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May 25, 2022

The Honorable Dianne Feinstein
Chairman
Subcommittee on Energy and Water Development
Committee on Appropriations
United States Senate

Energy Resilience: DOE’s Northeast Petroleum Product Reserves

Dear Madam Chairman:

The Department of Energy (DOE) maintains two regional petroleum product reserves to reduce the impact of severe disruptions in the supply of petroleum products in the Northeast. Such disruptions could occur when extreme storms or pipeline outages limit the supply or distribution of petroleum products or dramatically increase their price.¹ DOE established the Northeast Home Heating Oil Reserve (NEHHOR) in 2000 after home heating oil prices nearly doubled in the winter of 1999-2000. DOE established the Northeast Gasoline Supply Reserve (NGSR) in 2014 in the aftermath of gasoline supply issues following Hurricane Sandy in 2012. (See fig. 1 for the locations of the product reserves.) NEHHOR was used following Hurricane Sandy to provide fuel for first responder vehicles when the storm shut down other supplies. This was the only time either reserve has been used.

¹The product reserves were created under the authority provided to DOE in the Energy Policy and Conservation Act of 1975, as amended, and the Energy Act of 2000. Energy Policy and Conservation Act, Pub. L. No. 94-163, §§ 154, 159–61, 89 Stat. 871, 882-83, 886–89 (1975) (codified as amended at 42 U.S.C. §§ 6234, 6239-41); Energy Policy Act of 2000, Pub. L. No. 106-469, § 201, 114 Stat. 2029, 2034–36 (2000) (codified as amended at 42 U.S.C. §§ 6250, 6250a–6250d). For the purposes of the product reserves, the Northeast region includes Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

Figure 1: Northeast Home Heating Oil Reserve (NEHHOR) and Northeast Gasoline Supply Reserve (NGSR) Locations



Source: GAO analysis of Department of Energy documents. | GAO-22-105404

In addition to storing refined petroleum products in the two regional product reserves, DOE stores a large amount of crude oil in the Strategic Petroleum Reserve (SPR). As of March 2022, the SPR held 565 million barrels of crude oil in underground salt caverns along the Gulf Coast, which is more than 30 days of national crude oil consumption. In comparison, DOE’s regional product reserves hold 1 million barrels each—NEHHOR holds 1 million barrels of ultra-low-sulfur distillate, which can be used as home heating oil or diesel fuel, and NGSR holds 1 million barrels of gasoline. NGSR was established as part of the Strategic Petroleum Reserve. You asked us to review NEHHOR and NGSR. This report (1) assesses the effectiveness of the existing product reserves in mitigating supply risks in the Northeast and (2) identifies the extent to which DOE has considered future risks to petroleum product supplies and the benefits of alternative federal actions to mitigate these risks.

To assess the effectiveness of the reserves, we reviewed a DOE analysis of the existing product reserves, other DOE documents, laws and practices related to the reserves, and prior related GAO work;² analyzed DOE cost data; and interviewed DOE officials. We also reviewed other relevant reports and data on petroleum product markets and interviewed state energy officials. To identify the extent to which DOE considered future risks and the benefits of alternative actions to mitigate these risks, we reviewed DOE’s analysis of the product reserves and interviewed DOE officials. Enclosure I provides additional details on our objectives, scope, and methodology.

²For a list of our previous work in this area, see the Related GAO Products page at the end of this report.

We conducted this performance audit from September 2021 to May 2022 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain 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.

As Structured, DOE's Northeast Product Reserves Are Not Well Suited to Address Risks

We found that DOE's product reserves, as currently structured, are not well suited to address the risks of supply disruptions in the Northeast. This finding is based on our assessment of a DOE analysis, relevant laws and practices, discussions with DOE officials, and other factors raised by state officials.

Our review of a July 2020 internal DOE analysis of the existing product reserves concurs with DOE's determination that the product reserves are (1) expensive to maintain relative to crude oil reserves, (2) have only been used once to date, and (3) are small relative to regional consumption and commercial supply for heating oil and gasoline. Specifically:

- The product reserves cost about \$13 per barrel on an annual basis for operations and maintenance based on our analysis of DOE data, compared to DOE's estimate of about \$0.30 dollars per barrel for crude oil in the SPR.³
- Only NEHHOR has been used—once—following Hurricane Sandy. In comparison, we reported in 2017 that DOE released crude oil from the SPR 24 times from 1985 through September 2017.⁴ Moreover, DOE announced in March and April 2022 that it was releasing crude oil to address market and supply disruptions related to Russia's war in Ukraine.
- The product reserves are also quite small compared to consumption. Each product reserve contains 1 million barrels of fuel, less than 2 days of estimated consumption in the Northeast.⁵

We also identified other concerns with the product reserves as they are currently structured. In particular, DOE officials told us that the current criteria for using the product reserves make it unlikely that they would be used to meet short-term supply disruptions. Specifically, DOE stated that the product reserves' limited use to date stems in part from limitations to releasing product quickly enough to be useful in short-term disruptions given the release criteria.⁶ These

³The two product reserves cost a total of \$26.8 million in fiscal year 2021, according to our analysis of DOE cost data. Across the last 5 years, NEHHOR cost an average of \$8.7 million, and NGSR cost an average of \$19.5 million per year (about \$13.40 per barrel). This is costly relative to DOE's estimate of \$0.30 per barrel for crude oil reserves and also relative to similar product reserves in other countries, but appears broadly in line with the much smaller product reserves held by New York State.

⁴GAO, *Strategic Petroleum Reserve: Preliminary Observations on the Emergency Oil Stockpile*, [GAO-18-209T](#) (Washington, D.C.: Nov. 2, 2017).

⁵The Northeast consumed a daily average of about 0.6 million barrels of distillate fuel oil and about 1.4 million barrels of gasoline in 2019, according to our analysis of U.S. Energy Information Administration estimates of annual consumption per state.

⁶The Energy Policy and Conservation Act, as amended, outlines specific criteria for when petroleum products can be released from each product reserve. Broadly, both product reserves can be used to address severe interruptions in petroleum supply on the President's determination that an emergency situation is reducing supply and/or increasing price to an extent that is likely to cause a major impact on the national economy or create a regional, domestic, or international supply shortage, as well as in other specified situations. According to DOE officials, it is ultimately the President's decision to initiate a release. If the President does so, the DOE Secretary can sell heating oil or gasoline from the product reserves through a competitive bid process and/or at fair market value. In some cases, the

limitations include the requirement for a presidential finding of a severe energy supply disruption and the requirement to sell the product through a competitive bidding process, according to DOE officials.

Officials told us that it would generally take more than 1 week to release heating oil or gasoline from the product reserves—from the declaration of a severe energy disruption by the President to a competitive sale of the product on the open market.⁷ Further, DOE stated that after the short term, supplies can generally be brought in from other regions or countries. For example, we reported in 2018 that it takes about 10 days for ships to carry additional fuels from the Gulf of Mexico to New York Harbor in the Northeast.

DOE officials also noted that the usefulness of product reserves is limited by how readily those reserves can be distributed to locations that are affected by an emergency. Specifically, these officials told us that the primary obstacles to distributing petroleum products after natural disasters or other emergencies have been widespread power outages and distribution issues (e.g., blocked roads or pipelines that are not functioning) rather than physical supply shortages.

Currently, the existing product reserves are commingled in tanks with commercial supplies at commercial storage facilities, so both the product reserves and commercial supplies may be vulnerable to some of the same risks. For example, a storm that disrupts supplies from the 5 million barrel Raritan Bay facility in New Jersey would likely disrupt DOE's ability to distribute the 0.7 million barrels of gasoline held in NGSR in that same facility (see fig. 2). After Hurricane Sandy, DOE added requirements for the NEHHOR and NGSR storage contractors to be able to operate without commercial power by having access to a back-up generator.

State officials we interviewed also highlighted power outages as an impediment to accessing existing fuel supplies during some emergencies. For example, Hurricane Sandy-related power outages shut down many gas stations. After this experience, New York State passed a law requiring some gas stations to install a transfer switch so that a back-up generator can be used in the event of an emergency.

Secretary can make an exchange in which the recipient later returns a greater volume than was received (i.e., similar to a loan with interest) or make an agreement with another federal agency to make product from the reserve available.

⁷The contractors that operate NGSR and NEHHOR are obligated to be able to deliver the entire volume of the reserve in their facility within 10 calendar days of being notified by DOE that a release has been authorized. It can also take some time from the start of an emergency to a President's decision to authorize a release, according to DOE officials. These officials told us that a release may be possible in as little as a few days under ideal circumstances, but they expect it would generally take longer to conduct a competitive sale and take other steps to distribute the fuel. New York State energy officials told us that a volume-based auction may be quicker than the price-based auction required for DOE's product reserves. These officials told us that they expect that New York could release fuel from its product reserves within 1 to 2 days through a volume-based auction using the 3-day price average prior to the emergency event.

Figure 2: Storage Tanks Holding Northeast Gasoline Supply Reserve and Commercial Supplies at Raritan Bay Facility in New Jersey



Source: Buckeye Partners, L.P. | GAO-22-105404

State officials also identified some other concerns regarding the effectiveness of the product reserves as currently structured. For example, state officials told us that the current composition of the product reserves may not be the most useful mix of fuels to meet Northeast needs as energy markets continue to change.⁸ Specifically, state officials highlighted the region’s growing dependence on other fuels, including natural gas and propane. State officials also noted that the specific type of fuel that NEHHOR contains is not compatible with some power plants or generators in the region that take a different type of fuel (e.g., No. 6 fuel oil).

In response to questions about the costs of shutting down or restarting product reserves, DOE officials told us that there would be minimal costs to close the existing product reserves when the current storage contracts expire. Similarly, they said there would be minimal costs to reestablish such product reserves in the future, should DOE or Congress decide to do so. DOE owns the product in the reserves, so if it closed them down, the reserves could be sold at the market price. Similarly, if DOE or Congress decided to reopen the reserves, DOE could purchase the fuel at the market price. Other than the cost to purchase the product, most costs are for renting commercial storage space.

As of March 2022, DOE officials told us that the current administration was considering its position regarding whether to continue or recommend closing the two product reserves. DOE previously recommended closing both product reserves in recent years’ budget proposals after concluding that the product reserves were not cost or operationally effective. In the course of this review, DOE officials continued to raise concerns outlined above about their ability to effectively use the product reserves. Pending decisions about the product reserves’ future,

⁸State officials noted that heating oil remains important in the Northeast as the primary heating source for some vulnerable households and an emergency back-up source for other households.

Congress continued funding both product reserves for fiscal year 2022, and the President's proposed fiscal year 2023 budget also includes funding.

DOE Has Not Fully Considered Risks to Regional Product Supplies or Alternatives to Current Product Reserve Structures

DOE has not fully considered future risks to regional petroleum product supplies or the benefits of alternatives to the existing product reserves to mitigate such risks. Without fully considering risks or the benefits of alternatives, DOE's analysis is not sufficient to identify what role DOE should take going forward.

Supply risks. DOE's 2020 analysis of the Northeast product reserves focused on past scenarios rather than future risks or the potential role of alternatives to mitigate them. For example, DOE's 2020 analysis examined a scenario of another event similar to Hurricane Sandy in 2012. However, risks to the supply of petroleum products in the Northeast and other regions may have changed since NEHHOR and NGSR were created. For example, the likelihood of severe storms that can disrupt domestic petroleum product supplies will likely be higher in the future, according to DOE's 2015 report on climate change and regional energy vulnerabilities.⁹ Future risks may also have changed, as increased domestic production of petroleum products and crude oil have changed the U.S. from a net importer of petroleum to a net exporter.¹⁰ This may be a mitigating factor for some supply disruptions.

DOE has analyzed its approach to maintaining strategic petroleum reserves in the past, but these analyses did not fully evaluate supply risks to different regions. For example, after the Quadrennial Energy Review of 2015 recommended that DOE analyze the need for product reserves in all regions vulnerable to supply disruptions, DOE began but did not finalize studies on the costs and benefits of product reserves in the West and Southeast Coasts. In 2016, DOE completed a strategic review of its existing petroleum reserves, but this review did not cover forward-looking risks of domestic supply disruptions, as we previously reported.¹¹

Alternative federal actions. Additionally, DOE's product reserves analysis did not consider how future risks to product supplies could potentially be mitigated by alternative federal actions. For example, DOE's analysis focused on the effectiveness of the product reserves' current structure and did not examine whether alternative structures or policies could be put in place to make product reserves more responsive during emergencies or how much such alternatives would cost.¹² Alternatives could include different reserve sizes, geographic locations, fuel composition, ownership structure, or release criteria.¹³ We reported in 2017 that DOE had taken

⁹U.S. Department of Energy, *Climate Change and the U.S. Energy Sector: Regional Vulnerabilities and Resilience Solutions* (Washington, D.C.: Oct. 2015).

¹⁰U.S. Energy Information Administration, *Today in Energy*, "The U.S. exported slightly more petroleum than it imported in the first half of 2021" (Sept. 17, 2021).

¹¹[GAO-18-209T](#).

¹²DOE's internal analysis of the product reserves in 2020 focused on the existing product reserves' cost, use to date, and size relative to regional demand and commercial supply as currently structured.

¹³For example, DOE previously recommended integrating the authorities of the President to release products from the product reserves into a unified authority so that the release criteria for NEHHOR and NGSR are aligned with one another and "properly suited" to their purpose. At the time, DOE noted that doing so may allow for faster response times during disruptions involving petroleum products. See U.S. Department of Energy, *Long-Term Strategic Review*

some steps to evaluate different structures for holding reserves but had not formally done so in decades.¹⁴

DOE's analyses also did not consider alternative federal actions, such as coordinating with or supporting the efforts of states, other federal agencies, commercial suppliers, and others with key roles in mitigating supply risks. Such actions could include coordinating with the Federal Emergency Management Agency (FEMA) to ensure that there are sufficient fuel supplies for first responders and critical facilities to provide services in the aftermath of disasters.¹⁵

GAO leading practices highlight the importance of agencies analyzing risks and considering a range of alternatives to ensure that programs are forward looking and effective.¹⁶ Without broader consideration of future risks to petroleum product supplies, and future benefits from mitigating those risks through alternative federal actions, DOE may be overlooking the future resilience benefits of holding product reserves or pursuing alternative federal actions.

In 2018, we made a recommendation to DOE that, if fully implemented, would provide a more comprehensive analysis of the risks of petroleum product supply disruptions that could inform decisions regarding federal actions that may mitigate such risks.¹⁷ Although the broader SPR is authorized to hold both crude oil and refined petroleum products, our 2018 report found that DOE had not ensured that the SPR holds the right things (how much to hold in crude oil versus gasoline or other petroleum products) in the right places. We reported that DOE had started but not finalized studies on the costs and benefits of establishing product reserves in other regions. Among other things, we recommended that DOE further study the potential need for product reserves in all regions identified as vulnerable.

DOE disagreed with this recommendation, and it has no plans to further study product reserves, according to DOE officials. However, we continue to believe that fully implementing this recommendation would help DOE more fully assess the risks and potential benefits of alternatives to the existing Northeast petroleum product reserves.

of the U.S. Strategic Petroleum Reserve: Report to Congress (Washington, D.C.: Aug. 2016); and *Quadrennial Energy Review: Energy Transmission, Storage, and Distribution Infrastructure* (April 2015).

¹⁴[GAO-18-209T](#).

¹⁵This would not necessarily require that reserves be maintained at all times. For example, FEMA already plans for disasters by preplacing personnel and materials in areas that are expected to be hit by severe weather. The federal response to Hurricane Sandy's severe impacts on the energy sector in several states in 2012 may provide useful information on how DOE can coordinate with others to mitigate supply risks. At the President's direction, FEMA established a task force to better coordinate tribal, federal, state, local, and private-sector efforts. Among other actions, the task force coordinated fuel distribution points for first responders across New York and New Jersey, and the Department of Defense provided 9.3 million gallons of fuel at the request of both states.

¹⁶For example, Enterprise Risk Management is a forward-looking management approach to help agencies assess threats and opportunities related to achieving their goals, including by regularly considering risk and selecting appropriate risk responses. See GAO, *Enterprise Risk Management: Selected Agencies' Experiences Illustrate Good Practices in Managing Risk*, [GAO-17-63](#) (Washington, D.C.: Dec. 1, 2016). Analysis of Alternatives compares the operational effectiveness, costs, and risks of a number of potential alternatives to address valid needs and shortfalls in operational capability for the future environment. This process helps ensure that the best alternative that satisfies the mission need is chosen on the basis of the selection criteria, such as safety, cost, or schedule. See app. XI of GAO, *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs*, [GAO-20-195G](#) (Washington, D.C.: Mar. 2020).

¹⁷GAO, *Strategic Petroleum Reserve: DOE Needs to Strengthen Its Approach to Planning the Future of the Emergency Stockpile*, [GAO-18-477](#) (Washington, D.C.: May 30, 2018).

Agency Comments

We provided a draft of this report to DOE for review and comment. DOE provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to the appropriate congressional committees, the Secretary of the Department of Energy, and other interested parties. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or ruscof@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report include Quindi Franco (Assistant Director), Elise Vaughan Winfrey (Analyst-in-Charge), Adrian Apodaca, Breanne Cave, Philip Farah, William Gerard, Gabriel Jimenez-Barron, Jasmine Scott, and Caitlin Scoville.

Sincerely yours,

A handwritten signature in black ink that reads "Frank Rusco". The signature is written in a cursive style and extends to the right with a long, thin horizontal stroke.

Frank Rusco
Director, Natural Resources and Environment

Enclosure – 1

Enclosure I: Objectives, Scope, and Methodology

This report (1) assesses the effectiveness of the existing product reserves in mitigating supply risks in the Northeast and (2) identifies the extent to which the Department of Energy (DOE) has considered future risks to petroleum product supplies and the benefits of alternative federal actions to mitigate these risks.

To assess the effectiveness of the reserves, we reviewed a DOE analysis of the existing product reserves, other DOE documents, laws and practices related to the reserves, and prior related GAO work; analyzed DOE cost data; and interviewed DOE officials. Specifically, we (1) reviewed documentation of DOE's internal analysis on the product reserves' effectiveness and other relevant DOE documents, such as DOE's 2016 Long-Term Strategic Review of the Strategic Petroleum Reserve (SPR); (2) reviewed laws, practices, and related documentation on the reserves' release criteria; (3) reviewed prior GAO work; (4) analyzed DOE's cost data for the product reserves for fiscal years 2011 through 2021; and (5) interviewed officials from relevant DOE offices, including the office that manages the product reserves and the SPR.¹⁸

To assess the reliability of the cost data, we reviewed relevant documentation, reviewed written responses from DOE's Office of the Chief Financial Officer, and manually inspected the cost data for errors or inconsistencies and also compared high-level summary data to DOE budget documents. We determined these data to be sufficiently reliable for the purpose of describing the historical costs of DOE's product reserves. The cost data in this report were not adjusted for inflation.

We also reviewed other relevant reports and data on petroleum product markets. Specifically, we reviewed other reports with relevant information (e.g., perspectives on the role of product reserves in mitigating supply risks). We identified other reports based on a literature search and on referrals from DOE or state energy officials. We analyzed data on petroleum product markets published by the U.S. Energy Information Administration's State Energy Data System. To assess the reliability of the petroleum product markets data, we reviewed relevant documentation, interviewed and received written responses from DOE officials, conducted manual data testing for errors, and compared the data to similar data published in other sources. We determined these data to be sufficiently reliable for the purposes of our report.

We also interviewed a nongeneralizable sample of energy officials from Northeast states and stakeholder organizations (Massachusetts, New York, and the National Association of State Energy Officials (NASEO)) to obtain their perspectives on the role of DOE's existing product reserves in managing energy supply risks. We identified state energy officials based on referrals from DOE officials and other state energy officials and knowledge of the structure and potential benefits or limitations of product reserves in the Northeast. For example, New York established its own product reserve in the aftermath of Hurricane Sandy in 2012, and NASEO is a national nonprofit association for energy officials from U.S. states and territories that has published guidance on planning for petroleum supply disruptions.

To identify the extent to which DOE considered future risks and the benefits of alternative actions to mitigate these risks, we reviewed DOE's internal analysis of the product reserves'

¹⁸This included officials from the Office of Petroleum Reserves (OPR) and the Cybersecurity, Energy Security, and Emergency Response Office (CESER). OPR manages the product reserves and the SPR. CESER is tasked with managing energy risks and mitigating the impacts of energy disruptions in collaboration with other federal agencies, industry, and other levels of government.

effectiveness. In addition, we reviewed prior GAO work and open recommendations related to petroleum reserves and interviewed relevant DOE officials. We also requested information on any additional analysis conducted by DOE on future risks or potential alternatives related to the product reserves, but these officials told us that they were unaware of any such analysis.

Related GAO Products

Strategic Petroleum Reserve: DOE Needs to Strengthen Its Approach to Planning the Future of the Emergency Stockpile. [GAO-18-477](#). Washington, D.C.: May 30, 2018.

Strategic Petroleum Reserve: Preliminary Observations on the Emergency Oil Stockpile. [GAO-18-209T](#). Washington, D.C.: November 2, 2017.

Climate Change: Energy Infrastructure Risks and Adaptation Efforts. [GAO-14-74](#). Washington, D.C.: January 31, 2014.

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.: September 30, 2014.

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.

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