of recent years and isn't that more than we used to do? I think your analysis, of course, is correct in terms of

what we have seen since 2015, but there was a time when we left things alone and didn't think about it as a pay-for for something totally unrelated.

I think, as policymakers, we go down a dangerous path assuming that we still need this, assuming that we still view this as a security asset for this country. And if we do, then we better treat that asset respectfully. If we don't think we need it anymore, then we should do what Senator Manchin is proposing and make sure we sell it off at a time that we can make the most money possible. I am not suggesting that, by the way, just to make clear.

But I think as we think about the metric or the metrics and what goes into it, it is part of a broader conversation and it's not as easy as people would think. All you need is the 90-day supply and we are fine, we are good.

I appreciate that you have outlined, Mr. Bordoff, a few things that we should be looking at. I know that those were your ideas, if you were king and could direct the SPRO as you would, but making sure it is fit for purpose, the guidance on the use, the composition of the crude and the whole modernization issues.

I do think that guidance for use is something that has been as clear as mud, in my view. It gives great discretion and, in fairness, I want the President to be able to utilize that in event of an emergency and I think we were prepared, he was prepared rightly after the target hit in Abqaiq. I think that the response that we saw demonstrated exactly why it was so important to make sure that we have a viable SPRO. And it was interesting because some of my colleagues in comments to the press suggested this is exactly why we need to repeal the oil export ban. I am still muddling over that as a suggestion. But I think what we saw was others viewed the capability of the United States to respond as real. It was meaningful and that is a significant and, I think, an important message from a security perspective.

I know we haven't spelled out, okay, what the new metric is, but I think we have, again, raised the issue of the SPRO and why it continues to be relevant today. I would challenge those who think that well, because of climate change and the push to move ourselves off of fossil fuel, we don't need a SPRO. Probably until my lifetime has come and gone, I think, we are still going to be in that position where we will need it and we will want it.

So I thank you for your contributions to the discussion. I do take very seriously the life extension project that is underway, the modernization, as we call it here, I think that is an important part of what has to happen. And I did think that was one of those areas where it made sense to sell that off in order to address what we know is an aging infrastructure and making sure that it functions.

I still worry about our ability to actually demonstrate it throughout the full stream because we never know when we are really, truly going to need it and we definitely want to be able to demonstrate that it works, the efficacy.

So thank you for contributing. If you have additional insights that you would like to share with us, we would certainly appreciate it.

Know that this is something that this Committee is going to continue to be following and monitoring very, very carefully.

We appreciate your attendance and your thoughtful words this morning.

With that, the Committee stands adjourned.

[Whereupon, at 12:20 p.m. the hearing was adjourned.]

APPENDIX MATERIAL SUBMITTED

U.S. Senate Committee on Energy and Natural Resources
October 17, 2019 Hearing
The Status of the Strategic Petroleum Reserve and Related Energy Security Issues
Questions for the Record submitted to the Honorable Linda Capuano

QUESTIONS FROM CHAIRMAN LISA MURKOWSKI

Q1. Are you aware of standards or metrics that non-importer IEA countries or non-IEA exporter countries use to manage government reserves to support exports, price stability, or other oil market related impacts to their countries? Or that such countries require industrial producers to maintain? Could you share a summary of these approaches?

A1. In many non-IEA exporter countries, we see government-led management of oil reserves through national oil companies (NOCs). For example, members of the Organization of Petroleum Exporting Countries (OPEC) hold reserves that are managed by each countries' NOC. In these countries, transparent and accurate data on stock availability and metrics can be lacking. Saudi Aramco, Saudi Arabia's NOC, manages roughly 172 million barrels of crude oil stocks (as of the end of August 2019) domestically and abroad. Saudi Arabia is one of the largest non-IEA holders of crude oil stocks, aside from China and India. Many of these countries also heavily subsidize domestic petroleum product prices, thus insulating their domestic markets to price spikes, but exposing the government to oil price risk when prices rise and fall.

EIA is not aware of standards and metrics that non-importer IEA countries use to manage government reserves. For example, Canada does not have a strategic petroleum reserve (SPR) held by the Canadian government. However, the industry holds commercial crude oil stocks to ensure sufficient volume to operate domestic refineries and to retain sufficient inventories to ensure operational crude oil export capability. Some of the commercial crude oil stocks are held in pipelines (referred to as pipeline fill). Similarly, Norway and Mexico, the other non-importer IEA countries also lack SPR, but they both hold commercial inventories to ensure continuity of exports and refinery operations.

Q2. Are Australia, Canada, and Mexico capable of sufficiently responding to an IEA emergency response?

A2. Australia and Mexico are net importers of crude oil and petroleum products, while Canada is a net exporter. Consequently, these countries' challenges with emergency response varies significantly. EIA has published Country Analysis Briefs (CABs) for [Australia](#), [Canada](#), and [Mexico](#) and the CABs examine in great detail each of the countries' energy sectors, which may help with informing

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policymakers when answering this question. However, EIA does not have sufficient insight into IEA emergency response requirements by these countries.

- Q3. At the hearing we discussed the range of complex and uncertain factors, both quantitative and qualitative, that go into the concept of petroleum supply security – including physical access, price fluctuations, infrastructure access, refining capacity, etc. We also discussed that the U.S. is still directly affected by price and supply variability in global oil markets, even as our role as a “net importer” is rapidly changing and the metric of “days of net imports” becomes less applicable to measuring U.S. supply security. Could you summarize key policy areas, data, or metrics, aside from “days of net imports” that you believe Congress could or should consider when assessing U.S. supply security?
- A3. The United States’ position in global oil markets has undergone a significant shift in recent years. As recently as August 2006, U.S. imported 13.4 million barrels per day (b/d) more crude oil and petroleum products than it exported. Over time, U.S. net imports decreased significantly as U.S. crude oil production displaced some of the imports, and U.S. production of petroleum products far exceeded domestic consumption, resulting in growing exports. We have documented in a recent [Today in Energy](#) article that the United States became a net exporter of crude oil and petroleum products in September 2019, with net exports averaging 89,000 b/d during the month. This is the first month that the United States exported more crude oil and petroleum products than it imported, based on records of crude oil and petroleum products started on an annual basis in 1949 and on a monthly basis in 1973.

However, while U.S. net exports are expected to grow and average 570,000 b/d in 2020, the volume of trade underscores that the United States is integrated in the global oil market. In September 2019, U.S. gross exports of crude oil and petroleum products averaged 8.8 million b/d and gross imports averaged 8.7 million b/d. Thus, total U.S. petroleum trade was 17.5 million b/d, compared with total petroleum consumption of 20.2 million b/d.

EIA publishes a number of data series that may assist policymakers in developing metrics that define energy security. One such data series, for example, are EIA’s import and export data. EIA also publishes a number of other useful series, including [U.S. commercial inventories of crude oil and petroleum products](#), [U.S. crude oil production](#), [U.S. demand for crude oil and petroleum products](#), [sources of imports and destinations of exports](#), [international liquid fuels supply and inventories](#), among many others.

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QUESTIONS FROM RANKING MEMBER JOE MANCHIN III

- Q1. Congress has enacted 7 laws since 2015 that mandate the sale of crude oil from the Strategic Petroleum Reserve. If Congress continues to authorize oil sales in this manner, it needs to be in a way that optimizes the potential revenue of this legislative choice to ensure taxpayer fairness. We have a history of buying high, such as during the late 1970s and 2000s when prices were peaking, and then selling low. How do we protect ourselves from making sales from the Strategic Petroleum Reserve at a loss for these elective purposes? What are the real value net revenues or losses been from these sales?
- A1. EIA has not conducted analysis related to SPR's cost of crude oil and revenues resulting from various sales. However, DOE Assistant Secretary Steve Winberg, who testified alongside Dr. Capuano, received this same question, and, EIA respectfully refers Ranking Member Machin to his response.
- Q2. Some of the enacted legislation mandating the sale of crude oil from the Strategic Petroleum Reserve dictates an amount of sales to be made based on a set dollar revenue and others in terms of number of barrels. Does this legislative choice make a difference in terms of the potential real value revenue gains or losses?
- A2. Generally, the choice of whether to complete Strategic Petroleum Reserve (SPR) sales based on set dollar revenue or number of barrels may have an effect on the revenue of an SPR sale. The oil market is volatile, so timing can affect the price at which the oil is sold from the SPR. Global crude oil prices are affected by many factors, including geopolitical events abroad, oil supply disruptions, news about economic growth, and weather.

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QUESTIONS FROM CHAIRMAN LISA MURKOWSKI

- Q1. You mentioned the significant costs of maintaining refined petroleum product reserves – could you share a summary of this program, its budget and operational expense, and how the reserves have operated and been utilized since their creation?
- A1. The Department of Energy (DOE) maintains two refined petroleum product reserves – the Northeast Home Heating Oil Reserve (NEHHOR) and Northeast Gasoline Supply Reserve (NGSR).

Northeast Home Heating Oil Reserve

In 2000, in response to the sharp spike in home heating oil prices in the northeast during the winter of 1999- 2000, President Bill Clinton directed the Department of Energy (DOE) to establish a two million barrel emergency reserve of heating oil to create a buffer large enough to allow commercial companies to compensate for interruptions in supply during severe winter weather. In 2011, the NEHHOR was converted to a smaller, one million barrel reserve storing Ultra-Low Sulfur Distillate Heating Oil (ULSD-HO). ULSD-HO is exactly the same product as ULSD-Diesel Fuel being distinguished only by being dyed red to indicate that it is not for highway use. The NEHHOR is physically located in Revere, MA; Groton, CT; and Port Reading, NJ.

DOE’s current NEHHOR contract includes Contractor-Owned, Contractor-Operated storage services to receive, store, and ship U.S. Government-owned ULSD-HO.

- ULSD-HO under normal storage conditions will have an effective shelf life of six to twelve months.
- Average yearly cost to maintain the NEHHOR is approximately \$10 million (\$9.2 million for leasing and \$800,000 for DOE support such as information technology and quality control and analysis).
- The product acquisition cost of the one million barrel NEHHOR was approximately \$138,022,537 (based on 2011 NYMEX market prices [~\$3.28/gal]). As of November 2019, the JAN 2020 NYMEX market futures price for ULSD-HO was approximately \$1.91/gallon, making the current NEHHOR inventory market value approximately \$80,200,000 (\$57,822,537 less than its initial acquisition cost).

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The NEHHOR has only been used once, but not for its intended purpose to compensate for a disruption in home heating oil supply. In 2012, NEHHOR diesel fuel was authorized for release by President Obama to provide fuel for emergency equipment and buildings, including electrical generators, water pumps, GSA buildings, trucks and other vehicles in the aftermath of Hurricane Sandy.

Today, the NEHHOR provides about 2½ days supply of emergency home heating oil stocks at current consumption rates, thus its utility is extremely limited in the event of a home heating oil supply disruption. Additionally, it’s very likely a supply interruption event would also have an effect on distribution capability. NEHHOR provides no protection against an interruption in home heating oil distribution capability.

Northeast Gasoline Supply Reserve

In 2014, DOE established the NGSR containing one million barrels of gasoline as a response to Hurricane Sandy in 2012, which caused heavy damage to New York Harbor area refineries, resulted in widespread power outages, left more than 40 terminals in New York Harbor closed, and left some New York gas stations unable to distribute fuel for as long as 30 days. This reserve is intended to supplement the Northeast with additional supplies of gasoline for a limited time period in the event of a natural disaster or other disruption until existing distribution infrastructure can return to normal operations. The NGSR is physically located in South Portland, ME; Revere, MA; and Raritan Bay, NJ.

DOE’s current NGSR contract includes Contractor-Owned, Contractor-Operated storage services to receive, store, and ship U. S. Government-owned gasoline.

- Gasoline under normal storage conditions (before blending with ethanol) will have an effective shelf life of three to six months.

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- Average yearly contract cost to maintain the NGSR is approximately \$20.5 million (\$20 million for leasing and \$500,000 for DOE support such as information technology and quality control and analysis).
- The cost of the one-million barrel NGSR initial product acquisition was approximately \$121,906,638 (based on 2014 market prices [~\$2.91/gallon]). As of November 2019, the JAN 2020 NYMEX market futures price for regular gasoline was approximately \$1.64/gallon, which makes the current NGSR inventory market value approximately \$69,000,000 (\$52,906,638 less than its initial acquisition cost).

Since its creation in 2014, the NGSR has never been utilized and has cost over \$100 million to maintain/operate over that time.

- Q2. Would the Department consider including an analysis of additional, geographically diverse Strategic Petroleum Reserve sites in its upcoming reconfiguration report?
- A2. While the Department is open to considering new analyses of additional, geographically diverse Strategic Petroleum Reserve sites, such analysis is outside the scope of the SPR Post-Sale Configuration Study (currently in departmental review). Because the size of the SPR will continue to shrink dramatically over the next nine years due to laws mandating the sale of nearly 42 percent of the Reserve, reducing the inventory from 695 MMB to approximately 400 MMB in 2028, the post-sale configuration study, considering both the program mission and benefits to the U.S. economy, is written to address options for the substantial excess storage capacity of approximately 307 MMB that will exist at the conclusion of the sales.
- Q2a. And in other Department reviews and analyses?
- A2a. In light of changed U.S. and global petroleum markets, the Department is considering how best to leverage this national security asset to carry out its mission to protect the U.S. economy from severe petroleum supply disruptions and meet U.S. obligations under the International Energy Agency program. In the course of these evaluations, both the program mission and benefits to the U.S. economy will be carefully considered in determining the future state of the SPR.

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- Q3. Please provide a detailed timeline of milestones achieved and expected in the SPR modernization program, including life extension projects.
- A3. The planning and execution cycle for DOE capital asset projects follows a series of five sequential approval milestones, referred to as Critical Decisions, which correspond with the natural progression of a project. Each Critical Decision (CD) marks an authorization to increase the commitment of resources by DOE and requires successful completion of the preceding phase or CD.

Timeline of milestones completed by the Life Extension 2 program as of December 5, 2019:

Milestone	Completion Date
CD-0, Approve Mission Need (a need that cannot be met through other than material means)	October 2015
CD-1, Approve Alternative Selection and Cost Range (the selected alternative and approach is the optimum solution) • Completion of project definition phase and conceptual design • Covers all 4 sites: Bryan Mound, Big Hill, West Hackberry, Bayou Choctaw • Approved cost range \$750 million -- \$1.4 billion	December 2016
CD-3A, Approve Start of Construction/Execution – Approve Procurement of Long Lead Equipment • Approval allowed for release of construction funds so projects could proceed with construction related procurements • Bryan Mound scope (\$2.36M) – Purchase pipe, heat exchangers • Big Hill scope (\$24.83M) – Purchase pipe, heat exchangers, meter station • West Hackberry scope (\$3.75M) – Purchase pumps, heat exchangers	July 2017
CD-3A/B, Approve Start of Construction/Execution – Approve Procurement of Long Lead Equipment • Approval allowed for release of construction funds so projects could proceed with construction related procurements • CD-3A Bayou Choctaw scope (\$14.4M) – Purchase pumps, motors, sewage treatment plant, etc. • CD-3B Bryan Mound scope (\$1.3M) – Purchase pumps, motors • CD-3B Big Hill scope (\$7.7M) – Purchase pumps, circuit switchers • CD-3B West Hackberry scope (\$15.5M) – Purchase pumps, well-heads, casing materials	November 2018
CD-3B/C, Approve Start of Construction/Execution – Approve Procurement of Long Lead Equipment and Site Prep	October 2019

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• Approval allowed for release of construction funds so projects could proceed with construction related activities and procurements • CD-3B Bayou Choctaw scope (\$36M) – Purchase degas modules, high speed barrier; upgrade bridges, install secure WiFi • CD-3C Bryan Mound scope (\$17M) – Purchase entry portal equip & high speed barriers, valve actuators; construct laydown area, install secure WiFi • CD-3C Big Hill scope (\$16M) – Purchase valve actuators & motor-operated valves, high speed barriers; construct laydown area, install secure WiFi • CD-3C West Hackberry scope (\$29M) – Secure well drilling contract; purchase valve actuators & motor-operated valves, high speed barriers; construct laydown area & cavern dike mods; install secure WiFi	
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Timeline of expected future milestones as of December 5, 2019:

Milestone (Future)	Expected Completion Date
CD-3C/D, Approve Start of Construction/Execution – Approve Procurement of Long Lead Equipment and Site Prep • Approval will allow for release of construction funds so projects can proceed with construction related activities and procurements • CD-3C Bayou Choctaw scope (\$2.6M) – Purchase Degas UPS, flow meters, valves, oil/water separator, well heads, security drop arm barrier • CD-3D Bryan Mound scope (\$17.7M) – Purchase valves, flow meters, well heads; modify levee crossing • CD-3D Big Hill scope (\$17.1M) – Electrical work, road improvements, construct vehicle entry checkpoint, motor control center work • CD-3D West Hackberry scope (\$18.9M) – site prep for cavern expansion, purchase/install valves, construct vehicle entry checkpoint; purchase flow meters, fire hydrants, pipe, well heads	June 2020
Complete Project Design (Bryan Mound, Big Hill)	October 2020
Complete Project Design (West Hackberry, Bayou Choctaw)	January 2021
CD-2, Approve Performance Baseline (approval of the preliminary design of the project and the baseline scope, cost, and schedule)/ CD-3 Approve Start of Construction (All Sites)	April 2021
Award Construction Contracts (All Sites)	May 2021
CD-4, Approve Project Completion/Start of Operations – Bayou Choctaw (achievement of the project completion criteria defined in the Project Execution Plan, approval of transition to operations, and completion of the execution phase)	March 2024
CD-4, Approve Project Completion/Start of Operations – Big Hill Site (achievement of the project completion criteria defined in the Project Execution Plan, approval of transition to operations, and completion of the execution phase)	March 2024

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CD-4, Approve Project Completion/Start of Operations – Bryan Mound Site (achievement of the project completion criteria defined in the Project Execution Plan, approval of transition to operations, and completion of the execution phase)	October 2024
CD-4, Approve Project Completion/Start of Operations – West Hackberry Site (achievement of the project completion criteria defined in the Project Execution Plan, approval of transition to operations, and completion of the execution phase)	July 2025

- Q4. At the hearing we discussed the range of complex and uncertain factors, both quantitative and qualitative, that go into the concept of petroleum supply security – including physical access, price fluctuations, infrastructure access, refining capacity, etc. We also discussed that the U.S. is still directly affected by price and supply variability in global oil markets, even as our role as a “net importer” is rapidly changing and the metric of “days of net imports” becomes less applicable to measuring U.S. supply security. Could you summarize key policy areas, data, or metrics, aside from “days of net imports” that you believe Congress could or should consider when assessing U.S. supply security?
- A4. Data recently released by the U.S. Energy Information Administration for September 2019 showed the United States as a net exporter of petroleum (both crude oil and refined products) for the first time since at least 1950, the earliest year that the U.S. Energy Information Administration has data. In September 2019, the United States exported 89,000 barrels per day more petroleum than it imported. Net petroleum trade is calculated as total imports of crude oil and petroleum products less total exports of crude oil and petroleum products.

The idea behind using a net import calculation as a metric for U.S. petroleum security was that, if there was a disruption, a requisite amount of exports could be curtailed and used domestically instead. However, this implicitly assumes all crude oil barrels are the same when there are actually significant differences in the crude oil imported by the United States and that which is exported. As a major oil refining country, more than half of the U.S. refining capacity is specialized in refining relatively cheaper heavy crude, however, the United States now produces mostly light crude. While crude oil imports have declined, the substantial shift of the United States from a net importer of petroleum to a net exporter has largely been driven by a dramatic increase in exports of both refined product and light crude oil. Put in another way, the United States currently imports more crude oil than it exports, but it exports more petroleum products than it imports, resulting in net total petroleum exports.

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Rather than using net imports of petroleum as a metric, it may be better to use gross imports of crude oil, which stood at 6.5 million barrels per day in September 2019. These imports, if cut off, would likely drive a significant change to the U.S. export profile during the supply disruption to minimize the shortfall in conjunction with a likely Presidential finding that would lead to an SPR drawdown. It would also be useful to consider the origins of crude oil imports and the diversity of crude oil import sources. Other possible metrics would be crude oil inventory level and days of refinery inputs the inventory level can cover, compared with historical norms.

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QUESTIONS FROM RANKING MEMBER JOE MANCHIN III

- Q1. Congress has enacted 7 laws since 2015 that mandate the sale of crude oil from the Strategic Petroleum Reserve. If Congress continues to authorize oil sales in this manner, it needs to be in a way that optimizes the potential revenue of this legislative choice to ensure taxpayer fairness. We have a history of buying high, such as during the late 1970s and 2000s when prices were peaking, and then selling low. How do we protect ourselves from making sales from the Strategic Petroleum Reserve at a loss for these elective purposes? What are the real value net revenues or losses been from these sales?
- A1. SPR crude oil has a history of being sold for a greater value than the average purchase price. The SPR continually monitors the economic outlook for the petroleum industry and times our sales for when we believe revenue will be optimized within the time boundaries set by the particular law. To date, the SPR has been quite successful in selling crude oil for more than taxpayers paid, however, the inability to predict future market conditions with complete accuracy does have the potential to result in circumstances where SPR has to sell oil at lower than optimal rates in order to meet Congressionally mandated timeframes.

The following chart displays the profit from each of the legislative sales conducted thus far:

Fiscal Year	Authority for Sale	Average Sale Price (2019 \$)	*Average Purchase Price (2019 \$)	Profit (2019 \$)	Return on Investment
2017	21 st Century Cures Act	\$47.36	\$63.19	-\$15.83	-25%
2017	Bipartisan Budget Act of 2015 (Section 404 – Energy Security and Infrastructure Modernization Fund)	\$53.66	\$63.19	-\$9.53	-15%
2017 and 2018	Bipartisan Budget Act of 2015 (Section 403)21 st Century Cures Act	\$60.74	\$63.19	-\$2.46	-4%
2018	Bipartisan Budget Act of 2015 (Section 404 – Energy Security and Infrastructure Modernization Fund)	\$74.65	\$63.19	\$11.45	18%
2018 and 2019	Bipartisan Budget Act of 2015 (Section 403) 21 st Century Cures Act	\$69.87	\$63.19	\$6.68	11%

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2019	Bipartisan Budget Act of 2015 (Section 404 – Energy Security and Infrastructure Modernization Fund)	\$71.18	\$63.19	\$7.98	13%
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Average Purchase Price is an inflation adjusted average across all crude oil acquisitions.

- Q2. Some of the enacted legislation mandating the sale of crude oil from the Strategic Petroleum Reserve dictates an amount of sales to be made based on a set dollar revenue and others in terms of number of barrels. Does this legislative choice make a difference in terms of the potential real value revenue gains or losses?
- A2. This legislative choice does not make a difference in terms of the potential real value revenue gains or losses. Even in sales based on a set dollar revenue, the SPR offers a specific number of crude oil barrels in the sale. For example, if the dollar revenue target is \$300 million, the SPR converts that dollar revenue target to a number of barrels using forward market analysis and then offers the appropriate number of barrels to the market.
- Q3. Critical energy infrastructure has the potential to be targeted by bad actors, like in the case of the attack on the Saudi Aramco facility in September. Open source mapping is of particular concern, as it has the potential to be utilized to organize targeted attacks. Can you share any details about the precautions in place to protect our Strategic Petroleum Reserve from bad actors? Are you concerned about the availability of information regarding these storage sites? Do staff at our facilities have authority to act quickly and shut down systems to protect sites if needed, like was the case at the Saudi Aramco facility?
- A3. The SPR has a robust Security program that provides the resources needed to protect its mission and personnel against a spectrum of threats. Open source information about the SPR is monitored by several Operations Security (OPSEC) programs, which allows continuous monitoring of the information to determine if a credible threat exists. However, while measures are in place for monitoring open source information, there still appears to be information available on some public websites that could pose security risks for the SPR program.

The OPSEC Programs include partnerships and information sharing with DOE Counterintelligence offices, local law enforcement, and the Federal Bureau of Investigation (FBI). Additionally, the Strategic Petroleum Reserve storage sites have both the ability and authority to shut down systems to

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protect each storage site, if needed, in response to man-made or natural disasters. The SPR also has a dedicated recovery program in case a man-made or natural disaster renders a site non-functional.

Overall, the SPR has a strong security posture that we believe would lead potential threats to consider other targets. Unfortunately, it isn't necessary to "hit" the SPR directly to impact our ability to respond to a petroleum supply disruption. The SPR vulnerability remains with Government and commercial pipelines which are the key components in moving SPR crude oil to the various terminals and/or docks and into the market.

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 Questions for the Record Submitted to Mr. Jason E. Bordoff

Questions from Chairman Lisa Murkowski

Question 1: Are you aware of standards or metrics that non-importer IEA countries or non-IEA exporter countries use to manage government reserves to support exports, price stability, or other oil market related impacts to their countries? Or that such countries require industrial producers to maintain? Could you share a summary of these approaches?

The primary approach of which I am aware by which “non-IEA exporter countries” try to manage price stability is OPEC cooperation. The metrics in such producer countries are not necessarily applicable to the U.S., as production decisions are usually driven by government policy, and OPEC countries are willing to hold spare capacity.

Mexico is an oil exporter, and has recently moved to mitigate oil price volatility through a hedging program.¹

Question 2: At the hearing we discussed the range of complex and uncertain factors, both quantitative and qualitative, that go into the concept of petroleum supply security – including physical access, price fluctuations, infrastructure access, refining capacity, etc. We also discussed that the U.S. is still directly affected by price and supply variability in global oil markets, even as our role as a “net importer” is rapidly changing and the metric of “days of net imports” becomes less applicable to measuring U.S. supply security. Could you summarize key policy areas, data, or metrics, aside from “days of net imports” that you believe Congress could or should consider when assessing U.S. supply security?

As I testified, oil is priced in a global market and prices at the pump reflect world prices regardless of import levels. The vulnerability of consumers economically to global oil price spikes thus depends more on how much oil we consume than how much we import. Thus, the most obvious alternative measure to the IEA’s days of net import cover metric would be days of total petroleum consumption cover. The numerator could include just crude oil in the SPR, or both crude and product reserves held in public stocks, or potentially both public and private stocks of crude oil and petroleum products (depending on our assumptions about the ability of private stockholders to respond immediately to severe oil supply disruptions).

Other metrics that reflect the US economy’s continued structural dependence on oil include total spending on oil as a share of GDP, the oil intensity of GDP, and fuel consumption per capita or household, among others. The evolution of these metrics over time should also inform decisions to change the size of strategic oil stocks in response to changing dependence on oil in our economy.

In the context of the SPR, daily withdrawal capacity is another critical metric, which should be accurately assessed, regularly updated, and constantly adjusted to our expectations about the potential size (and duration) of a major oil supply disruption.

¹ See <https://www.reuters.com/article/us-mexico-oil-hedge-exclusive/exclusive-mexico-moves-to-launch-worlds-largest-oil-hedge-program-sources-idUSKCN1VQ2E1>

U.S. Senate Committee on Energy and Natural Resources
 October 17, 2019 Hearing
The Status of the Strategic Petroleum Reserve and Related Energy Security Issues
 Questions for the Record Submitted to Mr. Jason E. Bordoff

Questions from Ranking Member Joe Manchin III

Question 1: Congress has enacted 7 laws since 2015 that mandate the sale of crude oil from the Strategic Petroleum Reserve. If Congress continues to authorize oil sales in this manner, it needs to be in a way that optimizes the potential revenue of this legislative choice to ensure taxpayer fairness. We have a history of buying high, such as during the late 1970s and 2000s when prices were peaking, and then selling low. How do we protect ourselves from making sales from the Strategic Petroleum Reserve at a loss for these elective purposes? What are the real value net revenues or losses been from these sales?

According to the latest SPR annual report to Congress, the average acquisition cost of the crude oil currently in the SPR was \$30 per barrels (as of 2017), excluding storage costs.² As long as sales are completed at prices above this level (adjusted for inflation), SPR sales should result in a net gain for the federal government. For the government to make substantial losses on scheduled SPR sales, the oil price would have to sink to levels not seen in at least 15 years on a sustained basis.

Predicting oil prices is notoriously difficult. Price risk can be reduced by spreading out scheduled sales over a long period of time to avoid trying to predict the peak.

Moreover, as we noted in a recent study by the Center on Global Energy Policy,³ buying and selling oil at the right time is not the only way to derive substantial value from the SPR. Since the creation of the SPR, the growing depth, breadth, and sophistication of the global oil market has provided governments with the market tools to lower storage costs, or even turn the SPR into a profit center. Inventory monetization, joint stockholding, and the internationalization of the US SPR are only a few possible ways in which America could reduce the costs and increase the benefits of its strategic stocks.

Self-financing via inventory monetization:

Inventory monetization is a relatively simple method to extract value from unused inventories, which is routinely used by private market participants across the oil and gas supply chain. Using a risk-free approach, the federal government could cover the entire operating cost of the current SPR capacity by monetizing a relatively small portion of the crude oil in strategic storage.

Joint stockholding with oil major exporters:

Other IEA member states like Japan and South Korea have found innovative ways to manage and reduce the costs of strategic costs: they rent out storage capacity at some of their strategic tank farms at discounted rates to Middle Eastern exporters, in exchange for first drawing rights by the host country in case of emergency. Oil held under joint stockholding agreements can thus be classified as both commercial and strategic storage,

² See <https://www.energy.gov/sites/prod/files/2019/02/f59/EXEC-2018-001277%20-%202017%20SPR%20Report.pdf>, page 30.

³ Jason Bordoff, Antoine Halff, Akos Losz, "Nee Realities, New Risks: Rethinking the Strategic Petroleum Reserve," Center on Global Energy Policy, May 30, 2018, https://energypolicy.columbia.edu/research/report/new-realities-new-risks-rethinking-strategic-petroleum-reserve#_ftnref84

U.S. Senate Committee on Energy and Natural Resources
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offering advantages for both parties. Joint oil stockpiling agreements achieve two objectives simultaneously. On the one hand, net oil-importing countries enhance their respective SPR at low cost by not buying crude oil up front but retaining the preemptive right to purchase it in case of a disruption. On the other hand, oil exporters enjoy free or cheap storage facilities within close proximity to large consuming countries and can take advantage of the flexibility of having short-haul crude on offer to both their term contract clients and to other crude oil refiners that are not term clients.

Internationalizing the SPR by renting US storage facilities to major importing countries:

For Asian countries, building strategic storage facilities is an expensive proposition and a considerable hurdle to establishing strategic reserves. The United States may consider making its SPR storage capacity and strategic crude stocks available to third countries such as India or ASEAN nations for use in an emergency. If the SPR is to be used to manage price risks rather than to plug a physical hole in US oil supply, then the ownership of the stocks becomes a secondary consideration. Furthermore, if the ultimate beneficiaries of SPR draws are third-party nations (whether directly or indirectly, by redirecting to other countries shipments that would otherwise have been United States bound), then those recipient nations might as well be the original owners of the stocks.

While all of these tools require further study, they are worth considering as ways to maximize the SPR's value for the federal government.

Question 2: Some of the enacted legislation mandating the sale of crude oil from the Strategic Petroleum Reserve dictates an amount of sales to be made based on a set dollar revenue and others in terms of number of barrels. Does this legislative choice make a difference in terms of the potential real value revenue gains or losses?

Specifying some mandated sales in USD terms while others in barrel terms makes the estimation of the overall volumetric effect of planned sales—as well as the expected future size of the SPR—difficult. Whether to sell a specific dollar amount or volume amount may depend on the purpose of the sale. If crude sales are scheduled because it has been determined through careful study that the optimal size of the SPR should be smaller, it would make sense to sell the excess volume of barrels. By contrast, if the purpose of the sale is to raise revenue, such as the recently scheduled sales for SPR modernization, it would make sense to sell the amount necessary to raise that level of funds. As I have testified and written, the SPR should not be used as a piggy bank, and so sales scheduled to raise revenue should be limited to uses related to energy security and the SPR program.



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MEMORANDUM

November 14, 2019

To: Senate Committee on Energy and Natural Resources
Attention: Darla Ripchensky

From: Phillip Brown, Specialist in Energy Policy, pbrown@crs.loc.gov, 7-7386

Subject: Questions for the Record: Hearing on October 17, 2019 regarding *The Status of the Strategic Petroleum Reserve and Related Energy Security Issues*

This memorandum provides answers to Questions for the Record received from the Senate Committee on Energy and Natural Resources following an October 17, 2019 hearing titled *The Status of the Strategic Petroleum Reserve and Related Energy Security Issues*.

Questions from Chairman Lisa Murkowski

Question 1: Are you aware of standards or metrics that non-importer IEA countries or non-IEA exporter countries use to manage government reserves to support exports, price stability, or other oil market related impacts to their countries? Or that such countries require industrial producers to maintain? Could you share a summary of these approaches?

Three of the 30 International Energy Agency (IEA) member countries are currently net oil exporters: Canada, Mexico, and Norway. One of the three—Norway—has established a legally binding framework for managing and maintaining emergency oil reserves. Norway has enacted legislation and regulations which require certain oil (including crude oil, petroleum products, and bio fuels) importers and producers to maintain emergency stocks equal to 20 days of producer/importer sales or consumption during the preceding year.¹ The Norwegian government does not directly own emergency oil reserves. In the event of an emergency supply situation, the Norwegian government has the authority to direct producers and importers to release emergency oil reserves, at determined volumes, in response to the emergency being addressed.²

¹ Norway's emergency stockholding obligation is imposed on oil importers and producers that either imported or produced 10,000 standard cubic meters (approximately 63,000 barrels) of oil during the preceding year.

² For additional information about Norway's emergency oil reserves, see: International Energy Agency, *Norway's Legislation on Oil Security*, 2019.

Canada and Mexico do not hold federal emergency oil reserves and do not currently require industry to maintain emergency oil stocks.³

Regarding non-IEA oil exporting countries, there is limited publicly available information about government-controlled emergency oil stocks or any policies that might indicate standards and metrics used to determine such stock levels. However, some members of the Organization of the Petroleum Exporting Countries (OPEC) do maintain spare oil production capacity⁴ as a way to support OPEC's stated policy objective of maintaining oil price stability.⁵ In September 2019, the IEA reported that OPEC spare oil production capacity was approximately 3.2 million barrels per day.⁶ Approximately 90% of this spare capacity was held by Saudi Arabia (2.27 million bpd), the United Arab Emirates (0.33 million bpd), and Kuwait (0.29 million bpd). In the past, Saudi Arabia has indicated that the country's policy was to maintain 1.5 to 2.0 million barrels per day of spare oil production capacity.⁷ However, the methodology used to calculate this policy metric has not been disclosed. Furthermore, as Saudi Aramco—Saudi Arabia's national oil company—continues to access financial markets through bond issuances and an ongoing initial public offering (IPO) process, it is uncertain how much spare oil production capacity Saudi Arabia might maintain in the future.⁸

Additionally, the national oil companies (NOCs) of Saudi Arabia, the United Arab Emirates, and Kuwait have established joint oil stockpiling agreements with certain countries, including South Korea, Japan, and India. Under these arrangements, NOCs agree to store and maintain a determined volume of oil to be available during an emergency and to be located in storage facilities that are owned by and within the host country. Generally, such an agreement allows the host country to potentially receive an oil storage leasing fee and provides the host country a right to purchase a certain volume of crude oil over a period of time during an emergency event. In return, the NOC receives access to low-cost oil storage capacity in close proximity to its customers and can trade the oil on a commercial basis during non-emergency periods.⁹

Question 2: Are Australia, Canada, and Mexico capable of sufficiently responding to an IEA emergency response?

In the event of an IEA-coordinated emergency response to an oil shortage, member countries can contribute to a collective response in four ways: (1) stock draw, (2) production surge, (3) demand restraint, and (4) fuel switching. A combination of these response options can be implemented in order to contribute to an IEA emergency response. Stock draw is the typical measure employed during an emergency response, especially during the initial period (e.g., first 30 days) of an emergency.

³ For additional information about Mexico, see: International Energy Agency, *Energy Policies Beyond IEA Countries: Mexico*, 2017.

⁴ The Energy Information Administration defines spare capacity as "the volume of production that can be brought on within 30 days and sustained for at least 90 days." For additional information see: Energy Information Administration, *Energy and Financial Markets: What Drives Crude Oil Prices?*, available at <https://www.eia.gov/finance/markets/crudeoil/supply-opec.php>, accessed November 12, 2019.

⁵ OPEC's Mission Statement and Statutes are available at: https://www.opec.org/opec_web/en/about_us/23.htm.

⁶ This number excludes Iran's production capacity that is currently subject to U.S. sanctions. This number also reflects total OPEC spare capacity prior to the attacks on Saudi Arabia's oil infrastructure in September 2019.

⁷ Global Energy Markets: *Reducing Volatility and Uncertainty, Remarks by Saudi Arabia Minister of Petroleum and Mineral Resources H.E. Ali I. Al-Naimi at the 12th International Energy Forum*, March 2010.

⁸ For a discussion of Saudi Aramco's financial disclosures regarding spare capacity, see: Saudi Arabian Oil Company, *Global Medium Term Note Programme*, Base Prospectus dated 1 April 2019. Also, see: Saudi Arabian Oil Company, *Preliminary International Offering Circular*, November 9, 2019.

⁹ For additional information about joint oil stockpiling agreements, see: T. Doshi and S. Six. King Abdullah Petroleum Studies and Research Center, *Joint Oil Stockpiling between Middle East Exporters and Northeast Asian Importers: A Winning Formula?* August 2017.

IEA member countries that are net oil exporters are not required to hold emergency oil stocks since the emergency reserve commitment—as defined in the Agreement on an International Energy Program (IEP)—is based on 90 days of net oil imports (Article 2). Furthermore, the IEP stipulates that a country's drawdown obligation is directly linked to its emergency reserve commitment (Article 7). While these IEP provisions suggest that net exporting countries may not be required to contribute to a collective action, other IEP provisions (Article 8) indicate that participating countries are obligated to contribute to an emergency oil allocation based on a consumption metric. Furthermore, IEP implementation documents adopted by the IEA governing board obligate participating countries to contribute oil volumes during an IEA emergency response that are based on each country's consumption. The Initial Contingency Response Plan (ICRP), adopted in 2002, sets forth the procedures for calculating the emergency supply volumes needed during the first 30 days of an emergency and how emergency supply volume contributions are distributed among the participating countries. To allocate volume obligations, total consumption for the collective group is calculated and each country is assigned a percentage based on its portion of group-level consumption. This percentage is applied to the oil volumes required to address the emergency. Each country is allocated its expected volume contribution. As an example, should it be determined that an emergency oil supply shortage requires a collective response of 1 million bpd during the initial 30 days, and should Country A represent 10% of group-level consumption, then Country A would be obligated to contribute 100,000 bpd during the first 30 days of the emergency response. This expected contribution is without regard to a participating country's net oil import status. As a point of reference, the United States comprises approximately 40% of IEA group-level consumption.

Australia:¹⁰ As a net oil importer, Australia is obligated to maintain 90 days of net oil import volumes in the form of emergency oil stocks. As of July 2019, IEA reported that Australia's oil stock levels were equal to 58 days of net oil imports. Australia has not complied with the IEP 90-day emergency oil reserve obligation since 2012.¹¹ Nearly all of Australia's oil stocks are currently held by industry and are maintained solely for commercial purposes. IEA reports indicate that Australia does not require industry to maintain oil stocks that could be made available during an emergency to contribute to an IEA collective response.¹² The government of Australia has taken some actions to bring the country back into compliance with the IEA emergency oil stockholding obligation, including a procurement program to purchase up to 400,000 metric tons (approximately 2.9 million barrels) of oil "tickets" that would allow the country to contribute to an IEA collective action.¹³ Stockholding tickets—an approach used by IEA member countries to comply with emergency oil stock obligations—are contractual agreements which require the seller to maintain a defined amount of oil in reserve on behalf of the buyer, who can access the oil stocks during an emergency situation, in exchange for a fee.¹⁴ Australia's oil ticketing procurement process is currently scheduled to continue through the first half of 2020. Additionally, Australia has announced its intent to develop a plan to return to emergency stockholding compliance by 2026.

Australia's current emergency oil stocks may result in difficulties for the country should an IEA collective response contribution be required. While Australia could potentially employ other measures to contribute

¹⁰ For background about Australia's domestic oil security policies, see: International Energy Agency, *Australia's Legislation on Oil Security 2019*, 2019.

¹¹ Australian Department of the Environment and Energy, *International Energy Agency (IEA) Program Treaty*, available at <https://www.energy.gov.au/government-priorities/international-activity/international-energy-agency-ica-program-treaty>, accessed November 6, 2019.

¹² International Energy Agency, *Emergency Supply Security 2014*, 2014.

¹³ Details about Australia's ticketing procurement program are available at: <https://www.energy.gov.au/government-priorities/international-activity/oil-stock-ticketing>.

¹⁴ For additional information about stockholding tickets, see: International Energy Agency, *Emergency Supply Security 2014*, 2014.

to a collective response, the IEA has reported that demand restraint during the initial response period, fuel switching, and surge production options are limited.¹⁵

Canada:¹⁶ As a net oil exporter, Canada is not obligated to maintain emergency oil stocks equal to 90 days of net oil import volumes. However, the IEA's ICRP does obligate Canada to contribute to an IEA emergency response based on oil consumption levels. Canada represents roughly 5% of IEA total consumption. With no government-controlled emergency reserves and no federal requirement for industry to maintain emergency oil stocks, physical emergency oil reserves are not available to contribute towards an IEA coordinate response. Surge production, demand restraint, and fuel switching measures could potentially contribute to an IEA emergency response. However, the degree to which these measures might contribute is uncertain. For example, oil production in Canada is controlled by private industry, similar to the United States. While it might be possible under certain circumstances to surge oil production, the ability of potential increased oil production to contribute to an IEA collective response could possibly be limited by pipeline and rail takeaway capacity.¹⁷ Furthermore, fuel-switching options in Canada are reportedly limited.¹⁸ Canada does have an oil supply emergency framework that includes an Energy Supplies Allocation Board (ESAB), which is charged with planning for and implementing emergency oil supply procedures.¹⁹ In the event that a national energy emergency is declared, the ESAB would have the authority to activate crude oil and petroleum product allocation plans that could potentially contribute to demand restraint. However, it is not certain that a national energy emergency would be declared in Canada in the event of an IEA-coordinated emergency response.

Mexico: Mexico, which joined the IEA in 2018, is also a net oil exporter and is not required to maintain emergency oil stocks. However, the country would be obligated to contribute to an IEA emergency response based on its oil consumption level. Mexico represents approximately 4% of IEA oil consumption. While the country does have commercial oil and petroleum product oil storage capacity, as of 2017, the government of Mexico had not imposed any obligations to hold emergency oil stocks.²⁰ Also, fuel switching opportunities in Mexico are reportedly limited.²¹ According to a 2017 report, Mexico has a domestic energy emergency response policy framework that outlines multiple phases for assessment and decision making during an energy emergency.²² Government control of PEMEX, Mexico's national oil company, could potentially allow the government to require surge production during an emergency situation, although surging production could potentially affect the long-term performance and total resource recovery of existing oil production assets. Nevertheless, it has been reported that demand restraint is considered an option of last resort in response to an emergency.²³ Exactly how Mexico's domestic emergency policy framework might be integrated with its IEA emergency response obligations is uncertain.

¹⁵ Ibid.

¹⁶ For background about Canada's domestic oil security policies, see: International Energy Agency, *Canada's Legislation on Oil Security 2019*, 2019.

¹⁷ For additional information about pipeline and rail takeaway challenges in Canada's Alberta province, see: IHS Markit, *All aboard: A View of Alberta Curtailment*, May 2019.

¹⁸ International Energy Agency, *Emergency Supply Security 2014*, 2014.

¹⁹ International Energy Agency, *Canada's Legislation on Oil Security 2019*, 2019.

²⁰ International Energy Agency, *Energy Policies Beyond IEA Countries: Mexico 2017*, 2017.

²¹ Ibid.

²² Ibid.

²³ Ibid.

Question 3: At the hearing we discussed the range of complex and uncertain factors, both quantitative and qualitative, that go into the concept of petroleum supply security – including physical access, price fluctuations, infrastructure access, refining capacity, etc. We also discussed that the U.S. is still directly affected by price and supply variability in global oil markets, even as our role as a “net importer” is rapidly changing and the metric of “days of net imports” becomes less applicable to measuring U.S. supply security. Could you summarize key policy areas, data, or metrics, aside from “days of net imports” that you believe Congress could or should consider when assessing U.S. supply security?

The following discussion presents two potential alternative metrics and one potential policy area that Congress might choose to explore when considering U.S. oil supply security and the role of emergency oil reserves.

Petroleum Product Consumption Metric: One alternative metric that might possibly be considered for assessing and measuring petroleum supply security, and the potential need for emergency oil stocks, is petroleum product consumption. Unlike net imports—which can change as a function of petroleum production, demand, imports, and exports—consumption levels could potentially serve as a relatively consistent indicator for assessing the impact of global oil supply disruptions and the potential need for government-mandated oil reserves. Should a consumption metric be used, determining the number of days-of-consumption (e.g., 20, 30, 60, and 90) that might be covered could be challenging. For reference, estimated U.S. petroleum and other liquids consumption was nearly 20.5 million bpd in 2018.²⁴ The uncertain size, duration, and nature of oil supply disruptions make it difficult to quantify how much emergency oil reserve coverage might be needed. Some IEA net exporter member countries (e.g., Norway) consider consumption when determining the amount of emergency oil stocks that are required to be held. Additionally, the European Union Oil Stocks Directive (2009/119/EC) requires member countries to “maintain emergency stocks of crude oil and/or petroleum products equal to at least 90 days of net imports or 61 days of consumption, whichever is higher.”²⁵ Depending on how this metric might be applied, it could potentially be more consistent with IEA emergency response obligations that are allocated proportionally to each member country based on domestic consumption.

Gross Crude Oil Import Metric: Another alternative metric that might possibly be considered when assessing the potential need for emergency oil stocks is gross crude oil imports. In 2018 U.S. oil refiners imported approximately 7.8 million bpd of crude oil.²⁶ Similar to the consumption metric discussed above, gross crude oil import volumes could potentially serve as a consistent indicator of U.S. exposure to global oil markets and the potential effects of global supply disruptions. In 2020, Energy Information Administration (EIA) reference case projections indicate that the United States may be a net petroleum exporter. However, gross crude oil imports are projected to be approximately 7 million bpd in 2020.²⁷ Crude oil import volumes are an indication that some U.S. refineries are optimally configured to process certain types/blends of crude oil with certain quality characteristics. Approximately 90% of U.S. crude oil imports in 2018 were medium and heavy crude oil grades. While U.S. crude oil export volumes have

²⁴ Energy Information Administration, *Product Supplied*, available at https://www.eia.gov/dnav/pet/pet_cons_psup_dc_nus_mbbldpd_a.htm, accessed November 6, 2019.

²⁵ Additional information about the EU Oil Stocks Directive is available at: <https://ec.europa.eu/energy/en/topics/energy-security/eu-oil-stocks>, accessed November 6, 2019.

²⁶ Energy Information Administration, *Petroleum & Other Liquids: Imports by Area of Entry*, available at https://www.eia.gov/dnav/pet/pet_move_imp_dc_NUS-Z00_mbbldpd_a.htm, accessed November 7, 2019.

²⁷ Energy Information Administration, *Annual Energy Outlook 2019*, January 24, 2019.

increased since export restrictions were repealed in 2015, the majority of crude oil exports have been light and extra-light grades. An emergency oil reserve that is sized based on gross crude oil imports and that contains crude oil with quality characteristics consistent with that of crude oil imports could provide emergency oil reserves that could potentially allow the U.S. refining system to maintain optimal operations in the event of a global oil supply disruption. Assuming that emergency oil stocks could be efficiently transported and distributed to refiners, these stocks could potentially allow for the U.S. refining system to continue nominal operations for a period of time in the event that the United States lost access to all crude oil import sources—a worst-case and unlikely scenario.

Government vs. Industry Emergency Stocks: It is the current policy of the United States to create a strategic petroleum reserve to comply with IEA obligations and to reduce the impact of oil supply disruptions. One policy option that could potentially be explored is the possibility of transitioning the requirement for emergency oil stocks to be held in a government controlled strategic reserve to a requirement for industry to maintain emergency oil stocks at levels determined by the federal government. While an industry emergency reserve requirement might reduce some degree of government control over strategic oil stocks, it could potentially result in some operational efficiencies in the event an emergency drawdown and release is required. For example, an industry-based requirement could result in the development of regional emergency oil reserves designed to serve refineries in different U.S. regions in the event of a supply disruption. As a result, this approach could potentially address logistics and delivery challenges associated with a strategic reserve that is located in a single region, which is mostly the case in the United States. However, there are likely many other considerations associated with an industry-based emergency reserve requirement. Practical implementation challenges, selection of obligated parties (e.g., refineries, producers, mid-stream companies), costs and cost-recovery mechanisms, and the role of the federal government are some considerations that might require further evaluation should this policy option be explored.

Questions from Ranking Member Joe Manchin III

Question 1: Congress has enacted 7 laws since 2015 that mandate the sale of crude oil from the Strategic Petroleum Reserve. If Congress continues to authorize oil sales in this manner, it needs to be in a way that optimizes the potential revenue of this legislative choice to ensure taxpayer fairness. We have a history of buying high, such as during the late 1970s and 2000s when prices were peaking, and then selling low. How do we protect ourselves from making sales from the Strategic Petroleum Reserve at a loss for these elective purposes? What are the real value net revenues or losses been from these sales?

Current law includes general requirements for the Secretary of Energy to minimize costs and maximize sales receipts when acquiring and selling SPR crude oil. Specifically, 42 U.S.C. §6240(b)(1) requires the Secretary to acquire petroleum products for the SPR in a manner that minimizes the cost of the Reserve. Furthermore, 42 U.S.C. §6241(e)(1) requires the Secretary to sell petroleum products from the Reserve to the “highest qualified bidder.” The value received for mandated SPR crude oil sales is directly related to crude oil price levels at the time a notice of sale is issued and when oil deliveries occur. Crude oil prices are inherently difficult to forecast. Numerous and constantly changing variables can result in either upward or downward crude oil price pressure that can impact the price received for SPR mandated oil sales. One possible policy option that might be considered as a way to potentially ensure that SPR mandated oil sales occur for at least a certain price may be to establish a price floor for future mandated SPR sales. While this approach could prevent mandated sales from occurring below the floor price, it

might also prevent the sales from occurring at all should prevailing market prices at the time of the notice of sale be less than the established floor price. Due to the uncertain nature of future oil price levels, establishing a floor price policy could also potentially result in complications associated with budget scoring for future legislation that mandates SPR oil sales. Furthermore, determining the cost basis to be used for establishing a floor price might also be challenging.

An accurate assessment of the real value of net revenues or losses that might have resulted from mandated sales since 2015 requires information about the value of the mandated sales that have occurred, as well as detailed accounting information for the acquisition cost of oil contained in the SPR. Regarding mandated sales, the Department of Energy (DOE) has reported that FY2017, FY2018, and FY2019 mandated SPR sales resulted in average government revenues of \$45, \$58, and \$69 per barrel sold, respectively.²⁸ DOE also reports that the average price paid for crude oil in the SPR was \$29.89 per barrel at the end of fiscal year 2017.²⁹ These values reported by DOE—and assuming an average inventory cost accounting methodology—suggest that mandated SPR oil sales during fiscal years 2017 through 2019 exceeded the average acquisition price for crude oil in the reserve. However, the information and methodology used to calculate the average price paid (\$29.89 per barrel) for SPR crude oil has not been identified. DOE also does not indicate if the average price paid includes any inflation adjustments to reflect current (i.e., real) values. Publicly available information and previous studies and analyses about SPR costs do allow for an initial, although imprecise, assessment of the average nominal and real SPR oil acquisition price per barrel, as follows:

First, Annual SPR fill and withdrawal volumes provided in the most recent (2017) SPR annual report, along with nominal and real imported crude oil prices reported by EIA may provide some indication of an inflation-adjusted price per barrel for SPR oil inventories. However, it is important to note that the precision of such an approach is limited by several factors such as:

- (1) Non-cash royalty-in-kind SPR crude oil acquisitions in the 2000s,³⁰
- (2) Refiner crude oil acquisition costs—the values used to infer imported crude oil prices—which may differ from actual SPR crude oil acquisition prices,
- (3) Annual average imported crude oil prices that may not accurately reflect the actual market-indexed price paid/received for SPR inventory barrels as adjusted for quality and location considerations, and
- (4) Non-cash crude oil acquisitions that result from SPR oil exchanges.³¹

Figure 1 below illustrates annual SPR acquisitions/sales and average annual nominal and real imported crude oil prices.

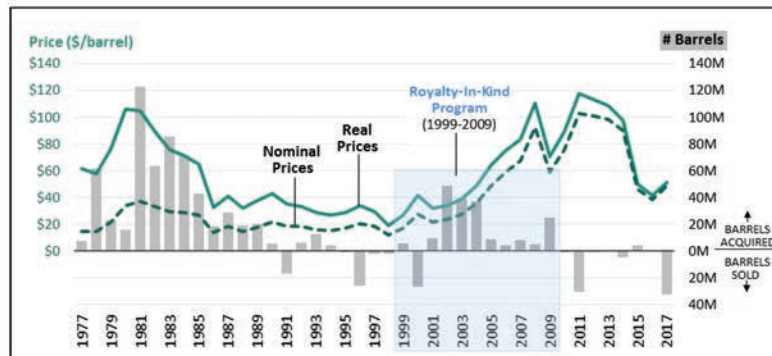
²⁸ Department of Energy, *Releasing Oil from the SPR: Non-Emergency Sales*, available at <https://www.energy.gov/eis/services/petroleum-reserves/strategic-petroleum-reserve/releasing-oil-spr#NonEmergency>, accessed November 8, 2019.

²⁹ Department of Energy, *Strategic Petroleum Reserve Annual Report for Calendar Year 2017*, December 2018.

³⁰ For information about the royalty-in-kind program, see: Department of Energy, *Strategic Petroleum Reserve: Filling the Strategic Petroleum Reserve*, available at <https://www.energy.gov/eis/services/petroleum-reserves/strategic-petroleum-reserve/filling-strategic-petroleum-reserve>, accessed November 13, 2019.

³¹ For information about SPR oil exchanges, see: Department of Energy, *Strategic Petroleum Reserve: SPR Crude Oil Sales and Exchanges*, available at <https://www.energy.gov/eis/spr-crude-oil-sales-and-exchanges>, accessed November 13, 2019.

Figure 1. SPR Acquisitions/Sales and Nominal and Real Imported Crude Oil Prices 1977-2017



Source: SPR acquisitions and sales from: Department of Energy, *Strategic Petroleum Reserve Annual Report for Calendar Year 2017*, December 2018. Nominal and real crude oil prices from: Energy Information Administration, *Short-Term Energy Outlook: Real Prices Viewer*, available at <https://www.eia.gov/outlooks/steo/realprices/>, accessed November 8, 2019.

Notes: M = Million.

Using data presented in **Figure 1** and considering the limitations discussed above, CRS employed the following approach to calculate an initial estimate of nominal and real average SPR oil acquisition prices per barrel. First, oil acquisition and sale volumes for each year were multiplied by nominal and real oil prices for each corresponding year. Results, both nominal and real, for each year were summed and then divided by the amount of crude oil held in the SPR at the end of calendar year 2017—663 million barrels according to the DOE annual report.³² Using this imprecise approach, the nominal average SPR acquisition price was estimated to be approximately \$25 per barrel as of the end of 2017. The inflation-adjusted average SPR acquisition price was estimated to be approximately \$68 per barrel in 2019 dollars. These acquisition price estimates do not include costs associated with building, maintaining, and operating SPR infrastructure.

Other studies and analyses, which encounter some of the same limitations and challenges as the previously discussed approach, have also evaluated the nominal and real cost of SPR crude oil acquisitions. The Government Accountability Office (GAO) published a report in 2006, which included nominal and real values for cumulative SPR oil acquisitions.³³ GAO reported that \$20.0 billion had been expended for crude oil on a nominal basis, including appropriations and royalty-in-kind acquisitions. Adjusted to 2005 dollars for this study, GAO reported that \$35.1 billion had been spent on SPR crude oil. At the time of GAO's study, SPR inventories were approximately 689 million barrels. Using this inventory number, the nominal SPR acquisition price would be approximately \$29.03 per barrel and the inflation-adjusted price would be approximately \$50.94 per barrel in 2005 dollars.

Analysis in 2015 conducted by ClearView Energy Partners estimated nominal and real expenditures for SPR crude oil acquisitions using annual appropriations to the SPR oil account and estimates for the foregone government receipts associated with royalty-in-kind SPR crude oil.³⁴ ClearView adjusted annual

³² Ibid.

³³ Government Accountability Office, *Strategic Petroleum Reserve: Available Oil Can Provide Significant Benefits, but Many Factors Should Influence Future Decisions about Fill, Use, and Expansion*, August 2006.

³⁴ ClearView Energy Partners LLC, *SPR Update: "I Want My Two (Billion) Dollars,"* July 16, 2015.

numbers using the Consumer Price Index to reflect 2015 dollars. On a nominal basis, this analysis estimated that the average SPR crude oil acquisition price was \$32.36 per barrel. Adjusted to 2015 dollars, the average SPR crude oil acquisition price was estimated to be \$73.77 per barrel. **Table 1** below summarizes each nominal and real average SPR oil price estimate presented in the above discussion.

Table 1. Summary of Nominal and Real SPR Oil Acquisition Price Estimates

Dollars per Barrel

	DOE Estimate	CRS Calculation	GAO	ClearView
Nominal Price Est. (year range)	\$29.89 (1977-2017)*	\$25 (1977-2017)	\$29.03 (1977-2005)	\$32.36 (1977-2015)
Real Price Est. (\$Year)	N/A	\$68 (2019)	\$50.94 (2005)	\$73.77 (2015)

Source: CRS, derived from sources as cited in the text above.

Notes: *For the purpose of this table, the DOE average price estimate is categorized as a nominal price. However, DOE has not indicated if this number represents either a nominal or a real estimate. Est. = Estimate. N/A = Not Available.

Based on estimates from the CRS calculation and other studies, it appears that inflation-adjusted average SPR crude oil acquisition prices, in some instances, might have been higher than the average revenue per barrel received from mandated SPR oil sales in fiscal years 2017 through 2019. However, due to the different analytical approaches, methodologies, data limitations, time-periods, and results discussed above, CRS is unable to definitively quantify any actual net revenues and/or losses that may have been realized from FY2017, FY2018, and FY2019 mandated SPR oil sales.

Question 2: Some of the enacted legislation mandating the sale of crude oil from the Strategic Petroleum Reserve dictates an amount of sales to be made based on a set dollar revenue and others in terms of number of barrels. Does this legislative choice make a difference in terms of the potential real value revenue gains or losses?

There is no indication that mandating SPR crude oil sales based on either volumes or dollar values would have an impact on the per barrel sales price of SPR crude oil. The value received from SPR sales will be a function of prevailing market prices at the time a notice of sale is issued, the due date for receiving bids, and the time at which oil deliveries occur.

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Questions from Chairman Lisa Murkowski

Question 1: Are you aware of standards or metrics that **non-importer IEA countries** or **non-IEA exporter countries** use to manage government reserves to support exports, price stability, or other oil market related impacts to their countries? Or that such countries require industrial producers to maintain? Could you share a summary of these approaches?

Answer: With reference to “non-importer IEA countries”, there are three IEA member countries which are net exporters of oil: Canada, Mexico and Norway. Norway places a stockholding requirement on the domestic oil market, requiring companies to ensure that a minimum level of stocks of oil products equivalent to 20 days of domestic sales be held at all times. In the case of Mexico, the Administration aims to establish in 2020 a requirement on industry to maintain minimum levels of gasoline, diesel and jet fuel, equivalent to 5 days of previous year’s average sales. Canada does not have a strategic petroleum reserve nor does it require industry to maintain a minimum level of oil stocks.

It should also be noted that many IEA countries include placing stockholding obligations on their domestic oil industry, based on metrics other than imports, in order to assure meeting their IEA obligation. Examples include requiring refiners to maintain stocks in terms of days of refinery output or requiring wholesalers to have stocks covering a specific level of days of their average sales from the previous year. For IEA countries which are also members of the EU, stock levels must also cover at least 61 days of consumption of the main product categories (i.e. gasoline, kerosene, diesel, and fuel oil); this has the effect of placing a higher stockholding obligation (than the 90 day net imports) on countries which are only marginal net importers of oil, such as Estonia, Denmark and the UK.

Regarding “non-IEA exporter countries”, only Brazil is known to have a minimum stockholding requirement placed on industry; producers and distributors of automotive diesel and gasoline are required to maintain a minimum of 3-5 days of sales, depending on the region of the country where they are located. No other non-IEA exporting countries are known to have strategic petroleum reserves or to set stockholding requirements on domestic industry. But it is known that some of these countries hold more stocks than strictly needed for operational purposes, for instance to overcome disruptions in domestic production, or to be close to their consumer markets. It is known that both Saudi Aramco and the Emirates are holding stocks in countries like Japan, Korea, India and the Netherlands.

Question 2: Are Australia, Canada, and Mexico capable of sufficiently responding to an IEA emergency response?

Answer: Yes, all three of these countries are capable of contributing to an IEA action, as the ability to contribute swiftly and effectively to an IEA collective action is also an IEA requirement. While the release of emergency oil stocks is the primary measure for contributing to an IEA action, other measures are possible, including restraining oil demand, substituting other energy sources to replace oil use, and temporarily surging crude oil production.

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In the case of Canada, an oil net-exporter, its contribution would primarily be made through a combination of oil demand restraint measures and taking steps to increase domestic oil production. Mexico is also a net-exporter of oil. In the time before building up the intended emergency stocks (by setting an obligation on oil companies to hold 5 days of average sales, see Answer 1), its contribution to an IEA collective action would be in the form of a combination of additional (surge) production and fuel switching. These measures sufficiently enable Mexico to contribute to an IEA collective action of the similar magnitude as past IEA actions. Moreover, Mexico has the ability to implement demand restraint measures that could reduce oil consumption by up to 10% of normal oil use, and which could also be used to contribute to an IEA action.

Australia is a net-importer of oil. Having previously been only a marginal net importer of oil, declining domestic oil production coupled with oil demand growth has resulted in a steady rise in net imports, and thus the amount of oil stocks necessary to meet Australia's IEA stockholding obligation. This resulted in Australia becoming non-compliant with its IEA stockholding requirement and oil stock levels in the first half of 2019 averaged 57 days of net imports. In response to this situation, the Australian government is working closely with the IEA to establish a plan for returning to compliance by 2026. In the interim, Australia purchases stockholding "ticket" contracts (where the buyer has the option to take delivery of the oil stocks in times of crisis) which allows Australia to contribute its share of an IEA collective action of a similar magnitude as past IEA actions.

Question 3: At the hearing we discussed the range of complex and uncertain factors, both quantitative and qualitative, that go into the concept of petroleum supply security – including physical access, price fluctuations, infrastructure access, refining capacity, etc. We also discussed that the U.S. is still directly affected by price and supply variability in global oil markets, even as our role as a "net importer" is rapidly changing and the metric of "days of net imports" becomes less applicable to measuring U.S. supply security. Could you summarize key policy areas, data, or metrics, aside from "days of net imports" that you believe Congress could or **should consider when assessing U.S. supply security?**

Answer: There are three key policy issues that should be considered when assessing US supply security: a) even as oil import dependency declines, the SPR remains critical for protecting from economic harm in major supply disruption; b) all IEA countries have an obligation to be able to contribute to an IEA collective action; and c) it is critical to broaden the IEA emergency system beyond the IEA member countries, and the US SPR can play an important role in this.

a) Despite declining import dependency, the United States will continue to be a major oil consumer, as the US economy remains the largest oil consumer in the world. In the event of a major supply disruption, the global nature of the oil market means that US consumers would still see their fuel prices impacted by price movements on the global product market, as the US market is not an isolated one. Even after becoming a net exporter of oil, concerns for oil supply security will not go away, as disruptions from events such as extreme weather or terrorist attacks can affect any country, and if a disruption is large enough to trigger a global recession, even major producer countries will feel the pain of such recession, as major producers in the Middle East have experienced. Thus the importance of having robust strategic petroleum reserves will remain critical for the US, as their participation in a global release is crucial to mitigate the adverse economic impacts of a supply disruption.

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b) As a member of the IEA, the US must have the ability to contribute effectively to a collective action, even if its stockholding obligation would decline to zero when becoming a net exporter. The US share in an IEA action, based on oil consumption, is approximately 42% of the total response. Thus maintaining an effective IEA emergency response system, where the economic damage of a significant oil supply disruption can be effectively mitigated, requires that the US be able to contribute its share in the action. It is therefore critical that the US maintain sufficient strategic petroleum reserve to ensure its ability to contribute to an IEA response such that the overall collective action can effectively respond to any conceivable sized disruption on the global market.

c) Oil consumption is growing substantially in countries outside of the IEA member countries. Maintaining an effective emergency response system into the future, where the net supply loss resulting from a global-scale disruption can be offset with incremental oil from emergency measures, requires that participation in the action be expanded to countries beyond the current IEA members. For this reason, having a dialogue on oil security with those countries is one of the highest priorities of the IEA, and aims for those countries to build up emergency reserves and use them in coordination with the IEA during global supply disruptions. The US, as the largest IEA member, has a substantial role in this outreach work. Efforts by the US SPR to open up available storage for use by other countries are very welcome, as this can provide cost effective options for countries wanting to build emergency stocks, and it sets the example for countries to consider the benefits of joint strategic stockpiling.

Questions from Ranking Member Joe Manchin III

Question 1: Congress has enacted 7 laws since 2015 that mandate the sale of crude oil from the Strategic Petroleum Reserve. If Congress continues to authorize oil sales in this manner, it needs to be in a way that optimizes the potential revenue of this legislative choice to ensure taxpayer fairness. We have a history of buying high, such as during the late 1970s and 2000s when prices were peaking, and then selling low. How do we protect ourselves from making sales from the Strategic Petroleum Reserve at a loss for these elective purposes? What are the real value net revenues or losses been from these sales?

Answer: The IEA is not in a position to advise on how to carry out the mandated sales of the US Strategic Petroleum Reserves, nor is the IEA able to calculate net revenues or losses from these sales.

Question 2: Some of the enacted legislation mandating the sale of crude oil from the Strategic Petroleum Reserve dictates an amount of sales to be made based on a set dollar revenue and others in terms of number of barrels. Does this legislative choice make a difference in terms of the potential real value revenue gains or losses?

Answer: The IEA is not able to comment on potential revenue gains or losses related to the way in which the mandated sales of the US Strategic Petroleum Reserves are implemented.