



## Testimony

Before the Subcommittee on Energy,  
Committee on Energy and Commerce,  
House of Representatives

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# STRATEGIC PETROLEUM RESERVE

## Preliminary Observations on the Emergency Oil Stockpile

Statement of Frank Rusco, Director,  
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# GAO Highlights

Highlights of [GAO-18-209T](#), a testimony before the Subcommittee on Energy, Committee on Energy and Commerce, House of Representatives

## Why GAO Did This Study

Over 4 decades ago, Congress authorized the SPR—the world's largest government-owned stockpile of emergency oil—to release oil to the market during supply disruptions and protect the U.S. economy from damage. The SPR is managed by DOE. According to DOE's strategic plan, the SPR benefits the nation by providing an insurance policy against actual and potential interruptions in U.S. petroleum supplies caused by international turmoil and hurricanes, among other things. The SPR also helps the United States meet its obligations, including to holding reserves of oil or refined petroleum products equaling 90 days of net petroleum imports, as one of 29 members of the IEA—an international energy forum established to help members respond to major oil supply disruptions. The SPR held almost 674 million barrels of oil at the end of September 2017.

This testimony primarily focuses on preliminary observations from ongoing work on (1) DOE's use of the SPR in response to domestic petroleum supply disruptions, (2) the extent to which the SPR is able to respond to domestic petroleum supply disruptions, and (3) how other IEA members structure their strategic reserves and extent to which DOE has examined these structures. GAO reviewed past work from August 2006 through September 2014 and DOE and IEA documentation. GAO also interviewed DOE and IEA officials, as part of GAO's ongoing work.

## What GAO Recommends

GAO is not making recommendations but will consider making them, as appropriate, as it finalizes its work.

View [GAO-18-209T](#). For more information, contact Frank Rusco at (202) 512-3841 or [ruscof@gao.gov](mailto:ruscof@gao.gov).

November 2, 2017

## STRATEGIC PETROLEUM RESERVE

### Preliminary Observations on the Emergency Oil Stockpile

## What GAO Found

GAO's preliminary analysis of Department of Energy (DOE) documents indicates that DOE has primarily used the Strategic Petroleum Reserve (SPR) to an exchange of oil to companies in response to domestic supply disruptions, such as hurricanes. In the event of a supply disruption, the SPR can supply the market by either exchanging oil for an equal quantity of oil plus an additional amount as a premium to be returned to the SPR in the future or selling stored oil. Since the SPR was authorized in 1975, DOE has released oil 11 times in response to domestic supply disruptions. All but one were in the form of an exchange, including six exchanges in response to hurricanes. For example, Hurricane Harvey in 2017 closed or restricted ports through which 2 million barrels of oil per day were imported. In response, DOE exchanged 5 million barrels of oil to Gulf Coast refineries. According to DOE officials, exchanges from the SPR allowed refineries to operate, ensuring continued production of refined petroleum products for use by consumers.

Based on past GAO work and preliminary observations, the SPR is limited in its ability to respond to domestic supply disruptions, including severe weather events, for three main reasons. First, as GAO reported in September 2014 (GAO-14-807), the SPR is almost entirely composed of oil and not refined products like gasoline, which may not be effective in responding to all disruptions. For example, following Hurricanes Katrina and Rita, nearly 30 percent of U.S. refining capacity was shut down for weeks, disrupting supplies of gasoline and other petroleum products. The SPR could not mitigate the effects of disrupted supplies. Second, as GAO also reported in September 2014, the SPR is nearly entirely located in the Gulf Coast, so it may not be responsive to disruptions in other regions, such as the West Coast. Third, GAO's ongoing work reviewed DOE and energy task force reports that found that statutory authorities governing SPR releases may inhibit their use for regional disruptions.

GAO's preliminary observations show that other International Energy Agency (IEA) member countries generally have used one of five reserve structures configured in various ways. The structures are defined by whether countries hold either public reserves (e.g., the SPR), industry reserves (e.g., placing reserve holding requirements on industry), or a combination. Most IEA members hold refined petroleum products in reserve, with many members holding at least a third of their reserves in these products. For example, in Germany, 55 percent of reserves are in petroleum products. In addition, some IEA members' reserves are geographically dispersed in their countries to respond to disruptions. For example, France has reserves in each of its seven regions and has used these to address fuel supply disruptions as a result of recent domestic strikes. DOE has taken some steps to evaluate other structures but has not formally evaluated the structures of other countries in over 35 years. In addition, DOE contractors studied the feasibility of regional product reserves in the Southeast and West Coast regions to address supply vulnerabilities from hurricanes and earthquakes, respectively but DOE did not finalize the two 2015 studies. In 2016, DOE released a long-term strategic review of the SPR that Congress had required and GAO recommended. However, DOE did not include the results of the two studies in its 2016 review.

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Chairman Upton, Ranking Member Rush, and Members of the Subcommittee:

I am pleased to be here today to discuss our work on energy resilience, specifically preliminary observations from our ongoing work looking at the Strategic Petroleum Reserve (SPR)—the world’s largest government owned stockpile of emergency oil. U.S. energy systems are vulnerable to a range of potential disruptions, including from international events, such as conflicts or terrorism incidents that may affect oil supplies, and domestic ones, such as from hurricanes and other severe weather events, which can disrupt oil and gas supplies and cause temporary fuel or electricity shortages. Because of the central role that energy plays in the U.S. economy and the configuration of the nation’s energy system, vulnerabilities may have wide-ranging implications for energy production and use, ultimately affecting transportation, industrial, agricultural, and other critical sectors of the economy that require reliable energy. We have reported on energy vulnerabilities as well as on federal efforts to address them.<sup>1</sup> Recent experience with Hurricanes Harvey, Irma, and Maria underscores these vulnerabilities. In addition to damaging infrastructure and property, and causing the loss of life, the hurricanes disrupted the operations of refineries representing at least 15 percent of the nation’s refining capacity, affected fuel distribution, and left millions of U.S. citizens without electricity.

After the Arab oil embargo, over 4 decades ago, Congress authorized the creation of the SPR to include the ability to release oil to the market during supply disruptions and protect the U.S. economy from damage. The SPR is managed by the Department of Energy (DOE). The SPR held 673.7 million barrels of oil as of September 30, 2017 which is worth about \$38.4 billion at prices as of October 30, 2017.<sup>2</sup> According to DOE’s 2014-

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<sup>1</sup>For example, in January 2017, we reported on federal grid resiliency efforts, finding that such efforts were fragmented across the Department of Energy, Department of Homeland Security, and the Federal Energy Regulatory Commission, and that these efforts overlapped to some degree, but were not duplicative. GAO, *Electricity: Federal Efforts to Enhance Grid Resilience*, [GAO-17-153](#) (Washington, D.C.: Jan. 25, 2017). In January 2014, we found that U.S. energy infrastructure may be affected throughout all major stages of the energy supply chain, increasing the risk of disruptions. GAO, *Climate Change: Energy Infrastructure Risks and Adaptation Efforts*, [GAO-14-74](#) (Washington, D.C.: Jan. 31, 2014).

<sup>2</sup>This calculation is based on average market oil prices as of October 30, 2017, in part, referenced from the West Texas Intermediate which is a domestic oil used as a benchmark for pricing.

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2018 strategic plan, the SPR benefits the nation by providing an insurance policy against actual and potential interruptions in petroleum supplies caused by international turmoil, hurricanes, accidents, or terrorist activities.<sup>3</sup> Releasing SPR oil during a disruption is intended to mitigate damage to the economy by replacing disrupted oil supplies, thereby reducing price increases that can result in economic damage. When processed, oil is converted into refined petroleum products such as gasoline and diesel fuel.

The SPR also helps the United States meet its stockholding obligations as a member of the International Energy Agency (IEA)—an international energy forum of 29 member nations established in 1974 to help members respond to major oil supply disruptions.<sup>4</sup> IEA members have agreed to fulfill obligations, including holding reserves of oil or refined petroleum products equaling 90 days of net petroleum imports, and to release these reserves, utilize demand restraint measures, increase surge production, or utilize fuel switching during an IEA collective action in response to oil supply disruptions. In September 2014, we found that changes including increasing oil production, shrinking oil imports, and changing oil and fuel distribution patterns have important implications for the SPR.<sup>5</sup> In that report, we concluded that changing market conditions have implications for the size, location, and composition of the SPR, and recommended that the Secretary of Energy undertake a comprehensive reexamination of the appropriate size of the SPR. In addition, in 2015, Congress required the Secretary of Energy to complete a long-range strategic review of the SPR.<sup>6</sup> DOE completed its review in August 2016 which reviewed the size,

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<sup>3</sup>U.S. Department of Energy, *U.S. Department of Energy Strategic Plan 2014-2018*, March 2014.

<sup>4</sup>The United States and 28 other Organisation for Economic Co-operation and Development countries are members of the IEA. The 29 member countries are Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Republic of Korea, Luxembourg, The Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.

<sup>5</sup>GAO, *Changing Crude Oil Markets: Allowing Exports Could Reduce Consumer Fuel Prices, and the Size of the Strategic Reserves Should Be Reexamined*, [GAO-14-807](#) (Washington, D.C.: Sept. 30, 2014).

<sup>6</sup>Bipartisan Budget Act of 2015, Pub. L. No. 114-74, § 402, 129 Stat. 584, 589 (2015).

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composition, infrastructure needs, and distribution capability of the reserve.<sup>7</sup>

My statement today is based primarily on preliminary observations from ongoing work and focuses on (1) how DOE has used the SPR to address domestic petroleum supply disruptions; (2) the extent to which the SPR is able to respond to domestic petroleum supply disruptions; and (3) how other IEA members have structured their strategic reserves and the extent to which DOE has evaluated these structures.

As part of our ongoing work, we reviewed reports and studies, including by DOE, IEA, and the U.S. Energy Information Administration (EIA)<sup>8</sup> and interviewed DOE and IEA officials. Specifically, to describe how DOE has used the SPR to address domestic petroleum supply disruptions, we reviewed DOE, IEA, and EIA documents. To examine the extent to which the SPR is able to respond to domestic petroleum supply disruptions, we reviewed documents and reports from DOE, IEA, and DOE's Inspector General and interviewed DOE officials. We also reviewed our past work from August 2006 through September 2014.<sup>9</sup> To describe how other IEA members have structured their strategic reserve systems to respond to disruptions, we reviewed IEA documents on members' reserve systems, reviewed a French document on its reserve system, and interviewed IEA officials about these systems. To describe the extent to which DOE has evaluated these structures, we reviewed DOE documents and interviewed DOE officials. We shared the information in this statement with DOE, and the agency provided comments.

We are conducting the work upon which this statement is based in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain

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<sup>7</sup>U.S. Department of Energy, *Long-Term Strategic Review of the U.S. Strategic Petroleum Reserve: Report to Congress*, (Washington, D.C.: Aug. 2016).

<sup>8</sup>EIA is a statistical agency within DOE that collects, analyzes, and disseminates independent information on energy issues.

<sup>9</sup>See: GAO, *Strategic Petroleum Reserve: Available Oil Can Provide Significant Benefits, but Many Factors Should Influence Future Decisions about Fill, Use, and Expansion*, [GAO-06-872](#) (Washington, D.C.: Aug. 24, 2006); GAO, *Strategic Petroleum Reserve: Improving the Cost-Effectiveness of Filling the Reserve*, [GAO-08-726T](#) (Washington, D.C.: Apr. 24, 2008); GAO, *Strategic Petroleum Reserve: Issues Regarding the Inclusion of Refined Petroleum Products as Part of the Strategic Petroleum Reserve*, [GAO-09-695T](#) (Washington, D.C.: May 12, 2009); [GAO-14-807](#).

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sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

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### Strategic Petroleum Reserve

The Energy Policy and Conservation Act (EPCA) of 1975 authorized the SPR, partly in response to the Arab oil embargo of 1973 to 1974 that caused a shortfall in the international oil market.<sup>10</sup> The SPR is owned by the federal government, managed by DOE's Office of Petroleum Reserves, and maintained by Fluor Federal Petroleum Operations LLC.<sup>11</sup> The SPR stores oil in underground salt caverns along the Gulf Coast in Louisiana and Texas. DOE established an initial target capacity for the SPR of 500 million barrels based on U.S. import levels and implemented a phased approach to create large underground oil storage sites in salt formations, to reach a physical storage capacity of 750 million barrels. The SPR currently maintains four storage sites with a physical capacity of 713.5 million barrels.

Three recent laws required sales of oil from the SPR to fund its modernization and other national priorities. The Bipartisan Budget Act of 2015 provided for the drawdown and sale of 58 million barrels of oil from fiscal years 2018 through 2025 and authorized the sale of up to \$2 billion worth of oil through fiscal year 2020 to be used for an SPR modernization program.<sup>12</sup> The Fixing America's Surface Transportation Act provided for the drawdown and sale of 66 million barrels of oil from fiscal years 2023 through 2025.<sup>13</sup> The 21st Century Cures Act provided for the drawdown and sale of 25 million barrels from fiscal years 2017 through 2019.<sup>14</sup> DOE estimates that, as a result of these sales, the SPR will hold between 506

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<sup>10</sup>Pub. L. No. 94-163, § 154(a), 89 Stat. 871, 882 (1975)(codified as amended at 42 U.S.C. § 6234(a).

<sup>11</sup>Fluor Federal Petroleum Operations LLC is the current DOE Management and Operating Contractor for the SPR.

<sup>12</sup>Pub. L. No. 114-74, §§ 403, 404, 129 Stat. 584, 589 (2015).

<sup>13</sup>Pub. L. No. 114-94, § 32204, 129 Stat. 1311, 1740 (2015).

<sup>14</sup>Pub. L. No. 114-255, § 5010, 130 Stat. 1033, 1197 (2015).

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and 513 million barrels of oil by 2025. For member countries to meet net petroleum import obligations, the IEA counts both public and private oil reserves, although the United States meets its IEA obligation solely through the SPR.<sup>15</sup> As of July 2017, according to IEA data, the SPR held the equivalent of 141 days of import protection and U.S. private oil held the equivalent of an additional 216 days, for a total of about 356 days.<sup>16</sup> Based on EIA projections of net imports, between 506 and 513 million barrels of oil would be equivalent to about 242 and 245 days of net imports in 2025.<sup>17</sup>

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## Regional Refined Product Reserves

The United States has two regional refined product reserves—Northeast Home Heating Oil Reserve and Northeast Gasoline Supply Reserve.

- **The Northeast Home Heating Oil Reserve**, which is not part of the SPR,<sup>18</sup> holds 1 million barrels of ultra-low sulfur distillate, used for heating oil, for homes and businesses in the northeastern United States,<sup>19</sup> a region heavily dependent upon the use of heating oil, according to DOE's website. The distillate is stored in leased commercial storage in terminals located in three states: Connecticut, Massachusetts, and New Jersey. In 2000, President Clinton directed the creation of the reserve to hold approximately 10 days of inventory,

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<sup>15</sup> Public reserves are owned by the government or an independent organization set up by the government, known as an agency. Private reserves, also called industry reserves, are oil held for commercial and operational purposes as well as oil held by industry to meet minimum national reserve requirements.

<sup>16</sup>According to the IEA data source, the total does not equal the sum of industry and public reserves due to rounding.

<sup>17</sup>This calculation is based on DOE officials' estimated reserve level of SPR in 2025 and forecast changes in net imports from the EIA reference case forecast from its Annual Energy Outlook 2017.

<sup>18</sup>The Energy Act of 2000 authorized the establishment of the Northeast Home Heating Oil Reserve, and specifically provided that such a reserve is not a component of the SPR. Pub. L. No. 106-469, § 201(a)(3), 114 Stat. 2029, 2034 (2000) (codified as amended at 42 U.S.C. § 6250(a)).

<sup>19</sup>The term Northeast, for purposes of the Northeast Home Heating Oil Reserve, is defined as the States of Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, Pennsylvania, and New Jersey. 42 U.S.C. § 6250(b)(1).

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the time required for ships to carry additional heating oil from the Gulf of Mexico to New York Harbor.<sup>20</sup>

- **The Northeast Gasoline Supply Reserve**, a part of the SPR, holds a 1 million barrel supply of gasoline for consumers in the northeastern United States. According to DOE's website, this region is particularly vulnerable to gasoline disruptions as a result of hurricanes and other natural events. In response to Superstorm Sandy, which caused widespread gasoline shortages in the region in 2012, DOE conducted a test sale of the SPR and used a portion of the proceeds from the sale to create the reserve in 2014. The gasoline is stored in leased commercial storage in terminals located in three states: Maine, Massachusetts, and New Jersey.

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## Statutory Release Authority for the SPR

Under conditions prescribed by EPCA, as amended, the President has discretion to authorize the release of petroleum products from the SPR to minimize significant supply disruptions.<sup>21</sup> In the event of an oil supply disruption, the SPR can supply the market by selling stored oil. Should the President order an emergency sale of SPR oil, DOE conducts a public sale, evaluates and selects offers, and awards contracts to the highest qualified bidders. Purchasers are responsible for making their own arrangements for the transport of the SPR oil to its final destination. The Secretary of Energy also is authorized to release petroleum products from the SPR through an exchange for the purpose of acquiring oil for the SPR.<sup>22</sup> According to DOE officials, this authority is sometimes utilized in oil supply disruptions when a specific volume of SPR oil is provided to a private sector company in an emergency exchange for an equal quantity

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<sup>20</sup>Initially, the Northeast Home Heating Oil Reserve held two million barrels of high sulfur heating oil. In 2011, the two million barrels of high sulfur heating oil was sold and replaced with one million barrels of ultra-low sulfur distillate.

<sup>21</sup>Pub. L. No. 94-163, § 161, 89 Stat. 871, 888 (1975) (codified as amended at 42 U.S.C. § 6241). The statute provides for a drawdown of the reserve upon a finding by the President that drawdown and sale are required by a "severe energy supply interruption," as defined by statute, or obligation under the international energy program. 42 U.S.C. § 6241(d). Limited drawdowns may be conducted if the President finds that a circumstance is, or is likely to become, a domestic energy supply shortage of significant scope or duration, action taken would assist directly and significantly in preventing or reducing the adverse impact of such shortage, and the Secretary of Defense has found that action taken will not impair national security. 42 U.S.C. § 6241(h).

<sup>22</sup>See 42 U.S.C. § 6240(a).



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of oil plus an additional amount as a premium to be returned to the SPR in the future. According to DOE's website, emergency exchanges are generally requested by a company after an event outside the control of the company, such as a hurricane, disrupts commercial oil supplies. The Secretary of Energy is also authorized to carry out test drawdowns through a sale or exchange of petroleum products to evaluate SPR's drawdown and sales procedures. When oil is released from the SPR, it flows through commercial pipelines or on waterborne vessels to refineries, where it is converted into gasoline and other petroleum products, and then transported to distribution centers for sale to the public.

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## Changing Petroleum Markets

Petroleum markets have changed substantially in the 40 years since the establishment of the SPR, including increases in global markets, increases in domestic oil production, and declines in net petroleum imports.

- **Increases in global markets.** At the time of the Arab oil embargo, price controls in the United States prevented the prices of oil and petroleum products from increasing as much as they otherwise might have, contributing to a physical oil shortage that caused long lines at gasoline stations throughout the United States. Now that the oil market is global, the price of oil is determined in the world market, primarily on the basis of supply and demand. In the absence of price controls, scarcity is generally expressed in the form of higher prices, as purchasers are free to bid as high as they want to secure oil supply. In a global market, an oil supply disruption anywhere in the world raises prices everywhere. Releasing oil reserves during a disruption provides a global benefit by reducing oil prices in the world market.
- **Increases in domestic oil production.** Reversing a decades-long decline, U.S. oil production has generally increased in recent years. According to EIA data, U.S. production of oil reached its highest level in 1970 and generally declined through 2008, reaching a level of almost one-half of its peak. During this time, the United States increasingly relied on imported oil to meet growing domestic energy needs. However, recent improvements in technologies have allowed producers to extract oil from shale formations that were previously considered to be inaccessible because traditional techniques did not yield sufficient amounts for economically viable production. In particular, the application of horizontal drilling techniques and hydraulic fracturing—a process that injects a combination of water,

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sand, and chemical additives under high pressure to create and maintain fractures in underground rock formations that allow oil and natural gas to flow—have increased U.S. oil and natural gas production.

- **Declines in net petroleum imports.** One measure of the economy's vulnerability to oil supply disruptions is to assess net petroleum imports—that is, imports minus exports. Net petroleum imports have declined by over 60 percent from a peak of about 12.5 million barrels per day in 2005 to about 4.8 million barrels per day in 2016. In 2006, net imports were expected to increase in the future, increasing the country's reliance on foreign oil. However, imports have declined since then and, according to EIA's most recent forecast, are expected to remain well below 2005 import levels into the future. Canada and Mexico are the nation's major foreign sources for imported oil. Furthermore, the United States has increased its exports of oil and refined petroleum products.

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## DOE Has Primarily Used Exchanges from the SPR to Address Domestic Petroleum Disruptions

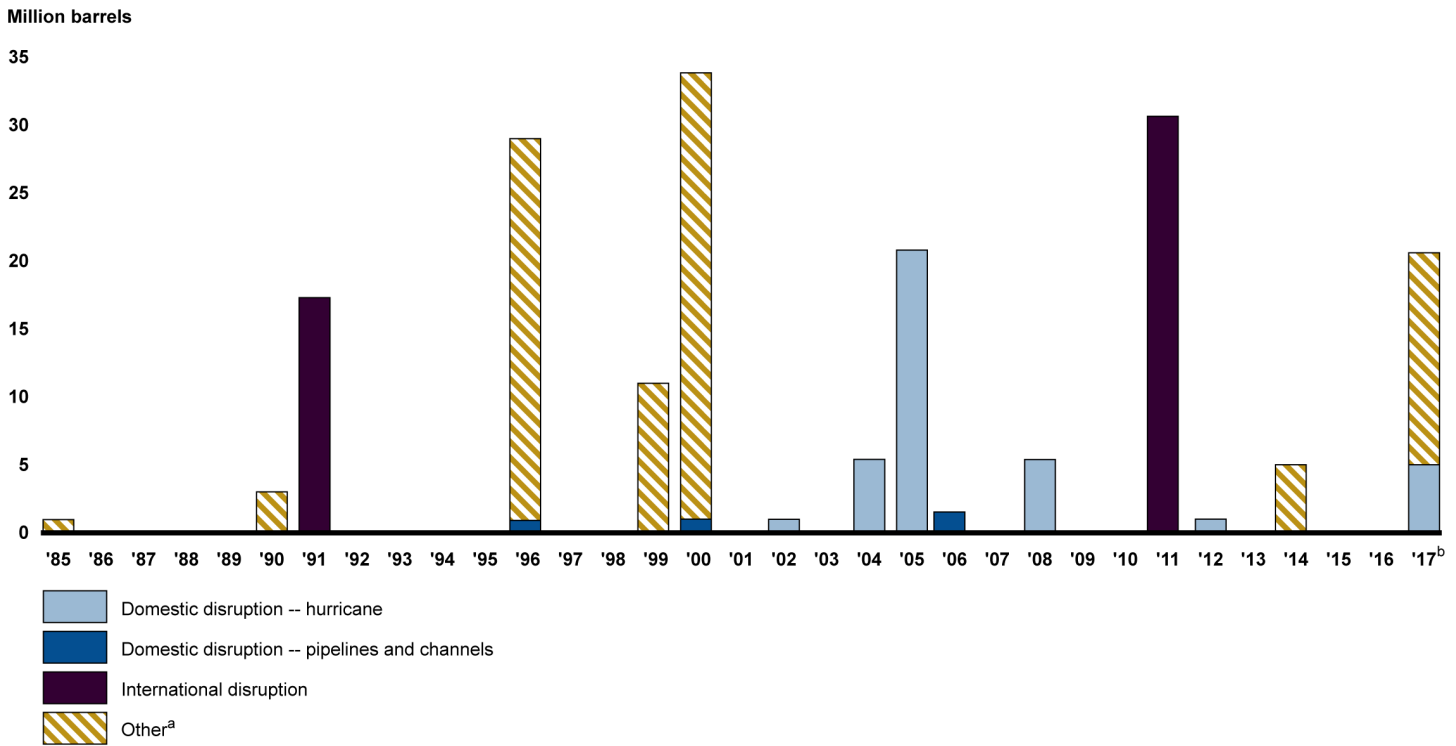
To quantify how DOE has used the SPR to address domestic petroleum supply disruptions, we reviewed DOE and EIA documents. We also reviewed our past work from August 2006 to January 2014.

Our preliminary analysis indicates that DOE has primarily used exchanges to private companies in response to domestic supply disruptions such as hurricanes and other events. DOE has released oil 24 times from 1985 through September 2017, including 11 releases in response to domestic supply disruptions.<sup>23</sup> Of these 11 releases, 10 were exchanges, including 6 exchanges in response to hurricanes. One of the 11 releases was an SPR sale in response to Hurricane Katrina, which was part of an IEA coordinated action release. Historic releases from the SPR are shown in figure 1.

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<sup>23</sup>The remaining 13 releases were conducted in response to international disruptions, or for budget deficit reduction, test sales to assess SPR operations, and other SPR operational needs. DOE officials stated that two additional releases were under way as of October 2017, that are not included in this 24 release total—those required in fiscal year 2018 under the Bipartisan Budget Act and the 21<sup>st</sup> Century Cures Act. As those sales are in process and yet not complete, GAO did not include them in its total of 24 releases.

**Figure 1: Preliminary Analysis of Historical Strategic Petroleum Reserve Releases**



Sources: Department of Energy (data); GAO (analysis). | GAO-18-209T

Note: Although the Strategic Petroleum Reserve (SPR) was created in 1975, DOE did not release oil from it until 1985. There were multiple releases in 1996, 2000, 2005, 2006, and 2017. For these years, the figure shows the sum of the released volumes under each category.

<sup>a</sup>Other includes sales for budget deficit reduction, test sales to assess SPR operations, and other SPR operational needs.

<sup>b</sup>Data for 2017 are through September.

Our preliminary analysis also indicates that the six exchanges from DOE to U.S. refineries in response to hurricanes totaled about 28 million barrels.

- Based on our preliminary analysis of DOE documents, most recently, in response to Hurricane Harvey in 2017, DOE exchanged 5 million barrels of oil to Gulf Coast refineries that requested supplies. Refinery operations largely depend on a supply of oil and feedstocks. Hurricane Harvey closed or restricted ports through which 2 million barrels of oil per day were imported, and several refineries had no supply options except for SPR oil. According to DOE officials, exchanges from the SPR have allowed refineries to continue to

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operate until alternative supply sources became available, ensuring continued production of refined petroleum products for use by consumers.

- Based on our preliminary analysis of DOE documents, DOE's most significant response to a hurricane was in 2005 following Hurricane Katrina. As we reported in January 2014, oil platforms were evacuated and damaged, virtually shutting down all oil production in the Gulf region as a result of the hurricane.<sup>24</sup> Based on our preliminary analysis of DOE documents, exchanges from the SPR, totaling 9.8 million barrels of oil, helped refineries offset this short-term physical supply disruption at the beginning of the supply chain, thereby helping to moderate the impact of the production shutdown on U.S. oil supplies. In addition to these exchanges, DOE also participated in an IEA collective action that was called in response to Hurricane Katrina by selling 11 million barrels of oil from the SPR, and IEA member countries delivered and sold much needed gasoline and other products to the United States. In total, DOE sold or exchanged 20.8 million barrels of oil from the SPR.

Our preliminary analysis of DOE documents and reports also showed that although almost all of DOE's releases in response to domestic supply disruptions have been from the SPR, DOE also used the Northeast Home Heating Oil Reserve in response to Superstorm Sandy in 2012. According to DOE's website, the agency transferred approximately 120,000 barrels of fuel to the Department of Defense to help provide fuel for first responders.

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## The SPR Is Limited in Its Ability to Respond to Domestic Disruptions

Based on our past work and preliminary observations, the SPR is limited in its ability to respond to domestic petroleum supply disruptions for three main reasons. First, as we reported in September 2014, reserves are almost entirely composed of oil and not refined products, which may not be effective in responding to all disruptions that affect the refining sector.<sup>25</sup> Second, as we reported in September 2014, reserves are nearly entirely located in one region, the Gulf Coast, which may limit responsiveness to disruptions in other regions. Third, during the course of our ongoing work, we reviewed DOE and energy task force reports that

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<sup>24</sup>[GAO-14-74](#).

<sup>25</sup>[GAO-14-807](#).

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found that the statutory authorities governing SPR releases may inhibit their use for regional disruptions.

- **Composition:** As we reported in September 2014, the SPR is almost entirely composed of oil, which may not be effective in responding to all disruptions that affect the refining sector. In September 2014, we reported that many recent economic risks associated with supply disruptions have originated from the refining and distribution sectors, which provide refined products, such as gasoline, rather than from shortages of oil.<sup>26</sup> Oil reserves are of limited use in such instances. We reported in May 2009 that following Hurricanes Katrina and Rita, nearly 30 percent of U.S. refining capacity was shut down for weeks, disrupting supplies of gasoline and other products.<sup>27</sup> The SPR could not mitigate the effects of disrupted supplies because it holds oil. As of September 2017, over 99 percent of the SPR and its Northeast Gasoline Supply Reserve component (about 674 of 675 million barrels) is held as oil rather than as refined products, such as gasoline and diesel. Moreover, Gulf Coast hurricanes severely impacted refinery operations, such as Hurricane Katrina in 2005, Hurricane Ike and Hurricane Gustav in 2008, and Hurricane Harvey this year. According to DOE officials, oil reserves are not able to mitigate the potential effects of large-scale Gulf Coast refinery outages that may impact refined product deliveries.
- **Location:** As we reported in September 2014, the SPR is nearly entirely located in one region, the Gulf Coast, which may limit its ability to respond to disruptions in other regions.<sup>28</sup> In the Gulf Coast, the SPR is located close to a major refining center as well as to distribution points for tankers, barges, and pipelines that can carry oil from it to refineries in other regions of the country. Most of the system of oil pipelines in the United States was constructed in the 1950s, 1960s, and 1970s to accommodate the needs of the refining sector and demand centers at the time. Given the SPR's current location in the Gulf Coast, transporting oil from the reserve may impact commercial distribution of oil. Based on our ongoing work, according to DOE's 2016 long-term strategic review of the SPR, the agency reported that the expanding North American oil production and the resulting shifts in how oil is transported around the country have

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<sup>26</sup>[GAO-14-807](#).

<sup>27</sup>[GAO-09-695T](#).

<sup>28</sup>[GAO-14-807](#).

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reduced the SPR's ability to add incremental barrels of oil to the market under certain scenarios in the event of an oil supply crisis. This means that while the SPR remains connected to physical assets that could bring oil to the market, in many cases, forcing SPR oil into the distribution system would result in an offsetting reduction in domestic commercial oil flows. As we reported in September 2014, it may be more difficult to move oil from the SPR to refineries in certain regions of the United States. For example, since no pipelines connect the SPR to the West Coast, supplies of petroleum products and oil must be shipped by pipeline, truck, or barge from other domestic regions or by tanker from foreign countries. Such modes of transport are slower and more costly than via pipelines. For example, it can take about 2 weeks for a vessel to travel from the Gulf Coast to Los Angeles—including transit time through the Panama Canal.

- **Statutory release authorities:** In the course of our ongoing work, we reviewed DOE and energy task force reports that found that the statutory authorities governing SPR releases may inhibit their use for regional disruptions. DOE is authorized to release petroleum distillate (fuel) from the Northeast Home Heating Oil Reserve upon a finding by the President of a severe energy supply interruption that includes a dislocation in the heating oil market or other regional supply shortage.<sup>29</sup> On the other hand, because the Northeast Gasoline Supply Reserve is a part of the SPR, DOE can release gasoline from that reserve only after the President makes the statutorily required findings for release from the SPR, which do not explicitly include the existence of a regional supply shortage.<sup>30</sup> According to DOE's 2016 long-term strategic review of the SPR, a regional product reserve is meant to address regional supply shortages, whereas the SPR of which the Northeast Gasoline Supply Reserve is a part of, is meant to

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<sup>29</sup>42 U.S.C. § 6250b(a). For purposes of the Northeast Home Heating Oil Reserve, a "dislocation in the heating oil market" can be deemed to occur only when the price differential between crude oil and heating oil, according to specified metrics, increases by more than 60 percent over its 5-year rolling average, the differential continues for 7 consecutive days, and the differential continues to increase thereafter. 42 U.S.C. § 6250b(b). The President can also find a severe energy supply interruption if there is a circumstance other than a dislocation in the heating oil market that constitutes a regional supply shortage of significant scope and duration and a release would assist directly and significantly in reducing the adverse impact of such shortage. 42 U.S.C. § 6250b(a)(2).

<sup>30</sup>42 U.S.C. § 6241(d), (h). According to DOE's long-term strategic review of the SPR, the purpose of the Northeast Gasoline Supply Reserve is to address regional supply shortages that can stem from localized natural disasters, such as severe winter weather or hurricanes impacting the Northeast, or from other incidents that may impact regional fuel supplies.

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address severe energy supply interruptions that have a national impact. As a result, according to DOE's 2016 long-term strategic review of the SPR, in practice, this means that the release of the gasoline reserve would have to have a national impact. The Quadrennial Energy Review of 2015 recommended that Congress integrate the authorities of the President to release products from the regional product reserves—the Northeast Home Heating Oil Reserve and Northeast Gasoline Supply Reserve—into a single, unified authority by amending the trigger for the release of fuel from the two refined product reserves so that they are aligned and properly suited to the purpose of a product reserve, as opposed to an oil reserve.<sup>31</sup>

As discussed, based on our preliminary observations, DOE has used the SPR in response to domestic supply disruptions, but the effectiveness of these releases is unclear because DOE has not formally assessed all of them. DOE has exchanged about 28 million barrels of oil in response to hurricanes, but we found only two reports assessing DOE's response to Hurricanes Gustav, Ike, Katrina, and Rita, and it is unclear whether DOE has examined other responses. According to a 2006 DOE Inspector General report, DOE used the SPR and its assets with great effectiveness to address emergency energy needs in the crises surrounding Hurricanes Katrina and Rita,<sup>32</sup> but the concentration of SPR sites along the Gulf Coast meant the United States also had to rely on refined petroleum products from Europe. The report noted that despite being in the path of the hurricanes' destruction, the SPR promptly fulfilled requests for oil from refineries suffering from storm-related supply

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<sup>31</sup>U.S. Department of Energy, *Quadrennial Energy Review: Energy Transmission, Storage, and Distribution Infrastructure*, April 2015. In a presidential memorandum released on January 9, 2014, the President created a Quadrennial Energy Review task force. The memorandum directed the task force to conduct a Quadrennial Energy Review and identified the challenges facing the nation's energy infrastructures as the focus of its first installment. The 2015 review recommended updating the SPR's release authority to reflect modern markets. Under the statute governing the SPR's release authority, while a limited drawdown can be ordered in anticipation of price increases, a full drawdown of the reserve cannot be ordered until a supply interruption has, among other things, resulted in a severe increase in the price of petroleum products. 42 U.S.C. § 6241(d), (h). The 2015 review also recommended that the authority to anticipate an economy-damaging price increase as a result of a severe energy supply interruption should be added to the broader EPCA drawdown authority to more closely conform to other EPCA goals of preventing "a severe increase in the price of petroleum products" that "is likely to cause an adverse impact on the national economy."

<sup>32</sup>U.S. Department of Energy, Office of Inspector General, *The Department of Energy's Use of the Strategic Petroleum Reserve in Response to Hurricanes Katrina and Rita – Audit Report*, DOE/IG-0747, (Washington, D.C.: Dec. 2006).



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shortages. However, the damage caused by Hurricane Katrina demonstrated that the concentration of refineries on the Gulf Coast and resulting damage to pipelines left the United States to rely on imports of refined petroleum products from Europe, as part of an IEA collective response. Consequently, regions experienced a shortage of gasoline, and prices rose. DOE testified in 2009 that despite a response from the SPR and IEA, some markets south of Virginia and north of Florida could not be immediately supplied with refined products due to a lack of infrastructure to receive and distribute imports from the Atlantic coast to inland population centers.<sup>33</sup> Exchanges with multiple refiners totaling 5.4 million barrels of SPR oil were authorized to Hurricanes Gustav and Ike in 2008. DOE assessed this response and submitted a report to Congress in 2009.<sup>34</sup> According to DOE's 2009 report, the exchanges conducted in September and October 2008 were successful in providing emergency petroleum supplies to refiners experiencing shortages caused by Hurricanes Gustav and Ike.

As we reported in May 2009, as originally enacted, EPCA envisioned the possibility that the SPR would include a variety of petroleum products stored at locations across the country.<sup>35</sup> In a 2009 hearing, the then Deputy Assistant Secretary for Petroleum Reserves testified that DOE still considers a large SPR focused on oil storage to be the best way to protect the nation from the negative impacts of a short-term international interruption to U.S. oil imports; however, the hurricanes of 2005 and 2008 showed that the SPR may be limited in its ability to address some short-

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<sup>33</sup>U.S. Department of Energy, David F. Johnson, Deputy Assistant Secretary for Petroleum Reserves, *Developing Refined Products Storage in the Strategic Petroleum Reserve*, testimony before the Committee on Energy and Natural Resources, United States Senate, May 12, 2009, accessed October 4, 2017, <https://energy.gov/fe/articles/developing-refined-products-storage-strategic-petroleum-reserve>.

<sup>34</sup>U.S. Department of Energy, *Report to the Congress on the Strategic Petroleum Reserve 2008 Emergency Test Exchanges*, (Washington, D.C.: Aug. 2009).

<sup>35</sup>[GAO-09-695T](#).

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term interruptions to domestic refined products supply and distribution infrastructure.<sup>36</sup>

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## Other IEA Members Structure Their Reserves Differently, with Some Holding Industry Reserves and Refined Products, and DOE Has Taken Steps to Explore These Structures

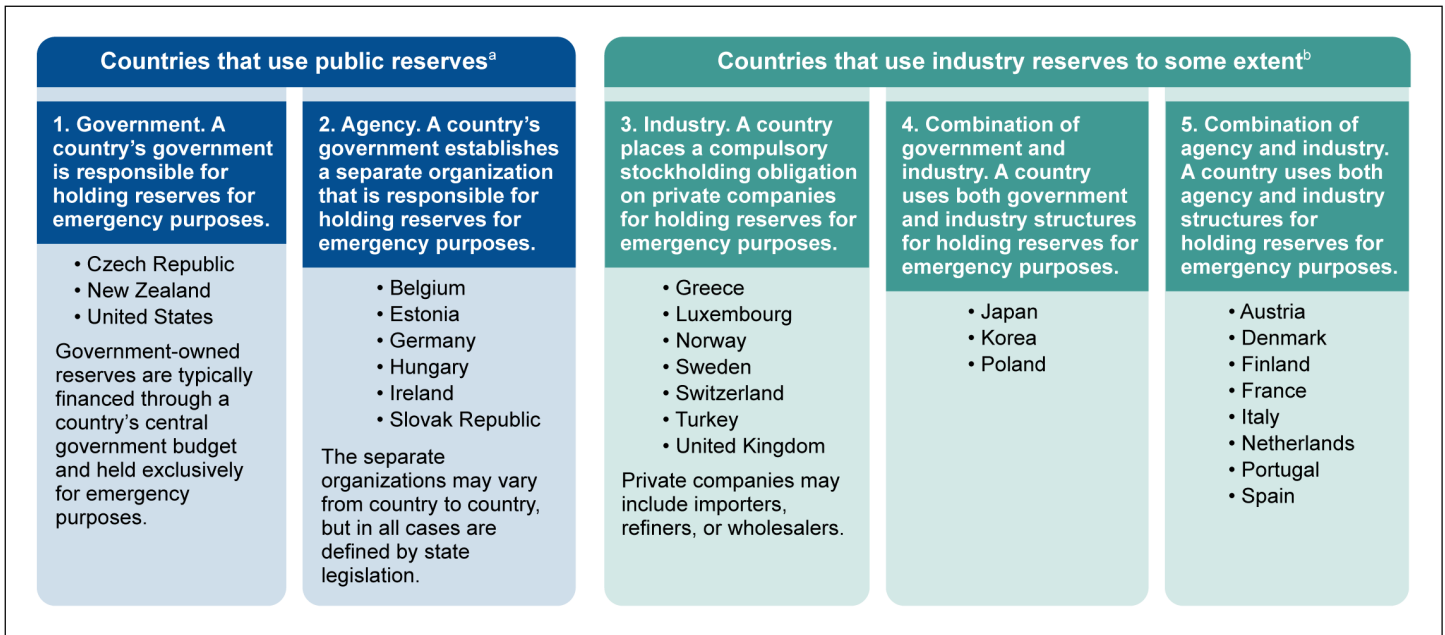
Based on information reviewed during the course of our ongoing work, to respond to disruptions, 27 of the 29 IEA member countries use one of five reserve structures, also known as stockholding structures, in which these countries hold public reserves, industry reserves, or a combination of these.<sup>37</sup> The five structures are shown in figure 2. Also, most members hold refined petroleum products, with many members holding at least a third of their reserves in refined petroleum products. Some members hold their refined petroleum products in different regions across their country to respond to disruptions.

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<sup>36</sup>U.S. Department of Energy, David F. Johnson, Deputy Assistant Secretary for Petroleum Reserves, *Developing Refined Products Storage in the Strategic Petroleum Reserve*, testimony before the Committee on Energy and Natural Resources, United States Senate, May 12, 2009, accessed October 4, 2017, <https://energy.gov/fe/articles/developing-refined-products-storage-strategic-petroleum-reserve>.

<sup>37</sup>The IEA refers to the various approaches that IEA member countries use to hold their reserves of oil or petroleum products as “stockholding structures.” As net exporters, Canada, Denmark, and Norway do not have a stockholding obligation under the International Energy Program Agreement. However, despite being net exporters, Norway and Denmark have stockholding structures by law. According to IEA officials, Australia is not compliant in meeting its stockholding obligations currently.

**Figure 2: Preliminary Analysis of Strategic Reserve Structures Used by International Energy Agency Member Countries**



Source: GAO analysis of International Energy Agency information. | GAO-18-209T

Note: According to International Energy Agency officials, as net exporters, Canada, Denmark, and Norway do not have a stockholding obligation under the International Energy Program Agreement. However, despite being net exporters, Norway and Denmark have stockholding structures by law. One country, Australia, relies on industry reserves, but does not place a compulsory obligation on industry.

<sup>a</sup>Public reserves are reserves that are owned by the government or an independent organization set up by government, known as an agency.

<sup>b</sup>Industry reserves, also called private reserves, are reserves held for commercial and operational purposes as well as reserves held by industry to meet minimum national reserve requirements.

Based on our preliminary analysis of information on the 29 IEA member countries, 18 place a stockholding obligation on industry either exclusively or in part to meet their total emergency reserve needs. Most of these countries distribute the stockholding obligation in proportion to companies' share of oil imports or of sales in the domestic market. However, several member countries instead impose a higher obligation on refineries because of their high amount of operating oil.

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According to a 2014 IEA report,<sup>38</sup> most IEA members hold some amount of refined petroleum products, and a European Union (EU) directive generally requires EU members to ensure that at least one-third of their stockholding obligation is held in the form of refined petroleum products.<sup>39</sup> For example, according to the IEA's website, Germany's stockholding agency, Erdolbevorratungsverband (EBV), holds 55 percent of its reserve in refined petroleum products such as gasoline, diesel fuel, and light heating oil.<sup>40</sup> In contrast, the United States holds almost all of its reserves in oil rather than refined petroleum products.

Some IEA member countries geographically disperse their reserves of refined petroleum products to be able to respond to domestic disruptions. For example, according to the IEA's website, to maintain a wide geographical distribution of emergency reserves, the French stockholding agency stores refined petroleum products in each of its seven geographic zones.<sup>41</sup> Moreover, according to the IEA's website, France's agency stores petroleum product reserves in each zone; reserves in each zone should represent specified amounts based on consumption in order to respond to emergencies.<sup>42</sup> During a labor strike in December 2013, France used its emergency reserves to supply local gas stations when delivery of fuel was impeded for a prolonged period of time, according to a French document. In another example, the IEA reported that Germany holds petroleum product reserves in several regions in the country and that the reserves are to be distributed throughout Germany, so that a minimum reserve equivalent to a 15-day supply is maintained in each of

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<sup>38</sup>International Energy Agency, *Energy Supply Security, Emergency Response of IEA Countries* (Paris, France: 2014).

<sup>39</sup>Specifically, the EU directive states that if a member has not committed to maintaining at least 30 days of specific reserves, it shall ensure at least one-third of its obligation is held in the form of certain specified products, including petroleum products. See Council Directive 09/119, art. 9, 2009 O.J. (L 265) 15 (EU).

<sup>40</sup>International Energy Agency, *Germany Oil Stocks*, accessed September 20, 2017, <http://www.iea.org/countries/membercountries/germany/oilstocks/>; and International Energy Agency, *Energy Supply Security, Emergency Response of IEA Countries* (Paris, France: 2014).

<sup>41</sup>International Energy Agency, *France Oil Stocks*, accessed September 25, 2017, <http://www.iea.org/countries/membercountries/france/oilstocks/>.

<sup>42</sup>International Energy Agency, *France Oil Stocks*, accessed September 25, 2017, <http://www.iea.org/countries/membercountries/france/oilstocks/>.

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five designated supply areas.<sup>43</sup> The rationale for this is to prevent logistical bottlenecks that could occur if all emergency reserves were stored centrally, according to a 2014 IEA report.<sup>44</sup>

Based on our preliminary observations, DOE has taken some steps to evaluate different structures for holding reserves. However, the agency has not formally evaluated other countries' structures in over 35 years and has not finalized its 2015 studies on regional petroleum product reserves. According to DOE officials, the agency explored the feasibility of adopting the industry structure shortly after creating the SPR and concluded that this and other structures were not feasible in the United States. In 1980, DOE studied the feasibility of adopting the agency structure, which is the most similar to the SPR since the only major difference is how the reserve is funded,<sup>45</sup> according to DOE officials. According to IEA documents, in the agency structure, generally the reserve is funded by a tax or levy on products or industry, which is passed down to the consumer. In contrast, the SPR is funded through congressional appropriations. However, DOE officials we interviewed cautioned that the agency has not reassessed its findings from 35 years ago. As mentioned above, in 2016 DOE reassessed the SPR in light of the changing global oil market, but this assessment did not include a review of other IEA countries' structures.

Our preliminary review indicates that DOE examined the feasibility of additional regional petroleum product reserves in two 2015 studies, but it did not finalize these studies or expand the SPR to include additional reserves. In September 2014, we reported that DOE officials told us they were conducting a regional fuel resiliency study that would provide insights into whether there is a need for additional regional product reserves and, if so, where these reserves should be located. The Quadrennial Energy Review of 2015 recommended that the agency analyze the need for additional or expanded regional product reserves by undertaking updated cost-benefit analyses for all of the regions of the

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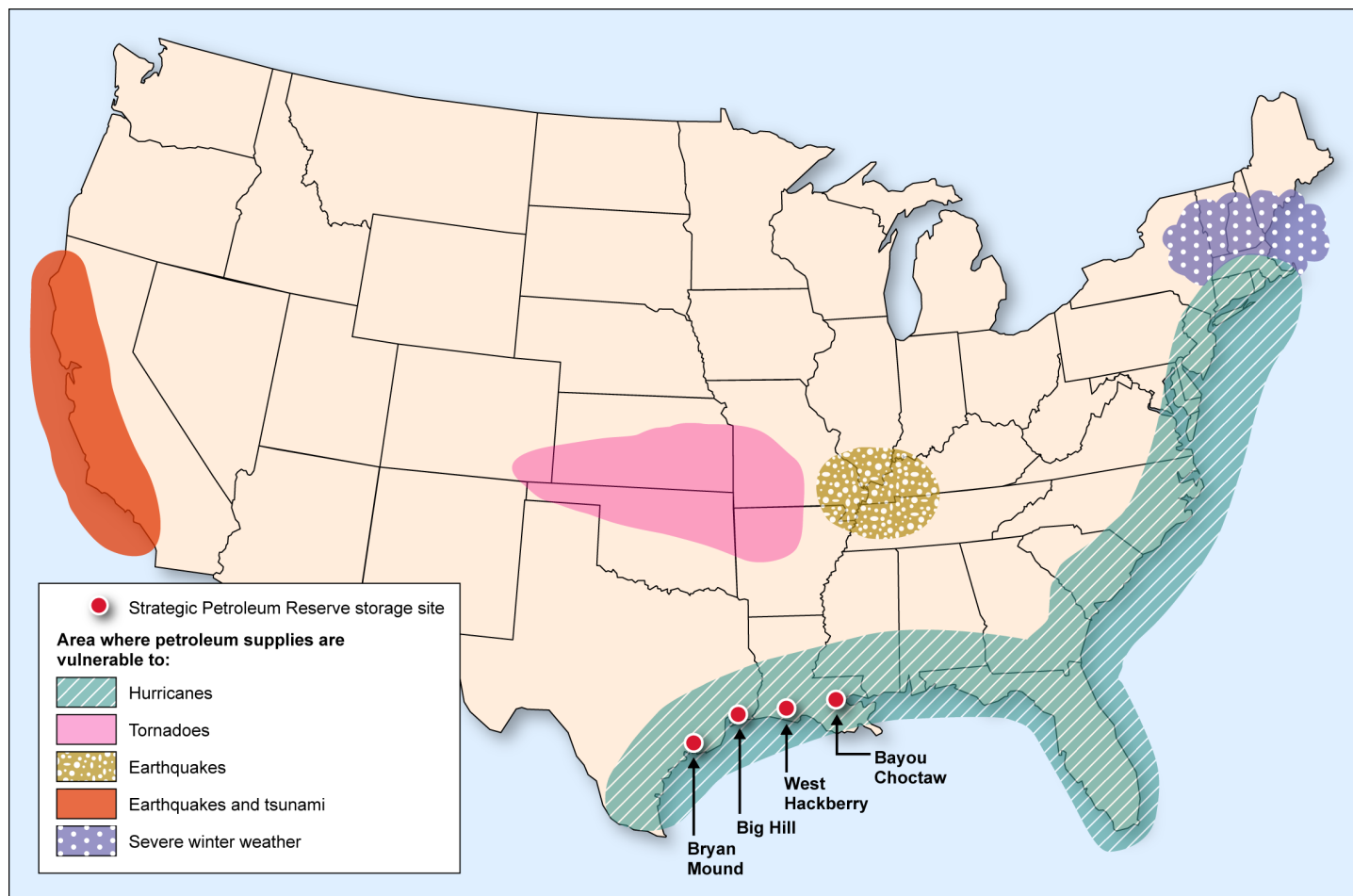
<sup>43</sup>International Energy Agency, *Energy Supply Security, Emergency Response of IEA Countries* (Paris, France: 2014).

<sup>44</sup>International Energy Agency, *Energy Supply Security, Emergency Response of IEA Countries* (Paris, France: 2014).

<sup>45</sup>As mentioned above, the establishment of the SPR was authorized by statute. According to DOE officials, establishment of an agency structure in the United States as an alternative to the SPR would similarly require new legislation.

United States that have been identified as vulnerable to fuel supply disruptions. Figure 3 illustrates vulnerabilities that DOE identified in 2014.

**Figure 3: U.S. Strategic Petroleum Reserve Locations and Regional Petroleum Supply Vulnerabilities Identified by the Department of Energy in 2014**



Sources: Department of Energy; Map Resources (map). | GAO-18-209T

In response to the 2015 recommendation, DOE contractors studied the feasibility of additional regional petroleum product reserves, as part of the SPR, in the U.S. Southeast and West Coast regions to address supply vulnerabilities from hurricanes and earthquakes, respectively. According to DOE officials, weather events in the Southeast are of higher probability but lower consequence, and events in the West Coast are of lower probability but higher consequence. DOE did not finalize its 2015 studies on regional petroleum product reserves and make them publicly available.

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According to DOE officials, because consensus could not be reached within the Administration on several issues associated with the refined product reserve studies, these studies were not included as part of DOE's 2016 long-term strategic review of the SPR. Our ongoing work indicates that DOE's 2016 long-term strategic review of the SPR did not account for the risks of domestic supply disruptions as a factor in determining the appropriate size, location, and composition of the SPR. Prior to the two 2015 studies, in 2011, DOE carried out a cost-benefit study of the establishment of a refined product reserve in the Southeast and estimated that such a reserve would reduce the average gasoline price rise by 50 percent to 70 percent in the weeks immediately after a hurricane landfall, resulting in consumer cost savings, according to the Quadrennial Energy Review of 2015.<sup>46</sup>

In closing, I note that we are continuing our ongoing work examining issues that may help inform future considerations for the SPR. Given the constrained budget environment and the evolving nature of energy markets and their vulnerabilities, it is important that DOE ensures the SPR is an efficient and effective use of federal resources. We look forward to continuing our work to determine whether additional DOE actions may be warranted to promote this objective.

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

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<sup>46</sup>According to DOE officials, all aspects of the 2011 study remain draft and pre-decisional since DOE did not officially approve the study.

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## GAO Contact and Staff Acknowledgments

If you or your staff have any questions about this testimony, please contact Frank Rusco, Director, Natural Resources and Environment, at (202) 512-3841 or [ruscof@gao.gov](mailto:ruscof@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. Key contributors to this testimony include Quindi Franco, Assistant Director; Philip Farah, Ellen Fried, Nkenge Gibson, Cindy Gilbert, Gregory Marchand, Patricia Moye, Camille Pease, Oliver Richard, Danny Royer, Rachel Stoiko, Marie Suding, and Kiki Theodoropoulos.



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