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STRATEGIC PETROLEUM RESERVE

Issues Regarding the Inclusion of Refined Petroleum Products as Part of the Strategic Petroleum Reserve

Statement of Frank Rusco, Director
Natural Resources and Environment

May 12, 2009

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Highlights

Highlights of GAO-09-695T, a report to Committee on Energy and Natural Resources, U.S. Senate

Why GAO Did This Study

The possibility of storing refined petroleum products as part of the Strategic Petroleum Reserve (SPR) has been contemplated since the SPR was created in 1975. The SPR, which currently holds about 700 million barrels of crude oil, was created to help insulate the U.S. economy from oil supply disruptions. However, the SPR does not contain refined products such as gasoline, diesel fuel, or jet fuel. The Energy Policy Act of 2005 directed the Department of Energy (DOE) to increase the SPR's capacity from 727 million barrels to 1 billion barrels, which it plans to do by 2018.

With the possibility of including refined products as part of the expansion of the SPR, this testimony discusses (1) some of the arguments for and against including refined products in the SPR and (2) lessons learned from the management of the existing crude oil SPR that may be applicable to refined products.

To address these issues, GAO relied on its 2006 report on the SPR (GAO-06-872), 2007 report on the globalization of petroleum products (GAO-08-14), and two 2008 testimonies on the cost-effectiveness of filling the SPR (GAO-08-521T and GAO-08-726T). GAO also reviewed prior DOE and International Energy Agency studies on refined product reserves.

View GAO-09-695T or key components.
For more information, contact Frank Rusco at (202) 512-3841 or ruscof@gao.gov.

What GAO Found

Since the SPR, the largest emergency crude oil reserve in the world, was created in 1975 a number of arguments have been made for and against including refined petroleum products. Some of the arguments for including refined products in the SPR are: (1) the United States' increased reliance on imports and resulting exposure to supply disruptions or unexpected increases in demand elsewhere in the world, (2) possible reduced refinery capacity during weather related supply disruptions, (3) time needed for petroleum product imports to reach all regions of the United States in case of an emergency, and (4) port capacity bottlenecks in the United States, which limit the amount of petroleum products that can be imported quickly during emergencies. For example, 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 product from Europe. Consequently, regions experienced a shortage of gasoline and prices rose. Conversely, some of the arguments against including refined products in the SPR are: (1) the surplus of refined products in Europe, (2) the high storage costs of refined products, (3) the use of a variety of different type of blends of refined products—"boutique" fuels—in the United States, and (4) policy alternatives that may diminish reliance on oil. For example, Europe has a surplus of gasoline products because of a shift to diesel engines, which experts say will continue for the foreseeable future. Europe's surplus of gasoline is available to the United States in emergencies and provided deliveries following Hurricanes Katrina and Rita in 2005.

The following three lessons learned from the management of the existing SPR may have some applicability in dealing with refined products.

- *Select a cost-effective mix of products*. In 2006, GAO recommended that DOE include at least 10 percent heavy crude oil in the SPR. If DOE bought 100 million barrels of heavy crude oil during its expansion of the SPR it could save over $1 billion in nominal terms, assuming a price differential of $12 between the price of light and heavy crude, the average differential from 2003 through 2007. Similarly, if directed to include refined products as part of the SPR, DOE will need to determine the most cost-effective mix of products.
- *Consider using a dollar-cost-averaging acquisition approach*. Also in 2006, GAO recommended that DOE consider acquiring a steady dollar value—rather than a steady volume—of oil over time when filling the SPR. This would allow DOE to acquire more oil when prices are low and less when prices are high. GAO expects that a dollar-cost-averaging acquisition method would also provide benefits when acquiring refined products.
- *Maximize cost-effective storage options*. According to DOE, below ground salt formations offer the lowest cost approach for storing crude oil for long periods of time—$3.50 per barrel in capital cost versus $15 to $18 per barrel for above ground storage tanks. Similarly, DOE will need to explore the most cost-effective storage options for refined products.

Mr. Chairman and Members of the Committee:

I am pleased to be here today to participate in the Committee's hearing on the proposal to include refined petroleum products as part of the Strategic Petroleum Reserve (SPR). The Energy Policy and Conservation Act authorized the establishment of the SPR in 1975 to help protect the U.S. economy from damage caused by oil supply disruptions following the Arab oil embargo of 1973 to 1974.[1] The SPR, which consists of over 700 million barrels of crude oil stored in salt caverns in Texas and Louisiana, is owned by the federal government and operated by the Department of Energy (DOE). When processed, crude oil is refined to produce petroleum products such as gasoline, diesel, and jet fuel. As originally enacted, the Energy Policy and Conservation Act envisioned the possibility that the SPR would include a variety of petroleum products stored at locations across the country. Specifically, section 154(d) of the 1975 act stated that:

> The Strategic Petroleum Reserve Plan shall be designed to assure, to the maximum extent practicable, that the Reserve will minimize the impact of any interruption or reduction in imports of refined petroleum products and residual fuel oil in any region which the Administrator determines is, or is likely to become, dependent upon such imports for a substantial portion of the total energy requirements of such region. The Strategic Petroleum Reserve Plan shall be designed to assure, to the maximum extent practicable, that each noncontiguous area of the United States which does not have overland access to domestic crude oil production has its component of the Strategic Petroleum Reserve within its respective territory.[2]

However, a Federal Energy Administration (FEA) study in 1977[3] found that, at that time, it was less costly to maintain a centralized crude oil reserve rather than dispersed storage with multiple product reserves. The possibility of including refined petroleum products at part of the SPR has been studied periodically by DOE since the mid-1970s and each time the idea has been rejected.

Since 1974, the United States and 27 other nations have become members of the International Energy Agency (IEA) and have agreed to maintain

[1]Pub. L. No. 94-163, Title I, Part B, 89 Stat. 881–90 (1975), *codified as amended at* 42 U.S.C. §§ 6231–6247(b).

[2]Repealed by Pub. L. No. 106-469, Title I, § 103(7)(C), 114 Stat. 2030 (2000).

[3]FEA, which was a predecessor agency to DOE, authored the 1977 study. FEA's functions were transferred to DOE effective October 1, 1977.

reserves of oil or petroleum products equaling 90 days of net imports and to release these reserves and reduce demand during oil supply disruptions.[4] IEA member nations fulfill this obligation in various ways; some countries require that industry hold reserves, others have created government reserves, and some countries hold a combination of the two. Additionally, some IEA countries hold refined products in addition to crude oil reserves while the U.S. holds only crude oil. In May 2009, the SPR contained about 719 million barrels, equal to about 65 days of 2008 U.S. average net monthly oil imports. In addition to government reserves, private industry inventory of crude oil and petroleum products varies over time, but DOE estimates that private inventory contains an amount equivalent to an additional 59 days of U.S. oil imports. Thus, at the current level of oil demand, the SPR combined with private industry holdings contains enough oil and petroleum products to exceed the United States' 90-day reserve requirement.

The Energy Policy Act of 2005 directed DOE to increase the SPR inventory to 1 billion barrels.[5] DOE plans to accomplish this increase by 2018 and has chosen to increase the size of two current SPR sites and create one new site to accommodate the expansion in inventory. In August 2006 we made a number of recommendations to the Secretary of Energy to improve the operation of the SPR and to improve decisions surrounding the SPR's use and expansion.[6] Specifically, we recommended, among other things, that the Secretary should study how to best implement experts' suggestions to fill the SPR more cost-effectively and to conduct a new review about the optimal oil mix in the SPR. Largely based on our

[4]The 28 member countries of the International Energy Agency are Australia, Austria, Belgium, Canada, Czech Republic, Denmark, 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.

[5]Pub. L. No. 109-58, Title III, § 301(e)(1), 119 Stat. 684 (2005).

[6]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).

August 2006 report, we testified twice in 2008 on options for DOE to improve the cost-effectiveness of filling the SPR to 1 billion barrels.[7]

With the expansion of the SPR, the issue of including refined petroleum products has resurfaced. As Congress debates whether to require DOE to include refined petroleum products, our testimony today will (1) summarize some of the arguments for and against including refined petroleum products and (2) highlight some of the lesson learned from the management of the existing SPR that may be applicable to refined petroleum products.

To address these issues, we reviewed our August 2006 report on the SPR, our December 2007 report on the globalization of petroleum products,[8] and our two 2008 testimonies on the cost-effectiveness of filling the SPR. We also reviewed the Energy Policy and Conservation Act, as amended; the regulations on the acquisition of petroleum for the SPR;[9] and prior DOE studies on the feasibility of including refined petroleum products as part of the SPR. In addition, we spoke with an IEA official and we reviewed IEA documents dealing with the issue of refined petroleum product reserves in the United States and other IEA member countries overseas. We conducted our work from April 2009 to May 2009 in accordance with all sections of GAO's Quality Assurance Framework that are relevant to our objectives. The framework requires that we plan and perform the engagement to obtain sufficient and appropriate evidence to meet our stated objectives and to discuss any limitations in our work. We believe that the information and data obtained, and the analysis conducted, provide a reasonable basis for any findings and conclusions.

Background

The United States is the largest consumer of crude oil and petroleum products. In 2007, the U.S. share of world oil consumption was approximately 24 percent. While DOE projects that U.S. demand for oil

[7]GAO, *Strategic Petroleum Reserve: Options to Improve the Cost-Effectiveness of Filling the Reserve*, GAO-08-521T, (Washington, D.C.: Feb. 26, 2008); and GAO, *Strategic Petroleum Reserve: Improving the Cost-Effectiveness of Filling the Reserve*, GAO-08-726T (Washington, D.C.: Apr. 24, 2008).

[8]GAO, *Energy Markets: Increasing Globalization of Petroleum Products Markets, Tightening Refining Demand and Supply Balance, and Other Trends Have Implications for U.S. Energy Supply, Prices, and Price Volatility*, GAO-08-14 (Washington, D.C.: Dec. 20, 2007).

[9]10 C.F.R. Part 626.

will continue to grow, domestic production has generally been in decline for decades, leading to greater reliance on imported oil. U.S. imports of oil have increased from 32 percent of domestic demand in 1985 to 58 percent in 2007.

In managing the SPR, the Secretary of Energy is authorized by the Energy Policy and Conservation Act, as amended, to place in storage, transport, or exchange, (1) crude oil produced from federal lands; (2) crude oil which the United States is entitled to receive in kind as royalties from production on federal lands; and (3) petroleum products acquired by purchase, exchange, or otherwise.[10] The act also states that the Secretary shall, to the greatest extent practicable, acquire petroleum products for the SPR in a manner that minimizes the cost of the SPR and the nation's vulnerability to a severe energy supply interruption, among other things.[11] In addition, until being repealed in 2000, the act provided the Secretary discretionary authority to require importers and refiners of petroleum products to store and maintain readily available inventories, and it directed the Secretary to establish and maintain regional petroleum reserves under certain circumstances.[12]

Under conditions prescribed by Energy Policy and Conservation Act, as amended, the President has the discretion to authorize the Secretary of Energy to release the oil in the SPR to minimize significant supply disruptions.[13] In the event of an oil supply disruption, the SPR can provide supply to the market—by selling stored crude oil or trading this oil in exchange for a larger amount of oil to be returned later. Presidents have twice ordered that oil be sold from the SPR in response to oil supply disruptions: that is, in response to the 1990-1991 Persian Gulf War and Hurricane Katrina in 2005. 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, then transported to distribution centers for sale to the public. Additionally, the

[10]42 U.S.C. § 6240(a).

[11]42 U.S.C. § 6240(b).

[12]Pub. L. No. 94-163, Title 1, Part B, §§ 156, 157, 89 Stat. 885–86 (1975), *previously codified as amended at* 42 U.S.C. § 6236 (Industrial Petroleum Reserve) and § 6237 (Regional Petroleum Reserve), respectively. *Repealed by* Pub. L. No. 106-469, Title I, §§ 103(9),(10), 114 Stat. 2030 (2000).

[13]Pub. L. No. 94-163, § 161, 89 Stat. 888–89 (1975), *codified as amended at* 42 U.S.C. § 6241.

SPR has sold or exchanged oil on several other occasions, including providing small quantities of oil to refiners to help them through short-term localized oil shortages.

Oil markets have changed substantially in the 34 years since the establishment of the SPR. 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.

In response to various congressional directives, DOE has studied the issue of including refined petroleum products at various times since 1975. After the initial SPR plan was developed, the issue was reviewed again in whole, or in part, in 1977, 1982, 1989, and 1998.[14] Except for the 1998 report, DOE concluded that including refined petroleum products as part of the SPR was unnecessary and too expensive. The 1998 study dealt with establishing a home heating oil reserve and while it did not conclude that a reserve should or should not be established, it did find the construction of such a reserve would have net negative benefits. The 2000 amendments to the Energy Policy and Conservation Act authorized the Secretary to establish a Northeast Home Heating Oil Reserve, which was created and filled that same year. Although this reserve is considered separate from the SPR, it is authorized to contain 2 million barrels of heating oil and

[14]Federal Energy Administration, Strategic Petroleum Reserve Office, *Strategic Petroleum Reserve Plan*, Energy Publication No. 95-2 (Washington, D.C.: January 1977); DOE, Office of the Secretary, *A Report to the Congress: Regional Petroleum Reserves*, DOE/EP-0080 (Washington, D.C.: Dec. 31, 1982); DOE, Office of the Assistant Secretary for Fossil Energy, *Report to the Congress on Expansion of the Strategic Petroleum Reserve to One Billion Barrels*, DOE/FE-0126 (Washington, D.C.: Apr. 1989); DOE, Office of the Assistant Secretary for Fossil Energy, *Report to Congress on the Feasibility of Establishing a Heating Oil Component of the Strategic Petroleum Reserve*, DOE/FE-0376 (Washington, D.C.: June 1998).

currently holds nearly that amount.[15] The Reserve is an emergency source of heating oil to address a severe energy supply interruption in the Northeast.[16] According to DOE, the intent was to create a reserve large enough to allow commercial companies to compensate for interruptions in supply of heating oil during severe winter weather, but not so large as to dissuade suppliers from responding to increasing prices as a sign that more supply is needed. To date, the Northeast Home Heating Oil Reserve has not been used to address an emergency winter shortage situation.

Some of the Arguments For and Against Including Refined Petroleum Products in the SPR

Some of the arguments for including refined petroleum products in the SPR are: (1) the United States' increased reliance on foreign imports and resulting exposure to supply disruptions or unexpected increases in demand elsewhere in the world, (2) possible reduced refinery capacity during weather related supply disruptions, (3) time needed for petroleum product imports to reach all regions of the United States in case of an emergency, and (4) port capacity bottlenecks in the United States which limit the amount of petroleum products that can be imported quickly during emergencies. Some of the arguments against including refined petroleum products in the SPR are: (1) the surplus of gasoline in Europe, (2) the high storage costs of refined products, (3) the use of 'boutique' fuels in the United States, and (4) policy alternatives may diminish U.S. reliance on oil.

Some of the Arguments for Including Refined Petroleum Products in the SPR

First, in our December 2007 report,[17] we found that while the United States was largely self-sufficient in gasoline in 1970, in fiscal year 2007, we imported over 10 percent of our annual consumption of gasoline and smaller percentages of jet fuel and some other products.[18] We also found that along with an increased reliance on imports the United States is exposed to supply disruptions or unexpected increases in demand anywhere else in the world. Because the SPR contains only crude oil, if an

[15] During June 2007, DOE sold 35,000 of its two million barrel reserve in order to cover the higher costs of new storage contracts. In August 2008, DOE repurchased 19,253 barrels of heating oil using $3 million of appropriated funds, taking the inventory to 1,984,253 barrels.

[16] Pub. L. No. 106-469, Title II, 114 Stat. 2034–37 (2000), *codified as amended at* 42 U.S.C. §§ 6250–6250e.

[17] GAO-08-14.

[18] Total gasoline includes both finished motor gasoline and motor gasoline blending components.

unexpected supply disruption occurs in a supply center for the United States, the government's emergency strategy would rely on sufficient volumes of the SPR and a refinery sector able to turn out products at a pace necessary to meet consumer demands in a crisis. Any growth in demand in the United States would put increasing pressure on this policy, and for much of the past 25 years, demand for refined petroleum products in the United States and internationally has outpaced growth in refining capacity.

Second, in our August 2006 report,[19] we found that the ability of the SPR to reduce economic damage may be impaired if refineries are not able to operate at capacity or transport of oil to refineries is delayed. For example, petroleum product prices still increased dramatically following Hurricanes Katrina and Rita, in part because many refineries are located in the Gulf Coast region and power outages shut down pipelines that refineries depend upon to supply their crude oil and to transport their refined petroleum products to consumers. DOE reported that 21 refineries in affected states were either shut down or operating at reduced capacity in the aftermath of the hurricane. In total, nearly 30 percent of the refining capacity in the United States was shut down, disrupting supplies of gasoline and other products. Two pipelines that send petroleum products from the Gulf coast to the East Coast and the Midwest were also shut down as a result of Hurricane Katrina. For example, Colonial Pipeline, which transports petroleum products to the Southeast and much of the East Coast, was not fully operational for a week after Hurricane Katrina. Consequently, average retail gasoline prices increased 45 cents per gallon between August 29 and September 5, short-term gasoline shortages occurred in some places, and the media reported gasoline prices greater than $5 per gallon in Georgia. The hurricane came on the heels of a period of high crude oil prices and a tight balance worldwide between petroleum demand and supply, and illustrated the volatility of gasoline prices given the vulnerability of the gasoline infrastructure to natural or other disruptions.

Third, because some foreign suppliers are farther from the U.S. demand centers they serve than the relevant domestic supply center, the time it takes to get additional product to a demand center experiencing a supply shortfall may be longer than it would be if the United States had its own product reserves. For example, imports of gasoline to the West Coast may

[19] GAO-06-872.

come from as far away as Asia or the Middle East, and the transport time and therefore cost is greater. To the extent that imported gasoline or other petroleum products come from far away, the lengthening of the supply chain has implications for the ability to respond rapidly to domestic supply shortfalls. Specifically, if supplies to relieve a domestic regional supply shortfall must come from farther away, the price increases associated with such shortfalls may be greater and/or last longer. In this sense, the West Coast and the middle of the country are more vulnerable to price increases or volatility than is the Northeast, which can receive shipments of gasoline from Europe, often on voyages of less than a week.

Fourth, the receipt of petroleum products may be delayed because port facilities are operating at or near capacity. For example, one-fourth of the ports in a U.S. Maritime Administration (MARAD) survey described their infrastructure impediments as "severe." Officials from the interagency U. S. Committee on the Maritime Transportation System, which includes MARAD, the National Oceanic and Atmospheric Administration, and the U.S. Army Corps of Engineers, told us that U.S. ports and waterways are constrained in capacity and utilization, and anticipate marine supply infrastructure will become more constrained in the future. Officials at the Ports of Los Angeles, Long Beach, Oakland, Houston, Savannah, and Charleston reported congestion and emphasized in a 2005 report that they are experiencing higher than projected growth levels. In fact, one European product transporter we spoke with said that the European response to Hurricanes Rita and Katrina were hindered because East Coast ports in the United States could not handle the number of oil tankers carrying petroleum products from Europe, with some tankers waiting for as long as 2 weeks at port.

Some of the Arguments Against Including Refined Petroleum Products in the SPR

First, a key impetus for global trade in petroleum products has been a structural surplus in production of gasoline and a deficit in production of diesel in Europe. This surplus of gasoline is largely the result of a systematic switch in European countries toward automobiles with diesel-powered engines, which are more fuel efficient than gasoline-powered engines. European regulators promoted diesel fuel use in Europe by taxing diesel at a lower rate, and European demand for diesel vehicles rose. The European refining and marketing sector responded to this change in demand by importing increasing amounts of diesel, and exporting a growing surplus of gasoline to the United States and elsewhere. The United States has purchased increasing amounts of gasoline, including gasoline blendstocks, from Europe in recent years. These imports have generally had a strong seasonal component, with higher levels of imports

during the peak summer driving months and lower imports during the fall and winter. The major exception to this seasonality came in the months of October 2005 through January 2006, when imports surged in response to U.S. shortfalls resulting from Hurricanes Katrina and Rita in August and September 2005, respectively. Experts and company representatives told us they believe this structural imbalance within the European Union will continue for the foreseeable future, and perhaps widen, resulting in more exports of European gasoline and blending components to the United States.

Second, in its prior reports on the subject, DOE found that refined petroleum product reserves are more costly than crude oil to store and must be periodically used and replaced to avoid deterioration of the products. Although DOE officials said some refined products can be stored in salt caverns just as the SPR crude oil is currently stored, these caverns are predominantly found on the Gulf Coast. In order to store refined product in other parts of the United States, storage tanks may need to be built, which is costlier than centralized salt cavern storage. According to DOE, stockpiling oil in salt caverns costs about $3.50 per barrel in capital costs. Storing oil in aboveground tanks, by comparison, can cost $15 to $18 per barrel. One of the maintenance costs of refined petroleum products that is not associated with crude oil storage is turnover, or replacement costs, because refined products deteriorate more quickly. Turnover of the product is required to ensure quality. For example, DOE found that when gasoline is stored in above-ground tanks, the turnover time is 18 to 24 months. Conversely, DOE found that crude oil could be stored for prolonged periods without losing quality. The more frequent the turnover, the higher the throughput and administrative costs.

Third, while the language in the Energy Policy and Conservation Act addresses refined petroleum products as well as crude oil, DOE conducted a study in 1977 that found geographically dispersed, small reserves of a variety of petroleum products would be more costly than a centralized crude oil reserve. For example, many states have adopted the use of special gasoline blends—or 'boutique' fuels, which could pose a challenge in incorporating refined products in the SPR. Unless requirements to use these fuels were waived during emergencies, as they were in the aftermath of Hurricanes Katrina and Rita, boutique fuels could need to be strategically stored at multiple regional, state, or local locations due to reduced product fungibility. Conversely, crude oil provides flexibility in responding to fluctuations in refined product market needs as regional fuel specifications and environmental requirements change over time. Furthermore, the switching of seasonal blends to meet environmental

requirements and product degradation would require inventory turnover as compared to crude oil storage, which does not require the same level of turnover.

Fourth, there are several policy choices that might diminish the growth in U.S. demand for oil. First, research and investment in alternative fuels might reduce the growth of U.S. oil demand. Vehicles that use alternative fuels, including ethanol, biodiesel, liquefied coal, and fuels made from natural gas, are now generally more expensive or less convenient to own than conventional vehicles, because of higher vehicle and fuel costs and a lack of refueling infrastructure. Alternative-fuel vehicles could become more viable in the marketplace if their costs and fuel delivery infrastructure become more comparable to vehicles fueled by petroleum products. Second, greater use of advanced fuel-efficient vehicles, such as hybrid electric and advanced diesel cars and trucks, could reduce U.S. oil demand. The Energy Policy Act of 2005, as amended, directs the Secretary of Energy to establish a program that includes grants to automobile manufacturers to encourage domestic production of these vehicles.[20] Third, improving the Corporate Average Fuel Economy (CAFE) standards could curb demand for petroleum fuels. After these standards were established in 1975, the average fuel economy of new light-duty vehicles improved from 13.1 miles per gallon in 1975 to a peak of 22.1 miles per gallon in 1987.[21] More recently, the fuel economy of new vehicles in the United States has stagnated at approximately 21 miles per gallon. However, CAFE standards have recently been raised to require auto manufacturers to achieve a combined fuel economy average of 35 miles per gallon for both passenger and non-passenger vehicles beginning in model year 2020.[22] Any future increases could further decrease the U.S. oil demand.

[20]Pub. L. No. 109-58, Title VII, § 712, 119 Stat. 818 (2005), *codified as amended at* 42 U.S.C. 16062.

[21]According to the Environmental Protection Agency, these fuel economy numbers are based on "real world" estimates that the federal government provides to consumers and are about 15 percent lower than the values used for compliance with the CAFE program.

[22]Pub. L. No. 110-140, §102, 121 Stat. 1498 (2007).

Lessons Learned from the Management of the Existing SPR that May Be Relevant to Refined Petroleum Products

The following three lessons learned from the management of the existing crude oil SPR highlight some of the issues that may need to be considered in acquiring refined petroleum products.

- *Select a cost-effective mix of products*. To fill the SPR in a more cost-effective manner, we recommended in August 2006 that DOE include in the SPR at least 10 percent heavy crude oils,[23] which are generally cheaper to acquire than the lighter oils that comprise the SPR's volume.[24] Including heavier oil in the SPR could significantly reduce fill costs because heavier oil is generally less expensive than lighter grades. For example, if DOE included 10 percent heavy oil in the SPR as it expands to 1 billion barrels, that would require DOE to add 100 million barrels of heavy oil, or about one-third of the total new fill. From 2003 through 2007, Maya—a common heavy crude oil—has traded for about $12 less per barrel on average than West Texas Intermediate—a common light crude oil. If this price difference were to persist over the duration of the new fill period, DOE would save about $1.2 billion in nominal terms by filling the SPR with 100 million barrels of heavy oil.[25] Similarly, refined petroleum products included as part of the SPR may comprise a number of different types of products (e.g., gasoline, diesel, and jet fuel) and possibly different blends of products (e.g., different grades and mixtures of gasoline); DOE will need to determine the most cost-effective mix of products in light of existing legal and regulatory requirements to use specific blends of fuels.
- *Consider using a dollar-cost-averaging acquisition approach*. Also in our August 2006 report, we recommended that DOE consider filling the SPR by acquiring a steady dollar value of oil over time, rather than a steady volume as has occurred in recent years. This "dollar-cost-averaging" approach would allow DOE to take advantage of fluctuations in oil prices and ensure that more oil would be acquired when prices are low and less when prices are high. In August 2006, we reported that if DOE had used this approach from October 2001 through August 2005, it could have saved

[23] GAO-06-872.

[24] The weight of oil is measured by its gravity index. According to DOE's Energy Information Administration, light oil is greater than 38 degrees gravity; intermediate oils, such as those in the SPR, are 22 to 38 degrees gravity; and heavy oil is 22 degrees gravity or below. See DOE, Office of the Assistant Secretary for Fossil Energy, *Strategic Petroleum Reserve: Annual Report for Calendar Year 2007* (DOE/FE-0525), for information on the composition of the SPR.

[25] This calculation is intended to illustrate the magnitude of potential savings, and is not meant to be a projection of actual savings. The actual price difference between light and heavy oil over the course of the new fill could be smaller or larger than over the past 5 years, which would either reduce or increase the savings.

approximately $590 million in fill costs. We also ran simulations to estimate potential future cost savings from using a dollar-cost-averaging approach over 5 years and found that DOE could save money regardless of the price of oil as long as there is price volatility, and that the savings would be generally greater if oil prices were more volatile. We would expect a dollar-cost-averaging acquisition method to also provide positive benefits when acquiring refined petroleum products.

- *Maximize cost-effective storage options*. According to DOE, salt formations offer the lowest cost, most environmentally secure way to store crude oil for long periods of time. Stockpiling oil in artificially created caverns, deep within rock-hard salt, has historically cost about $3.50 per barrel in capital costs. In comparison, storing oil in above-ground tanks can cost $15 to $18 per barrel. Similarly, for those refined petroleum products that can be stored below ground, salt formations may offer a cost-effective storage option. However, possible storage options would need to be evaluated hand-in-hand with the need to (1) turn over the refined stocks periodically because their stability deteriorates over time, and (2) transport the refined petroleum products quickly to major population centers where the products will be used.

Mr. Chairman, this concludes my prepared statement. I would be pleased to answer any questions that you or other Members of the Committee may have at this time.

GAO Contacts and Staff Acknowledgments

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