



August 2018

AIRCRAFT CARRIER DISMANTLEMENT AND DISPOSAL

Options Warrant
Additional Oversight
and Raise Regulatory
Questions

GAO Highlights

Highlights of [GAO-18-523](#), a report to congressional committees

Why GAO Did This Study

The Navy is planning to dismantle and dispose of CVN 65 after 51 years of service. In 2013, the estimated cost to complete the CVN 65 work as originally planned increased to well over \$1 billion, leading the Navy to consider different dismantlement and disposal options.

The Senate Report accompanying a bill for the National Defense Authorization Act for Fiscal Year 2018 included a provision for GAO to review the Navy's plans for CVN 65. This report addresses (1) dismantlement and disposal options under consideration; (2) nuclear regulatory authority considerations; and (3) funding and reporting practices.

GAO reviewed budget, cost, and schedule documentation, as well as applicable laws, regulations, executive orders, policies, and guidance. GAO interviewed officials from the Navy and commercial companies about the dismantlement and disposal options, and NRC and state agencies about regulatory considerations.

What GAO Recommends

Congress should consider requiring Naval Reactors to coordinate with NRC to identify the applicable regulatory authority for a CVN 65 commercial dismantlement and disposal. GAO is also making four recommendations, including that the Navy take action to provide additional budget information and reporting to facilitate improved transparency and accountability for the CVN 65 cost, schedule, and risks. The Department of Defense agreed with all four recommendations.

View [GAO-18-523](#). For more information, contact Shelby S. Oakley at (202) 512-4841 or OakleyS@gao.gov.

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What GAO Found

The Navy is assessing two options to dismantle and dispose of its first nuclear-powered aircraft carrier—ex-USS *Enterprise* (also known as CVN 65). CVN 65 dismantlement and disposal will set precedents for processes and oversight that may inform future aircraft carrier dismantlement decisions.

Characteristics of the Navy's Potential CVN 65 Dismantlement and Disposal Options

	Naval shipyard option	Full commercial option
General approach	Puget Sound Naval Shipyard dismantles a distinct section of the ship—the propulsion space section—that contains the 8 defueled reactors and all other nuclear-related material Shipyard prepares reactor packages for transport and disposal at facility in Hanford, Washington Commercial company dismantles and recycles or disposes of non-nuclear sections	Commercial company(ies) dismantles entire ship; potential companies and work locations yet to be determined Nuclear-related dismantlement uses applicable industry work practices—may include cutting into smaller components for shipping; disposal site(s) yet to be determined Commercial company recycles or disposes of non-nuclear portions
Navy preliminary cost estimate (dollars)	1.05 billion-1.55 billion	750 million-1.4 billion
Navy preliminary schedule estimate	10 years, 2034 start	About 5 years, 2024 start
Nuclear regulatory authority	Naval Reactors (Department of Energy)	Disagreement exists between Naval Reactors and Nuclear Regulatory Commission

Source: GAO analysis of Navy and Nuclear Regulatory Commission information. | GAO-18-523

The Navy could rely on its extensive regulatory experience for the naval shipyard option. However, the Navy's ability to effectively evaluate the full commercial option is hampered by a disagreement with the Nuclear Regulatory Commission (NRC), which oversees the commercial nuclear industry. Naval Reactors officials assert that NRC's regulatory authority should apply to the full commercial option. NRC disagrees with this position. Coordination between the two agencies to identify the applicable regulatory authority and craft a regulatory plan would help ensure accountability, solidify cost estimates, and facilitate a CVN 65 decision.

The budget documentation and reporting that the Navy typically uses for ship dismantlement and disposal projects will not enable adequate oversight of CVN 65—a multi-year project with a cost that may exceed \$1 billion. The documents that support Navy budget requests for dismantlement and disposal funding do not provide data that decision makers can readily use to track dismantlement costs against an established baseline or to evaluate funding plans for future years. Further, the Navy has no reporting requirements to support accountability for CVN 65 activities. Large defense acquisition programs generally are required to submit more detailed budget information and report on cost, schedule, and performance. These practices could be adapted for CVN 65 to provide information that will facilitate oversight commensurate with the scale of the effort.

Contents

Letter	1
Background	3
Naval Shipyard Option for CVN 65 Is More Defined than Full Commercial Option but May Pose Challenges for Meeting Navy Priorities	10
Budget Documentation and Reporting Does Not Include Sufficient Information to Facilitate Transparency and Oversight for CVN 65	22
The Navy's Evaluation of CVN 65 Dismantlement and Disposal Options Is Hampered by a Regulatory Authority Disagreement	29
Conclusions	37
Matter for Congressional Consideration	38
Recommendations for Executive Action	38
Agency Comments	39
Appendix I – Objectives, Scope, and Methodology	42
Appendix II – Comments from the Department of Defense	46
Appendix III – Comments from the Nuclear Regulatory Commission	50
Appendix IV – GAO Contact and Staff Acknowledgments	51
Tables	
Table 1: Characteristics of the Navy's Potential CVN 65 Dismantlement and Disposal Options	13
Table 2: Changes in Puget Sound Naval Shipyard CVN 65 Plans, Estimate Methodology, Schedule, and Cost	15
Table 3: DOD Acquisition Reporting Elements That Could Be Adapted for Use with CVN 65 Dismantlement and Disposal	28
Table 4: Regulatory Authority Scenarios Being Considered by the Navy for Nuclear-Related CVN 65 Dismantlement and Disposal Activities	30

Figures

Figure 1: CVN 65 Aircraft Carrier Timeline of Events Following Decommissioning	4
Figure 2: Relative Size of CVN 65 Nuclear-Powered Aircraft Carrier	5
Figure 3: General Process for Nuclear-Powered Ship Dismantlement and Disposal at Puget Sound Naval Shipyard	7
Figure 4: Laws and Executive Order Related to Nuclear Materials	9
Figure 5: Proposed CVN 65 Sectioning Approach for Puget Sound Naval Shipyard Dismantlement Option	12
Figure 6: Puget Sound Naval Shipyard Average Workload Projections with Available Workforce and Notional Growth without CVN 65 Work	19

Abbreviations

ACAT	Acquisition category
DOD	Department of Defense
NRC	Nuclear Regulatory Commission
OMN	Operation and Maintenance, Navy
SCN	Shipbuilding and Conversion, Navy

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August 2, 2018

Congressional Committees

After 51 years of service, ex-USS *Enterprise* (also known as CVN 65)—the Navy’s first nuclear-powered aircraft carrier—is being prepared for dismantlement and disposal. At approximately 76,000 tons, CVN 65 will require an unprecedented level of work to dismantle and dispose of as compared to previous ships. The Navy originally intended to dismantle the entire CVN 65, both nuclear and non-nuclear components, at Puget Sound Naval Shipyard and Intermediate Maintenance Facility (hereafter referred to as Puget Sound Naval Shipyard), which is its usual facility for this type of activity. However, in 2013, the Navy’s cost estimate for the shipyard to perform all CVN 65 dismantlement and disposal activities increased—from a range of \$500 million to \$750 million—to well over \$1 billion. This led the Navy to consider alternatives. In 2016, the Navy issued a request for proposals to have a commercial company recycle the non-nuclear portions of the ship. The Navy also sought information from industry at that time on the potential for a commercial company to dismantle and dispose of the entire ship. In February 2017, the Navy announced it canceled its request for proposals on commercial recycling of non-nuclear portions of the ship and continued assessing its options.

As part of this assessment, the Navy determined it will not dismantle the entire ship at Puget Sound Naval Shipyard. Instead, it is focused on two potential options. One involves Puget Sound Naval Shipyard dismantling and disposing of a section of the ship that contains the nuclear material—referred to as the propulsion space section—with disposal at the Department of Energy’s Hanford low-level radioactive waste disposal site in the state of Washington. The other entails the Navy awarding a contract for commercial industry to fully dismantle and dispose of the nuclear and non-nuclear materials for the entire ship. For the purposes of this report, we refer to these two options as (1) the naval shipyard option and (2) the full commercial option, respectively.

Regardless of the approach the Navy chooses, CVN 65 will set precedents for the processes, costs, and oversight that may be used to dismantle and dispose of nuclear-powered aircraft carriers in the future, such as the Nimitz-class carriers which the Navy will begin to retire in the mid-2020s. Senate Report 115-125 accompanying a bill for the National Defense Authorization Act for Fiscal Year 2018 included a provision for GAO to review the Navy’s plans for CVN 65 dismantlement and disposal.

This report (1) describes the differences between the dismantlement and disposal options under consideration, including cost and schedule as well as workload and facilities; (2) evaluates the Navy's funding and reporting practices for dismantlement and disposal activities; and (3) assesses the effect that nuclear regulatory authority considerations have on dismantlement and disposal options for CVN 65.

To conduct our work, we reviewed documentation on prior, ongoing, and future Navy ship dismantlement and disposal plans and activities, as well as information specific to the different CVN 65 options the Navy has considered or is considering. We used this information to evaluate the Navy's history with ship dismantlement and disposal, how its plans for CVN 65 have evolved, and what is currently known about the different options the Navy is considering for the ship. We also reviewed the Navy's preliminary cost and schedule information and assessed naval shipyard workload and facility data. This included workload data for fiscal years 2006 through 2025 and facility data for fiscal years 2018 through 2035. To assess the reliability of these data, we interviewed knowledgeable officials and reviewed documentation to verify the controls and measures used to validate and maintain the data. We determined these data to be reliable for our purposes of discussing the existing and planned workload at Puget Sound Naval Shipyard. We also reviewed documentation on the Navy's funding and reporting practices, as well as regulatory authorities and processes for nuclear materials that may apply to CVN 65 dismantlement and disposal. This included a review of applicable laws, regulations, executive orders, policies, and guidance. Further, we assessed the typical budget information and reporting requirements for dismantlement and disposal in relation to federal internal control standards.¹ Additionally, we reviewed past GAO reports that addressed operation and maintenance activities at naval shipyards, and the processes, facilities, and requirements for nuclear materials.² We also

¹GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: September 2014).

²GAO, *Naval Shipyards: Actions Needed to Improve Poor Conditions that Affect Operations*, [GAO-17-548](#) (Washington, D.C.: Sept. 12, 2017); *Depot Maintenance: Executed Workload and Maintenance Operations at DOD Depots*, [GAO-17-82R](#) (Washington, D.C.: Feb. 3, 2017); *Nuclear Regulatory Commission: Regulatory Fee-Setting Calculations Need Greater Transparency*, [GAO-17-232](#) (Washington, D.C.: Feb. 2, 2017); *Nuclear Security: NRC Has Enhanced the Controls of Dangerous Radioactive Materials, but Vulnerabilities Remain*, [GAO-16-330](#) (Washington, D.C.: July 1, 2016); and *National Environmental Policy Act: Little Information Exists on NEPA Analyses*, [GAO-14-370](#) (Washington, D.C.: Apr. 15, 2014).

reviewed federal and Department of Defense (DOD) budget, financial, and acquisition policies and guidance, as well as relevant reports from DOD and other nuclear energy-related organizations, such as the Organisation for Economic Co-operation and Development's Nuclear Energy Agency.

In addition to reviewing documentation that addresses these areas, we interviewed officials from the Naval Sea Systems Command—which includes Naval Reactors—Puget Sound Naval Shipyard, and the Nuclear Regulatory Commission (NRC). We also interviewed officials from health and environmental agencies for the states of Texas and Washington. Ship dismantlement activities have occurred in these states and both have nuclear waste disposal sites. Additionally, we interviewed officials and reviewed documentation from commercial companies involved in shipbreaking or nuclear-related industries. These companies include Atkins Global; EnergySolutions; Huntington Ingalls Industries (HII – Nuclear); International Shipbreaking Limited; NorthStar Group Services; and Waste Control Specialists. For more information on our scope and methodology, see appendix I.

We conducted this performance audit from August 2017 to August 2018 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.

Background

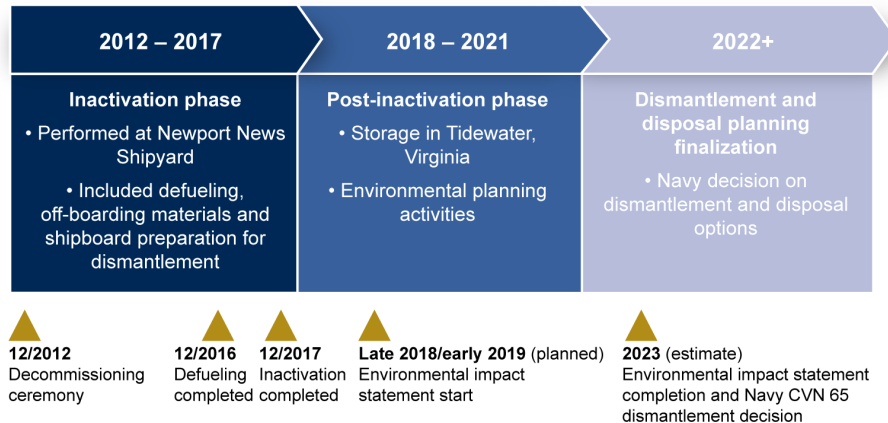
In 1961, the Navy commissioned the first and only Enterprise-class aircraft carrier, CVN 65, which was the world's first nuclear-powered aircraft carrier.³ CVN 65 served the Navy's needs for 51 years, deploying 25 times and sailing more than 1 million miles during that time. The carrier, which was powered by eight nuclear reactors, was the predecessor of the two-reactor Nimitz-class aircraft carriers that followed

³A nuclear-powered ship is constructed with the nuclear power plant(s) inside the engineering spaces. Each nuclear reactor onboard a U.S. Navy warship is located inside a specifically engineered space called the reactor compartment. A nuclear reactor is the heart of a nuclear power plant, in which nuclear fission may be initiated and controlled in a self-sustaining chain reaction to generate energy or produce heat. In shipboard nuclear reactors, the heat of nuclear reaction is transferred to water in a secondary steam system. The steam is then used as the source of power for the propulsion plant.

it into service. The Navy plans to begin retiring the Nimitz-class carriers in the next decade.

Following the retirement of CVN 65 in 2012, the Navy began preparing the ship for dismantlement and disposal in a process called inactivation. These inactivation activities—which Navy officials stated cost \$863 million to complete—included removing the nuclear fuel from the ship’s reactors and taking off equipment and other materials in preparation for dismantlement of the ship. The Navy’s next steps include planning efforts to meet the environmental requirements associated with dismantling and disposing of a nuclear-powered ship, such as handling of radioactive and other hazardous materials. The final step for CVN 65 will be dismantlement, including the recycling of non-nuclear portions of the ship and safe disposal of nuclear and other hazardous materials. Figure 1 provides a timeline of CVN 65 events.

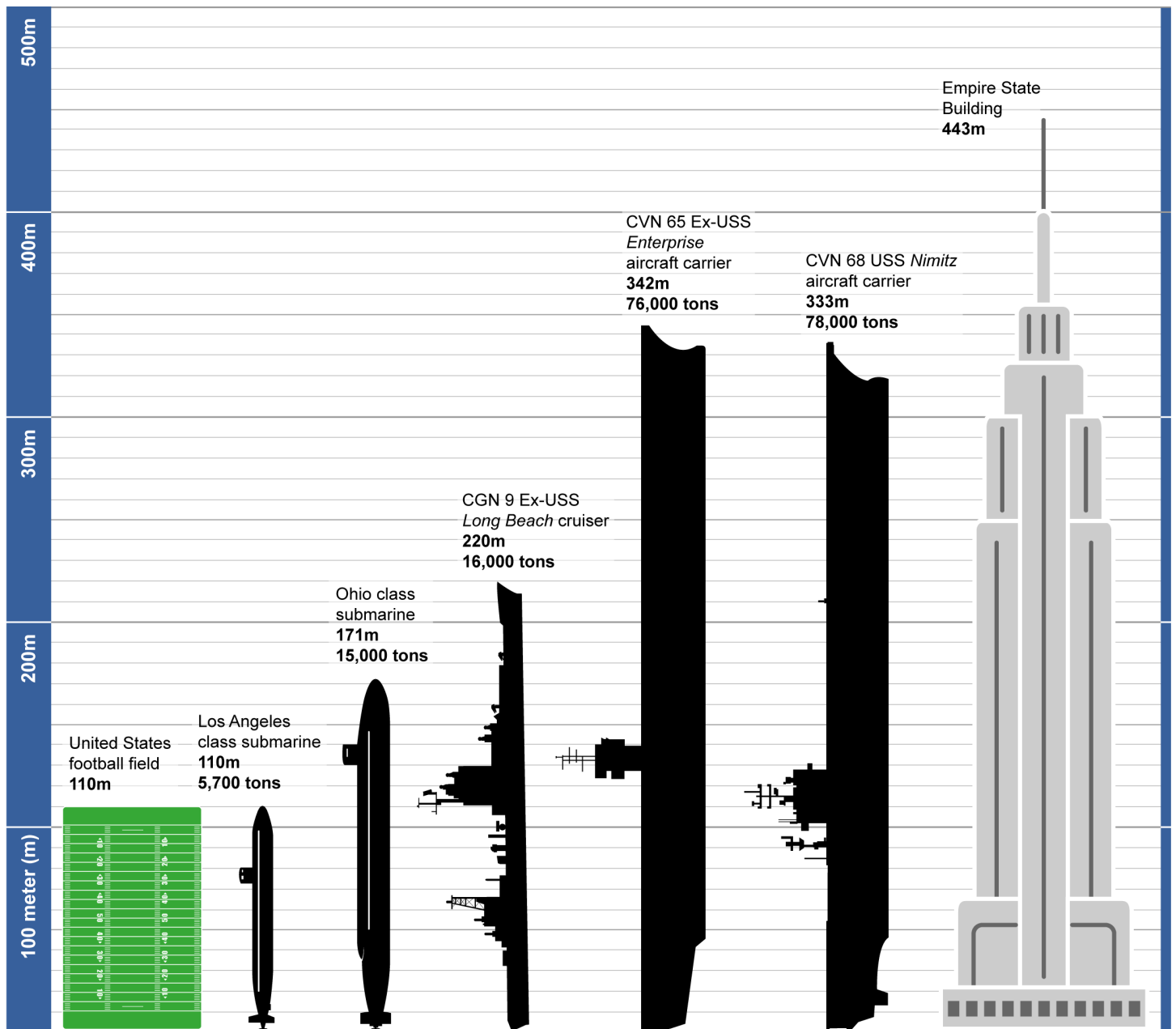
Figure 1: CVN 65 Aircraft Carrier Timeline of Events Following Decommissioning



Source: GAO analysis of Navy documentation. | GAO-18-523

CVN 65 is the largest nuclear-powered ship that has been retired by the Navy. Figure 2 compares the size of CVN 65 to previous and future Navy vessels requiring dismantlement and disposal, as well as other relatable structures.

Figure 2: Relative Size of CVN 65 Nuclear-Powered Aircraft Carrier



Source: GAO analysis of Navy data. | GAO-18-523

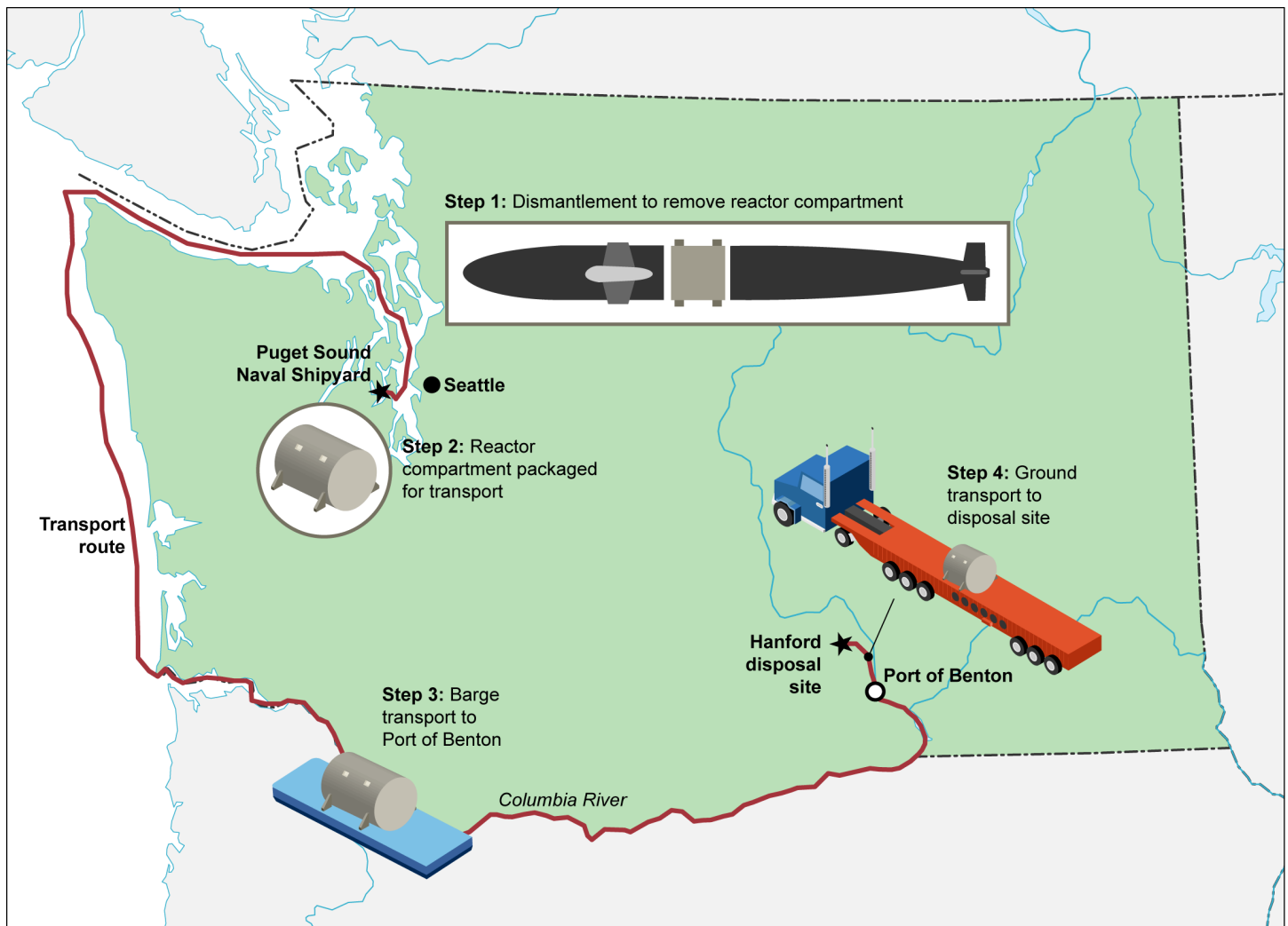
Puget Sound Naval Shipyard Dismantlement and Disposal Activities

In 1990, the Navy authorized a program to recycle decommissioned submarines at Puget Sound Naval Shipyard in Bremerton, Washington. According to Navy officials, the Department of Energy's low-level waste site in Hanford, Washington, was the only practical site at the time for disposal of the defueled submarine reactor compartments, which included low-level radioactive waste.⁴ Puget Sound Naval Shipyard is the largest shipyard on the U.S. West Coast, and while it is equipped and staffed to work on all classes of Navy vessels, it primarily conducts maintenance on nuclear-powered aircraft carriers and submarines, which the Navy considers a priority. This shipyard has the only dry dock on the West Coast capable of servicing an aircraft carrier and is the Navy's only site for dismantlement and disposal of nuclear-powered ships.

Since 1990, the Navy has inactivated over 130 nuclear-powered vessels. Inactivation is the process used to prepare a ship for disposing of the compartments that house the reactors and recycling the hull or for safe storage pending dismantlement and disposal at a later date. Inactivation includes draining hydraulic systems and tanks, and removing hazardous and expendable materials, tools, spare parts, and furnishings from the ship. The removal of the spent fuel from a ship's nuclear reactor(s), referred to as defueling, usually happens as part of inactivation. Historically, when a ship is dismantled at Puget Sound Naval Shipyard, the reactor compartments are removed and packaged for transport to the Hanford low-level radioactive waste disposal site. Figure 3 shows the typical path followed for dismantlement and disposal at the shipyard.

⁴Low-level radioactive waste includes items that have become contaminated with radioactive material or have become radioactive through exposure to neutron radiation. It typically consists of contaminated protective shoe covers and clothing, reactor water treatment residues, and equipment and tools, among other items. Radioactivity can range from just above background levels found in nature, to very highly radioactive in certain cases, such as what may occur with parts from inside the reactor vessel in a nuclear power plant.

Figure 3: General Process for Nuclear-Powered Ship Dismantlement and Disposal at Puget Sound Naval Shipyard



Source: GAO analysis of Navy data (data); MapResources (map). | GAO-18-523

Dismantlement and Disposal by Commercial Industry

The Navy often uses commercial industry to dismantle and recycle its non-nuclear ships, including aircraft carriers, such as ex-USS *Constellation* and ex-USS *Ranger* completed in 2017. Navy officials noted that the cost to the government in recycling recent ships has been minimal—ranging from 1¢ to \$6 million—because of the resale value of their scrap metal.

Commercial companies have decommissioned 32 civilian nuclear reactor plants—work that the Navy has noted is comparable to nuclear-powered ship dismantlement and disposal. Commercial industry uses a component-based process for commercial nuclear plant decommissioning. This process breaks the reactor down into smaller components for transport and disposal, and separates nuclear waste from non-nuclear waste as much as possible to reduce disposal costs.

Requirements Related to Dismantlement and Disposal of Nuclear-Powered Ships

Several laws and an executive order have established the regulatory authority and requirements underlying the dismantlement and disposal of nuclear-powered Navy vessels. The Atomic Energy Commission exercised control of nuclear technology primarily for military purposes until 1954, when the Atomic Energy Act was amended.⁵ These amendments allowed for the possibility of a privatized nuclear energy industry. Twenty years later, the Atomic Energy Commission was abolished and split into the Nuclear Regulatory Commission (NRC) and the Energy Research and Development Administration—which was later absorbed into the Department of Energy.

Under this structure, NRC is responsible for overseeing commercial nuclear reactor safety, licensing reactors, and establishing regulations and guidelines for radioactive waste disposal for the commercial nuclear industry. The National Nuclear Security Administration, a separately organized agency within the Department of Energy, is responsible for the management and security of the nation's nuclear weapons, as well as nonproliferation programs. The Naval Nuclear Propulsion Program—also known as Naval Reactors—is a joint program of the Department of Energy and DOD that has cradle-to-grave responsibility for all naval nuclear propulsion matters. Figure 4 provides a brief description of laws and orders related to nuclear materials.

⁵Atomic Energy Act of 1954, Pub. L. No. 83-703, 68 Stat. 919 (codified as amended at 42 U.S.C. §§ 2011-2297g-4 (2018)).

Figure 4: Laws and Executive Order Related to Nuclear Materials

Atomic Energy Act of 1946	Atomic Energy Act of 1954	Energy Reorganization Act of 1974	Executive order 12344 Issued in 1982 ^a	Low-Level Radioactive Waste Policy Amendments Act of 1985, as amended
<p>Emphasized military aspects of nuclear energy and did not provide for commercial application of atomic energy</p> <p>Established the Atomic Energy Commission</p>	<p>Authorized the Atomic Energy Commission to continue its weapons program, promote commercial uses of nuclear power, and protect against hazards related to the possession and use of nuclear materials</p>	<p>Abolished the Atomic Energy Commission and divided its functions between the Energy Research and Development Administration (later part of the Department of Energy) and the Nuclear Regulatory Commission</p>	<p>Sets forth Naval Reactors' responsibility for all aspects of the Navy's nuclear propulsion, including research, design, construction, testing, operation, maintenance, and ultimate disposition of naval nuclear propulsion plants</p>	<p>Gives states the responsibility to dispose of low-level radioactive waste generated within their borders and allows them to form compacts to locate facilities to serve a group of states and the facilities will be regulated by the Nuclear Regulatory Commission or by states</p>

Source: GAO analysis of relevant laws and an executive order. | GAO-18-523

^aSee also 50 U.S.C. §§ 2406, 2511 (2018).

In addition to the nuclear-specific requirements guiding the dismantlement and disposal process, the Navy must comply with the National Environmental Policy Act.⁶ Specifically, this act requires federal agencies to evaluate the likely environmental effects of projects they are proposing, generally by preparing either an environmental assessment or a more detailed environmental impact statement.⁷ An environmental impact statement must, among other things, (1) describe the environment that will be affected, (2) identify alternatives to the proposed action and identify the agency's preferred alternative, (3) present the environmental impacts of the proposed action and alternatives, and (4) identify any

⁶42 U.S.C. §§ 4321-4347 (2018).

⁷Agencies may prepare an environmental assessment to determine whether a proposed project is expected to have a potentially significant impact on the human environment. If the agency determines that the project may cause significant environmental impacts, an environmental impact statement should be prepared. However, if the agency determines there are no significant impacts from the proposed project, then it is to prepare a Finding of No Significant Impact that presents the reasons why the agency has reached that conclusion. If a proposed project fits within a category of activities that an agency has already determined normally does not have the potential for significant environmental impacts or the activity has been excluded from National Environmental Policy Act analysis by statute, then the agency may instead approve it by using a categorical exclusion.

adverse environmental impacts that cannot be avoided should the proposed action be implemented. The Act's requirements are invoked for major federal actions, such as the construction of buildings or highways, or the dismantlement and disposal of reactor compartments from nuclear-powered vessels.

Since 1996, nuclear-related dismantlement and disposal activities performed by Puget Sound Naval Shipyard have been based on the same environmental impact statement—which addresses the effects of disposing of submarine and cruiser reactor compartments. In 2012, the Navy produced an environmental assessment analyzing the effects of removing and preparing the reactor compartments of CVN 65 for disposal at Puget Sound Naval Shipyard and transporting the compartment packages to the Hanford site for disposal. It found that these activities would have no significant impact on the environment beyond existing activity. Naval Reactors subsequently decided, however, that a new environmental impact statement is required for CVN 65 because the alternatives identified for dismantling and disposing of the ship could potentially have significant impacts on the environment that are not captured by the existing environmental assessment. As part of the new statement for CVN 65, Navy officials said environmental factors that account for the naval shipyard and full commercial options will be reviewed, as well as indefinite waterborne storage of the ship pending dismantlement and disposal at a later date.

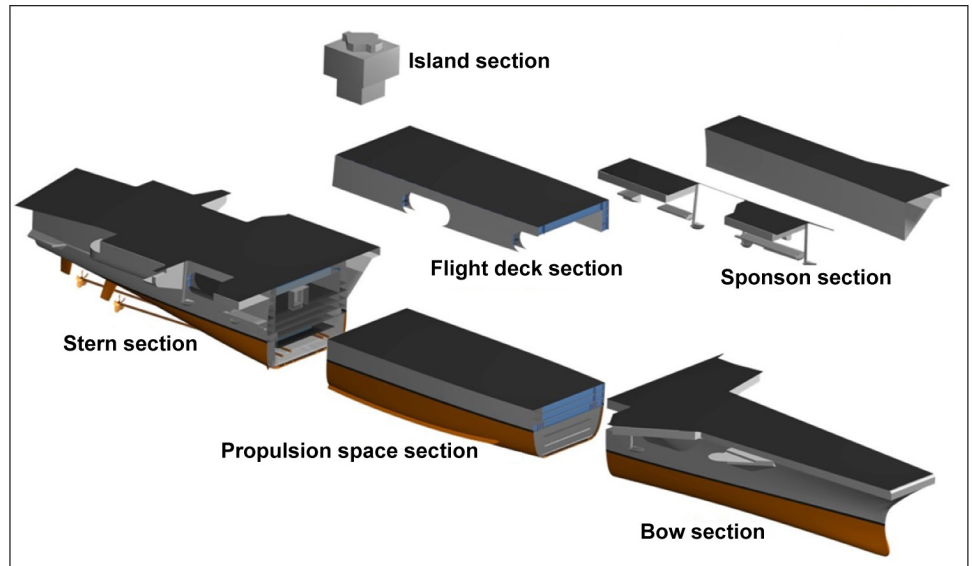
Naval Shipyard Option for CVN 65 Is More Defined than Full Commercial Option but May Pose Challenges for Meeting Navy Priorities

The Navy is weighing a number of considerations before making a decision for CVN 65 dismantlement and disposal. The naval shipyard option offers well-established processes for dismantlement and disposal of the ship's nuclear material and better understood cost and schedule estimates than the full commercial option. Our analysis of available data, however, found that the naval shipyard option would contribute to existing workload backlogs and exacerbate facility challenges at the shipyard that could affect its work maintaining the active fleet—a Navy priority. While the Navy has not defined its requirements for the full commercial option, industry does not expect to face workload or facility challenges. Navy officials also believe that the full commercial option potentially could shorten the timeline for completing the work and reduce the total cost.

Naval Shipyard Option Is Based on a Well-Established Process, While Navy Has Yet to Characterize Full Commercial Option

Although CVN 65 is the first nuclear-powered aircraft carrier requiring dismantlement and disposal, the Navy has well-established processes for dismantling and disposing of nuclear-powered submarines and cruisers. Navy officials explained that the shipyard's extensive dismantlement and disposal experience with these vessels has resulted in a strong understanding of how to accomplish the work. Further, the Navy has been working on plans to address the ship-specific needs of CVN 65 for many years. If the Navy chooses the naval shipyard option for CVN 65, it expects to adapt and use these well-established processes to dismantle the 28,000-ton nuclear propulsion space section at Puget Sound Naval Shipyard. This section would contain the 8 defueled reactors and all other nuclear-related material that remains on the ship. To separate the propulsion space from the ship, a commercial company would perform "ship-shaping" to create a dedicated ship section for all of the nuclear-related work. This activity would minimize the portion of the ship transported to the naval shipyard for dismantlement and disposal. The remaining ship sections would be commercially recycled. The shipyard is evaluating two designs for reactor compartment packages that could be used for transport and disposal of the ship's nuclear material. One design—based on a package previously used for cruiser reactors—would involve the shipyard preparing 8 single reactor packages. The other includes a new design that would enclose 2 reactors in dual reactor packages. Figure 5 shows how the Navy anticipates the ship would be divided into sections through this process.

Figure 5: Proposed CVN 65 Sectioning Approach for Puget Sound Naval Shipyard Dismantlement Option



Source: Navy documentation. | GAO-18-523

In contrast, the Navy formally began considering the potential for a full commercial option for CVN 65 within the past 4 years. According to Navy officials, although information received through previous requests for information and hosting discussions with commercial industry helped shape their understanding of the potential for a commercial ship dismantlement, they ultimately have had relatively limited interaction with commercial companies to determine their potential plans and processes for CVN 65 dismantlement and disposal. Naval Reactors officials stated they are waiting for the environmental impact statement process to officially begin before further engaging with prospective commercial companies and the public.

Many of the details for a full commercial option will depend upon Navy requirements, such as standards, technology, or specific procedures required to do the work; data and analysis in the environmental impact statement; and preferred work practices and facilities of prospective companies. Officials we interviewed from companies with potential interest in the work stated that because the Navy has not communicated its CVN 65 requirements for a full commercial option, any commercial approach described for the work would be hypothetical at this point, relying on their extensive prior experience with nuclear materials handling, packaging, shipping, and disposal—including nuclear ship

maintenance and decommissioning of commercial reactors—or ship recycling. Commercial company officials noted that despite the lack of definitive information available, they would anticipate employing typical practices used for commercial nuclear reactor decommissioning, ship dismantlement, and control of nuclear materials to complete CVN 65 work. In terms of locations for the work, Naval Reactors officials noted that many coastal sites in the United States could potentially accommodate CVN 65 dismantlement activities, and the location of the work site would affect the proposed disposal site or sites. Table 1 provides characteristics of the two options that the Navy is considering for CVN 65 dismantlement and disposal.

Table 1: Characteristics of the Navy’s Potential CVN 65 Dismantlement and Disposal Options

	Naval shipyard option	Full commercial option
General approach	<p>Commercial company divides CVN 65 into sections and creates a distinct nuclear propulsion space section in the middle of the ship that contains the 8 defueled reactors and all other nuclear-related material</p> <p>Company dismantles and recycles or disposes of non-nuclear sections</p> <p>Propulsion space section is transported by heavy-lift towing to Puget Sound Naval Shipyard</p> <p>Naval shipyard dismantles nuclear propulsion space section using established shipyard processes and constructs 4 or 8 reactor packages for transport and disposal</p>	<p>Commercial company(ies) dismantles entire ship based on applicable industry practices; may be similar to component-based dismantlement used for nuclear power plant decommissioning</p> <p>Company recycles or disposes of non-nuclear portions</p>
Nuclear-related dismantlement location	Puget Sound Naval Shipyard	Not yet determined
Disposal path	Transport reactor compartment packages by barge and ground transport vehicle to low-level radioactive waste disposal facility in Hanford, Washington	Not yet determined
Navy preliminary cost and schedule estimates	\$1.05 billion-\$1.55 billion 10 years, 2034 start	\$750 million-\$1.4 billion About 5 years, 2024 start

Source: GAO analysis of Navy documentation and interviews. | GAO-18-523

Estimates for Both
Dismantlement Options
Require Further
Development

Cost and schedule estimates for both CVN 65 options have yet to be formally established by the Navy. Puget Sound Naval Shipyard has been refining CVN 65 plans and estimates over many years. However, its most recent estimates for cost and schedule still may not fully account for uncertainties in completing the work because it represents a first-of-its-kind project with an unprecedented scale. The Navy's notional estimates for the commercial option are a first step in establishing expectations and will evolve as requirements for the work are better understood. The Navy awarded a contract in July 2018 to the Center for Naval Analyses—a federally funded research and development center serving the Navy and other defense agencies—to complete a cost analysis for the full commercial option. This effort is expected to provide the Navy with a cost estimate for CVN 65 in October 2018, followed by a model through which the Navy can develop cost estimates for future Nimitz-class dismantlement and disposal efforts. The findings from the CVN 65 environmental impact statement may contribute to the final cost and schedule estimates for either option.

Better Fidelity in Existing Naval Shipyard Option Estimates

Puget Sound Naval Shipyard officials explained that as their planning has progressed, they have refined their cost and schedule estimates for CVN 65 dismantlement and disposal. Overall, the Navy's cost estimates have increased significantly from initial estimates but have been relatively stable since 2016. The schedule went through similar fluctuations but has steadied. Table 2 outlines changes in the shipyard's plans and how they affected cost and schedule.

Table 2: Changes in Puget Sound Naval Shipyard CVN 65 Plans, Estimate Methodology, Schedule, and Cost

Year	Planning history	Estimate methodology	Schedule duration	Cost (in then-year dollars)
2011	Puget Sound Naval Shipyard dismantles and disposes of entire ship beginning in 2017 - prepare 8 single reactor compartment packages - recycle non-nuclear portions	Based on workdays per ton to reflect returns of completed cruiser reactor packages	7 years	500 million-750 million
2013	Same approach as 2011	Developed manning profiles for each phase of work - added cost for removal of hazardous materials - added support costs for increased duration of effort	12 years, 9 months	1.25 billion-1.85 billion
2014	Puget Sound Naval Shipyard begins dismantlement and disposal of propulsion space section of ship in 2019 Commercial recycling of non-nuclear portions	Updated manning profiles - reduced non-nuclear work and duration at shipyard	12 years	950 million-1.4 billion
2016	Same overall approach as 2014 - prepare 4 dual reactor compartment packages	Based on actual ship checks, drawings, and work teams - included nuclear and fire safety oversight - added oversight for ship-shaping to create propulsion space section	10 years	1.05 billion-1.55 billion ^a

Source: GAO analysis of Navy documentation. | GAO-18-523

Note: Navy officials stated that all estimates include an average of \$113 million in capital investments to Puget Sound Naval Shipyard required to execute the CVN 65 reactor compartment package disposal, while also ensuring that doing so would not affect the shipyard's maintenance of active ships.

^aPuget Sound Naval Shipyard included a \$51 million (6 percent of labor costs) management reserve for risk mitigation.

The schedule for starting the work at the naval shipyard also changed. Navy officials stated that as a result of the Navy's decision in early 2017 to reassess its options for CVN 65, it delayed the expected start date for the naval shipyard option from 2019 to 2034 based on analysis of the workload at the naval shipyard, which we discuss below.

Although Puget Sound Naval Shipyard officials noted their cost estimate includes some margin to account for CVN 65 being the first project of its kind, it may not adequately account for the extent of unknown facts or

circumstances that could affect cost. For example, unrecognized hazardous materials may exist in inaccessible areas of the CVN 65 propulsion space section that will only be discovered once the work is underway, which could affect cost and schedule. Execution of the work in support of a new dual reactor compartment package design also could lead to unanticipated challenges that cause deviations from estimates.

No Formal Estimates for Full Commercial Option

The Navy has notionally estimated cost and schedule for a full commercial option to be \$750 million to \$1.4 billion and about 5 years to complete. These estimates suggest that the commercial option could cost less and take less time to complete than the naval shipyard option. Navy officials stated that the notional cost estimate is derived from data reported by nuclear power plant operators, with differences in size and scope for the nuclear reactors incorporated.⁸ They also said that the notional estimate will be updated once it receives additional information from industry during the planning process.

Navy officials told us they expect the cost per reactor for CVN 65 would be significantly less than the NRC decommissioning average for a commercial facility because CVN 65 reactor compartments are smaller, the reactors are more compact, and they have already been through the costly defueling activity. A 2016 international study on the cost of decommissioning nuclear power plants identified several high-level categories and their contribution to total costs for reactors decommissioned in the United States, such as project management, site restoration, and waste packaging, transportation, and disposal.⁹ According to this study, about 25 percent of decommissioning costs can be attributed to reactor decontamination and dismantling. Using this percentage and the average cost to decommission a commercial nuclear reactor, we estimate the cost to dismantle the eight CVN 65 defueled reactors to range from \$1.2 billion to 1.3 billion, which is at the higher end of the Navy's notional estimated range for the full commercial option.

⁸The Nuclear Regulatory Commission noted these reported data are not equivalent to the actual cost to decommission a reactor, but represent the majority of the cost associated with safely decommissioning a single nuclear facility.

⁹Organisation for Economic Co-operation and Development, Nuclear Energy Agency, *Costs of Decommissioning Nuclear Power Plants*, NEA report No. 70201, 2016.

In addition to the potential cost, the Navy initially projected about a 5-year period of performance for the full commercial option based on limited industry input. Navy officials told us the full commercial option start date, beginning no earlier than 2024, is contingent on the finalization of the environmental impact statement and a record of decision that chooses this option as the Navy's path forward. The Navy's intent would be to award a contract shortly after the environmental impact statement is completed if the Navy decides to pursue the full commercial option. Commercial officials told us they do not anticipate a need for significant lead time before starting work, though the need will be better understood once the Navy outlines requirements for the work.

Finally, the cost for a full commercial option could be influenced by the contract type selected by the Navy. Contract type selection is a key factor in determining how cost risk is shared between the Navy and the contractor. Firm-fixed-price contracts are suitable for situations where the risk involved is minimal or can be predicted with an acceptable degree of certainty. Conversely, cost-type contracts are used when either requirements are not sufficiently defined or uncertainties with contract performance do not permit costs to be sufficiently estimated to use a fixed-price contract. Although no decision has been made, Navy officials told us they are interested in using a firm-fixed-price contract—a contract type that has been used for commercial reactor decommissioning. Under a firm-fixed-price contract, the contractor agrees to perform the work for a price that is not subject to change based on the contractor's cost experience in performing the contract, placing full responsibility for all costs and resulting profit on the contractor. Navy officials stated that because CVN 65 is the first nuclear-powered aircraft carrier to be disposed of, the scope of the effort will need to be better defined before they could reliably conclude that firm-fixed-price contracting would be appropriate. Specifically, insufficiently understood risks may make potential contractors unwilling to accept the risks associated with a firm-fixed-price contract.

The Navy's Priorities for Puget Sound Naval Shipyard Present Challenges Not Expected for Full Commercial Option

The Navy has stated its priority for Puget Sound Naval Shipyard is the work associated with maintaining nuclear-powered aircraft carriers and submarines currently in the fleet. However, as we reported in 2017, Puget Sound Naval Shipyard has had significant fleet maintenance delays since fiscal year 2000.¹⁰ These delays resulted in 4,720 lost operational days for nuclear-powered aircraft carriers and submarines. The addition of CVN 65 would contribute to challenges in the naval shipyard's ability to meet workload demands and further constrain its available facilities. In comparison, despite the lack of detail about the Navy's requirements, commercial company officials we interviewed stated they currently do not anticipate any major workload challenges or conflicts with other ongoing or future work in completing the work on CVN 65 based on their existing workforce and potential facilities for performing the work.

Puget Sound Naval Shipyard Workload and Facility Challenges

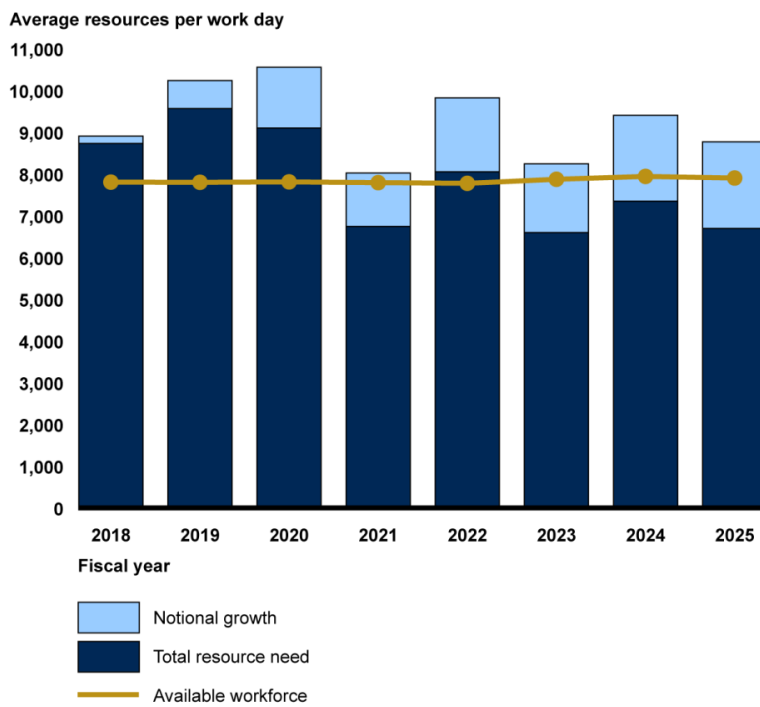
Based on our analysis of workload and resources data from Puget Sound Naval Shipyard, we found that the shipyard consistently operates at its maximum annual workload level and this likely will continue regardless of the Navy's decision for CVN 65. A Naval Reactors analysis of the shipyard's workload data also shows the workload meeting or exceeding capacity for the foreseeable future. The shipyard's workload projections that we reviewed show it will be working at or near capacity through fiscal year 2025—the last year for which data were available. Adding the work associated with dismantlement and disposal of CVN 65 would put the shipyard over current workload capacity.

Shipyard officials explained that historically, the workload projection for a given year matures as that year approaches, and the dips that sometimes are depicted in future-year workload projections generally vanish. Workload maturity or growth can be attributed to changes in the Navy's maintenance plans, deferred maintenance, growth from the previous year, and overall shipyard productivity. The condition of a ship when it arrives for maintenance can also contribute to growth if inspections of systems or components reveal a need for unplanned repairs. To account for historical variability and improve projections of overall workload, in 2015 shipyard officials began including 10 percent in unallocated workload to projections.

¹⁰[GAO-17-548](#).

In reviewing the shipyard workload and resources data, we also found that the shipyard regularly underestimates workload for future years—especially 5 years or more out—with workload growth for future years consistently exceeding 15 percent. Even without the CVN 65 work at the naval shipyard, projections show its workload with average notional growth will meet or exceed the workforce available to complete the work, as shown in figure 6.

Figure 6: Puget Sound Naval Shipyard Average Workload Projections with Available Workforce and Notional Growth without CVN 65 Work



Source: GAO analysis of Navy data. | GAO-18-523

Notes: The average total resource need indicates the amount of work days that are estimated to complete planned work for each work day. When this exceeds the available workforce, the shipyard must use measures, such as overtime hours, to address the additional need.

CVN 65 dismantlement and disposal workload projections are not included in these data.

According to the Navy, it is typical for naval shipyards to continually shift resources across projects to align worker-specific trade skills to the type of work executed on any hull in the shipyard, at any particular time. To

achieve a level and sustainable workforce across the fiscal years, the number of full-time employees required to support planned work is sized as part of the total workforce. The shipyard mitigates peaks in workload (above the available workforce) through the use of additional overtime, loans from other naval shipyards, and contracting. When that cannot occur, the shipyard will defer workload until it can be executed.

The CVN 65 dismantlement and disposal work could affect the shipyard's ability to complete active fleet maintenance. We found that the addition of the CVN 65 dismantlement and disposal would add almost a year's worth of work across the estimated 10-year dismantlement and disposal period to an already busy shipyard that has demonstrated difficulties in accurately projecting its future work. The Navy prioritizes maintenance of the active fleet, but the scale of the CVN 65 work would reduce the shipyard's ability to delay or reprioritize dismantlement and disposal. Shipyard officials noted that the Navy often defers planned dismantlement and disposal to address higher-priority active fleet maintenance. For example, smaller submarines prepared for dismantlement can instead be stored at the shipyard until workforce and space are available to complete the work. However, an aircraft carrier—even when reduced to a propulsion space section as proposed for CVN 65—would not offer the same level of flexibility to defer work. CVN 65 would involve a more extensive resource commitment because of its increased size relative to past ship dismantlement projects and would occupy limited facilities at the shipyard. Specifically, current plans require 3 years pier side to prepare the propulsion space section for dismantlement and reactor compartment disposal and about 5 years in a dry dock for the actual dismantlement.

Further, the shipyard expects a significant increase in its submarine inactivation and reactor compartment disposal and hull recycling workload due to the end of service for an additional class of submarines—specifically, the Ohio-class submarines starting in 2027. The estimated increase in inactivation and reactor recycling workload would overlap with the planned start for CVN 65 dismantlement and disposal in 2034, if the Navy elects to pursue this option. In addition, the shipyard already has a backlog of 10 submarines and the ex-USS *Long Beach* cruiser in storage awaiting disposal and recycling at its long-term storage facility for defueled, decommissioned, and inactivated nuclear-powered ships. Another 3 submarines are pier-side at Puget Sound Naval Shipyard. This backlog is not expected to subside as submarines continue to be retired, and each vessel represents thousands of workdays that the shipyard has to commit to its dismantlement and disposal.

Navy and Industry Expect Full Commercial Option to Face Fewer Challenges

While the Navy has not established specific requirements for the full commercial option, Navy officials maintain that it does not present the same workload and facility challenges that exist for the naval shipyard option. Commercial companies have flexibility in selecting a location for CVN 65 dismantlement activities based on facility and workforce availability considerations. Some company officials we spoke with also noted they have existing worksites—which are audited and approved by Naval Reactors—where they process, package, and transport low-level radioactive waste or operate low-level radioactive waste disposal sites licensed by NRC. These include facilities for radioactive waste processing and decontamination of materials for recycling. Additionally, company officials said they anticipate that a substantial amount of the work could be performed with the ship in the water—similar to the traditional approach used to dismantle non-nuclear vessels for recycling—and existing contractor facilities likely would not require major upgrades or improvements other than to provide for the radiological-based waste handling and packaging considerations.

Commercial company officials told us that they would not expect significant additional hiring needs based on their limited understanding of the potential CVN 65 work and their existing workforce capacity. They added that the nuclear dismantlement and disposal industry has an available, qualified workforce that could easily be employed if additional workforce were needed. Given the early stage of the Navy's planning for CVN 65 and the Navy's lack of formal engagement with commercial companies at the time of our review, we did not assess the current or future commercial workforce capacity. Any details on potential CVN 65 facility and workforce plans from commercial companies will be hypothetical until the Navy formally begins efforts to seek input from commercial companies and communicate requirements.

Budget Documentation and Reporting Does Not Include Sufficient Information to Facilitate Transparency and Oversight for CVN 65

The Navy's approach typically used to budget for and report on ship dismantlement and disposal does not provide sufficient information to support decision makers' oversight of CVN 65—a multi-year project that may require more than \$1 billion to complete. We found the Navy is not required to provide detailed budget information or report dismantlement and disposal cost, schedule, and programmatic information to decision makers. Providing additional information through budget requests and reporting would help ensure that decision makers have sufficient information to oversee CVN 65 dismantlement and disposal activities and to support future decisions.

Budget Exhibits for Dismantlement and Disposal Lack Ship-Specific Details

The Navy uses budget exhibits to provide congressional decision makers information about dismantlement and disposal efforts. If no changes are made to the information provided within the Operation and Maintenance, Navy (OMN) budget exhibits, the CVN 65 dismantlement and disposal budget request will include limited details for planned work, funding needs, and total estimated costs. The bulk of the Navy's past dismantlement and disposal work is comprised of comparatively low-cost projects—particularly submarines—with limited resource demands compared to a nuclear-powered aircraft carrier like CVN 65, a multi-year project with a cost that will potentially exceed \$1 billion. For example, nuclear-powered submarines have an average dismantlement and disposal cost of about \$26 million and average about 50,000 workdays. Federal internal control standards recommend that agency management communicate with external stakeholders the necessary quality information—such as complete cost and schedule information for CVN 65 dismantlement and disposal—to achieve objectives.¹¹ Budget exhibits are a primary source of information about all programs and other activities during budget planning and congressional appropriation decisions. Well-prepared budget exhibits help provide a rationale for the amount and timing of funding requests. Given that this multi-year, large-scale project is the first of its kind, more detailed information would facilitate greater transparency and oversight of cost, schedule, and performance.

¹¹[GAO-14-704G](#).

Limited Budget Information Provided for Dismantlement and Disposal

The Navy uses the OMN appropriation account to fund dismantlement and disposal activities.¹² The Navy's Financial Management Policy Manual provides overall summary guidance on OMN budget formulation, but it does not provide specific guidance on reporting criteria for dismantlement and disposal of Navy ships.¹³ Budget exhibits are prepared to justify appropriation requests and are key documents that can be used to support congressional oversight. DOD acquisition training materials state that well prepared budget exhibits make programs more defensible. However, in assessing the OMN budget exhibits associated with dismantlement activities for fiscal years 2007-2018, we found they provide little ship-specific detail that could be used to monitor a significant project such as the planned effort for CVN 65 dismantlement and disposal, which may begin requesting funding as soon as fiscal year 2023.

Specifically, we reviewed the dismantlement and disposal funding requests from the past several years, which reside within the Navy's OMN budget exhibits under the *Ship Activations/Inactivations* sub-activity group of the *Mobilization* budget activity. In doing so, we found these exhibits generally contain high-level information with a summary of funding changes for the current fiscal year and the requested funding estimate for the budget year. We could not definitively identify or track dismantlement and disposal of specific ships because

- key work activities are not described by ship,
- cost and schedule for individual ships are not presented, and
- prior year costs and cost to complete a specific ship's dismantlement and disposal are not provided.

In reviewing programmatic documentation other than the budget requests, such as Puget Sound Naval Shipyard dismantlement planning

¹²OMN appropriations are for expenses not otherwise provided for, such as day-to-day costs of operating naval forces, including fuel, supplies, and maintenance of ships. Department of the Navy, Office of the Assistant Secretary of the Navy (Financial Management and Comptroller), *Financial Management Policy Manual*, Oct. 2017.

¹³Department of the Navy, Office of the Assistant Secretary of the Navy (Financial Management and Comptroller), *Financial Management Policy Manual*, Oct. 2017.

documents and the Navy's long-range shipbuilding plans, we found instances of submarine inactivation costs significantly exceeding estimates and notable delays to the start dates for work activities. We found that, although not required, this information was not reflected in the budget exhibit documents we reviewed. As another example we previously noted, Navy officials stated that CVN 65 inactivation—already completed in December 2017—cost \$863 million. We could not track this cost from the budget exhibits because of their limited detail. As a consequence of the general lack of detail in the budget exhibits, decision makers cannot readily identify if cost growth occurred or if a specific ship was dismantled when planned, hindering oversight of dismantlement and disposal projects.

The Navy's OMN annual appropriations fund work activities on a year-by-year basis, which does not necessarily allow for tracking of the full resource commitment of a project over time or enable monitoring of cost growth to determine if additional funds are needed. Navy officials stated that they fully fund dismantlement and disposal efforts that span multiple fiscal years. They added that for CVN 65, the Navy may divide the work into multiple discrete phases that are separately funded due to the lengthy projected schedule. This approach could require the Navy to seek OMN appropriations in several non-consecutive years. Such an approach could make tracking CVN 65 dismantlement and disposal funding challenging, as the total cost and any changes would be obscured among the multiple funded activities that collectively compose the total dismantlement and disposal effort. Navy officials acknowledged that they could provide further information, such as total project cost and an overall schedule for CVN 65, in the OMN budget exhibits. However, without direction from DOD leadership or Congress, Navy officials stated that they have no plans to deviate from providing the traditional OMN budget exhibit information. Providing additional information in the CVN 65 budget exhibit could enable decision makers to track total cost, any cost changes, schedule progress, and general performance for the CVN 65 dismantlement and disposal.

Navy Could Provide More Budget Details for CVN 65

While the Navy funds ship dismantlement and disposal from the OMN account, budget exhibits for other accounts—such as the Shipbuilding and Conversion, Navy (SCN) account typically used for major investment items—offer examples of how to provide decision makers with more detailed information. Budget exhibits for SCN appropriations are structured to identify major elements of cost and track those costs over

time, consistent with DOD Financial Management Regulations. For example, the SCN budget exhibits typically contain specific information for each ship being procured with a distinct funding line for major cost categories such as basic construction, propulsion, and electronics. Additionally, these budget exhibits describe the program with specific plans for the upcoming budget year and estimate across 5 fiscal years (known as DOD's Future Years Defense Program), including the total cost to complete the program.¹⁴ While some of the SCN budget exhibit elements are not applicable to dismantlement and disposal, others could be adapted and used in an OMN budget exhibit for CVN 65 to provide information that would enable better oversight, such as

- work activities planned and performed by fiscal year;
- prior years' funding data;
- future years' funding plans;
- total estimated cost;
- cost to complete dismantlement;
- schedule of key events; and
- information on the contractor(s), contract type, and contract award and completion dates.

Navy officials said they typically would not provide the level of detail found in SCN budget exhibits or the exhibits for other DOD acquisition programs because OMN exhibits are not designed to support the same level of oversight. Unlike DOD acquisition programs, DOD projects completed with operation and maintenance funds typically are not investment programs and generally do not require the same level of oversight. However, as we previously indicated, Navy officials noted that if DOD leadership or Congress provided clear direction on what additional details related to CVN 65 dismantlement and disposal should be included in OMN budget exhibits, it could provide that additional information to support oversight. Navy officials stated that given the considerable funding needs and congressional interest with CVN 65, they were

¹⁴The Future Years Defense Program is the program and financial plan for DOD as approved by the Secretary of Defense. It arrays programmed dollars, manpower and force structure over a 5-year period (force structure for an additional 3 years), portraying this data by Major Force Program (i.e., strategic forces, mobility forces, and research and development) for DOD internal review for the program and budget review submission. It is also provided to the Congress in conjunction with the President's budget submission.

assessing options for providing specific detail in the OMN budget exhibit for its dismantlement and disposal activities. They added that no specific decisions had been made on what additional information, if any, would be included for CVN 65.

Lack of Reporting Requirements Limits Opportunities for Insight into CVN 65 Dismantlement and Disposal Cost, Schedule, and Performance

Despite being a part of the final phase in the program's life cycle, we found no specific reporting requirement related to the cost, schedule, risk management, and general performance of dismantlement and disposal activities in DOD or Navy policy that would support oversight by DOD or Congress.¹⁵ Officials from Naval Reactors and the Naval Sea Systems Command confirmed that there is no reporting requirement for performance of dismantlement and disposal of Navy ships. Navy officials noted that dismantlement and disposal activities are included in their annual briefings to Congress that support the Navy's budget requests, but acknowledged that the typical comparatively low-cost ship dismantlement and disposal activities are generally of less interest when combined with a briefing on shipbuilding and other high-dollar acquisition investments. This approach may be appropriate for submarine dismantlement and disposal activities that have lower costs, shorter periods of performance, and a well-established history. However, the magnitude of CVN 65's anticipated cost of dismantlement and disposal is comparable to that of large DOD acquisition programs. Such programs generally are expected to provide more information to decision makers within DOD and Congress through formal reporting on plans, activities, and performance to support accountability than what has traditionally been provided with respect to Navy dismantlement and disposal activities.

The precedent-setting nature of the CVN 65 dismantlement and disposal adds a level of risk and heightens the importance of having sufficient accountability measures to facilitate oversight. There is greater potential for unexpected challenges to arise because a nuclear-powered aircraft

¹⁵DOD Directive 5000.01, *The Defense Acquisition System*, describes the management principles for DOD's acquisition programs. DOD Instruction 5000.02, *Operation of the Defense Acquisition System*, outlines a framework for managing acquisition programs. Collectively, these are known as the DOD 5000 series. Secretary of the Navy Instruction 5000.2E, *Department of the Navy Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System*, issues procedures for major and non-major defense acquisition programs. Current law requires major defense acquisition programs to submit a summary report to several congressional committees at Milestone A that contains the total life-cycle cost estimate for the program. 10 U.S.C. § 2366a(c)(1)(B)(i).

carrier has not been dismantled and disposed of before. Additionally, CVN 65 provides an opportunity to establish a foundation for management and oversight of future aircraft carrier dismantlement and disposal efforts, with the first of 10 Nimitz-class carriers expected to reach the end of its service life in the next decade. Standards for internal control in federal government state that in order to identify and mitigate risk, program objectives such as a baseline for cost and schedule, should be clearly defined in measurable terms so performance in attempting to achieve those objectives can be assessed.¹⁶ Doing so would also provide the Navy with the ability to collect important historical cost data that could be used to inform cost estimates for future aircraft carrier dismantlement and disposal efforts.

DOD acquisition programs could serve as a model to identify appropriate cost and schedule objectives for the CVN 65 dismantlement and disposal, even though it is not an acquisition program and not subject to these requirements. DOD acquisition programs with significant resource commitments comparable to that expected of CVN 65 are generally subject to structured oversight and have reporting requirements to support performance transparency and accountability. As discussed earlier, preliminary cost estimates for CVN 65 dismantlement and disposal may exceed \$1 billion, regardless of the option the Navy ultimately selects. While many requirements for DOD acquisition programs are not relevant to dismantlement and disposal, even when costs may reach similar levels, we found elements of the reporting requirements associated with larger DOD acquisition category (ACAT) programs that the Navy could leverage to facilitate oversight of CVN 65 dismantlement and disposal.¹⁷ For example, ACAT II programs—which have estimated costs comparable to CVN 65 dismantlement and disposal cost expectations—are required by DOD policy to establish a program cost and schedule baseline prior to program start and report any significant deviations from the established baseline.¹⁸ They also are required by statute to provide information on risk management. Table 3

¹⁶[GAO-14-704G](#).

¹⁷Defense acquisition program ACAT classifications depend on estimated costs and type of acquisition. All acquisition programs generally are required by statute or DOD guidance to provide program information at milestones and other decision points, although these requirements differ by ACAT level and may be tailored in many circumstances.

¹⁸Defense acquisition programs are designated as ACAT II when estimated to require a total expenditure for procurement of more than \$835 million in fiscal year 2014 dollars.

highlights some DOD acquisition program reporting elements that could support oversight of CVN 65 dismantlement and disposal.

Table 3: DOD Acquisition Reporting Elements That Could Be Adapted for Use with CVN 65 Dismantlement and Disposal

Acquisition element	Description	Potential benefits of application
Acquisition program baseline	Establishes cost and schedule baseline estimates before project start and requires reporting of certain deviations in cost, schedule, or performance, among others	If a baseline for cost and schedule is established prior to contract award or funding naval shipyard work, it would allow tracking and reporting of cost and schedule deviations above certain thresholds from initial estimates through the life of the project
Independent cost estimate or assessment	Provides an independent evaluation of the quality, accuracy, and reasonableness of a program's cost estimate, with emphasis on specific cost and technical risks Identifies risks related to budget shortfalls or excesses	Allows for a validation of the Navy's cost expectations and a determination of whether the Navy's estimate accurately reflects the project expectations Could support a determination that the project can be completed without the need for significant adjustment to future budgets if the elements of project cost risk are properly identified, evaluated, and include mitigation plans
Risk management plan	Establishes procedures to identify, manage, and mitigate risks; estimates the likelihood and possible consequences in terms of cost, schedule, and performance	Procedures that could help to manage risks for a large-scale, first-of-its-kind project

Source: GAO analysis of DOD Instruction 5000.02 and GAO cost estimation guidance. | GAO-18-523

For example, once a cost baseline is established, comparison to an independent cost estimate or assessment could provide greater assurance that the risks associated with performing CVN 65's large-scale, first-of-a-kind dismantlement activities were adequately considered and appropriately estimated. GAO's *Cost Estimating and Assessment Guide* states an independent review of a program's cost estimate is crucial to establishing confidence in the estimate.¹⁹ It provides an unbiased test of whether the program cost estimate is reasonable and can be used to identify risks related to budget shortfalls or excesses. The Naval Center for Cost Analysis is responsible for developing independent cost assessments for ACAT II Navy programs, while the Office of the Secretary of Defense's Office of Cost Assessment and Program

¹⁹GAO, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, [GAO-09-3SP](#) (Washington, D.C.: March 2009).

Evaluation develops independent cost estimates for major defense programs.

As noted earlier, the Navy continues to refine its cost estimate of the naval shipyard option and expects to receive an estimate for the full commercial option from the Center for Naval Analyses in October 2018. The Navy stated it considers the anticipated cost estimate and model from the Center for Naval Analyses to be the independent cost estimate for the full commercial option. We view this estimate as a valuable step in establishing cost expectations for the full commercial option, but believe it is inadequate because it will determine the Navy's cost expectations as opposed to validating an existing estimate—the intent of having an independent assessment. For the naval shipyard option, the Navy suggested no plans for an independent cost estimate as it continues to refine the current cost estimate prior to a decision for CVN 65. Completing an independent cost estimate for both CVN 65 options prior to a Navy decision on its dismantlement and disposal approach would provide additional information to inform a decision that could have repercussions for carrier dismantlement and disposal activities for years to come. Adapting certain acquisition program requirements to the CVN 65 effort, as described above, would help the Navy establish baselines that can be tracked by decision makers to assess cost and schedule, and help identify deviations, if any. These types of reporting requirements would provide decision makers with greater information to support their oversight and hold the Navy accountable for meeting CVN 65 dismantlement and disposal expectations.

The Navy's Evaluation of CVN 65 Dismantlement and Disposal Options Is Hampered by a Regulatory Authority Disagreement

The regulatory authority determines the rules, procedures, and oversight that will guide the dismantlement and disposal process for CVN 65. The Navy is considering three regulatory authority scenarios related to the naval shipyard or full commercial options, as discussed in table 4.

Table 4: Regulatory Authority Scenarios Being Considered by the Navy for Nuclear-Related CVN 65 Dismantlement and Disposal Activities

	Regulatory authority	Description of scenario
Naval shipyard option	Naval Reactors	Naval Reactors serves as regulatory authority for dismantlement and disposal managed by Puget Sound Naval Shipyard. Many existing shipyard oversight organizations and activities to assist Naval Reactors with its oversight based on extensive experience (about 130 reactors dismantled and disposed of at shipyard).
Full commercial option	Nuclear Regulatory Commission (NRC) or agreement state ^a	Naval Reactors officials view ship dismantlement and disposal as similar to its other nuclear-related processing and disposal activities, and believe NRC or a state should be able to serve as regulatory authority. NRC asserts it does not have regulatory authority for naval nuclear propulsion waste, nor would a state. Continued pursuit of the full commercial option without resolving this disagreement could present challenges for <ul style="list-style-type: none"> • ensuring accountability for safe dismantlement and disposal; • business case analysis used to examine costs, benefits, and risks; • Navy and industry cost estimates; and • industry workload and schedule estimates.
Full commercial option	Naval Reactors	Naval Reactors lacks experience, organizational structure, and practices to draw upon for nuclear-related dismantlement and disposal work performed by industry. Naval Reactors would need to establish new roles and responsibilities for oversight which it has typically done through naval shipyard support.

Source: GAO analysis of Naval Reactors and NRC information. | GAO-18-523

^aNRC is authorized to enter into agreements where it relinquishes authority to states—referred to as agreement states—which then assume regulatory authority over certain nuclear materials.

The Navy Has Regulatory Precedent for the Naval Shipyard Option

If the Navy chooses the naval shipyard option, it can rely on Naval Reactors' extensive experience serving as the regulatory authority for dismantlement activities conducted at Puget Sound Naval Shipyard. Naval Reactors has overseen the dismantlement and disposal of roughly 130 reactors from submarines and cruisers by the naval shipyard. Many shipyard oversight organizations and activities, as well as on-site Naval Reactors personnel, help control environmental and human health exposures. For example, the Radiological Controls Office is responsible for monitoring radiation exposure to the workforce and ensuring radioactivity is confined to controlled work areas. The Nuclear Quality Division employs nuclear auditors who review performance, processes, and instructions for all nuclear work at the shipyard.

Although the scale and design of CVN 65 creates some unique dismantlement and disposal considerations as compared to the

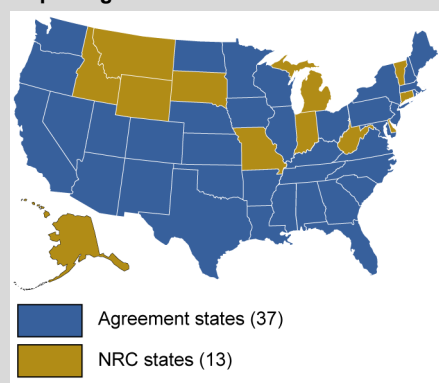
submarine and cruiser activities, Navy officials stated they plan to use the same organizations located at the shipyard and practices to oversee performance if they decide to complete the CVN 65 work at the shipyard. The environmental impact statement planned for CVN 65 is expected to outline the different needs that the aircraft carrier presents for the dismantlement process and disposal path, such as changes related to the transportation of CVN 65 reactor packages required if the Navy chooses to use four larger dual reactor compartment disposal packages instead of eight single packages to dispose of the carrier's reactors. While the Navy can rely on familiar regulatory practices to support the naval shipyard option, as discussed earlier, this option includes potential workload and schedule disadvantages.

Disagreement Persists about the Appropriate Regulatory Authority for the Full Commercial Option

Agreement State Program

The Atomic Energy Act gives the Nuclear Regulatory Commission (NRC) authority over domestic industrial, medical, and research uses of radioactive materials. The act also authorizes NRC to enter into agreements with states (called agreement states) so they assume, and NRC relinquishes, regulatory authority over specified radioactive materials. Specifically, NRC is authorized to enter into agreements to allow states to assume regulatory authority over source, byproduct, and special nuclear materials in quantities insufficient to form a critical mass. NRC must find a state program adequate to protect public health and safety and compatible with NRC's program for regulating such materials before entering into these agreements. The mechanism for the transfer of NRC's authority to a state is an agreement signed by the governor of the state and the chair of the Commission.

Map of Agreement States



Source: GAO (data); MapResources (map). | GAO-18-523

Naval Reactors' position is that a commercial company could dismantle and dispose of CVN 65 under the regulatory authority of NRC or an agreement state. According to Naval Reactors officials, the full commercial option would represent a continuation of Naval Reactors' long history of nuclear-related activities with vendors licensed and regulated by NRC or agreement states. For example, Naval Reactors officials noted they commonly have used facilities licensed by NRC or agreement states for a range of manufacturing, processing, and disposal activities available for naval nuclear materials. Naval Reactor officials specifically assert that, as CVN 65 has already been defueled, such a facility should be able to process the byproduct material on the ship.²⁰ However, NRC stated its disagreement that it or an agreement state is able to serve as the regulatory authority for CVN 65, emphasizing that regulatory responsibility for the safe processing and disposal of Navy ships falls to Naval Reactors under its Department of Energy authority. NRC officials also noted that Naval Reactors has been regulating nuclear-powered ship dismantlement and disposal activities exclusively at Puget Sound Navy Shipyard for decades.

Coordination between Naval Reactors and NRC to identify the applicable regulatory authority and establish a regulatory plan for the CVN 65 full commercial option would help ensure accountability for safe dismantlement and disposal of CVN 65 under the full commercial option. It would also enable the Navy and commercial companies to effectively estimate costs. Without a resolution, the Navy could face challenges in estimating the cost and completing a comprehensive business case analysis of costs, benefits, and risks for the full commercial option if it is unsure of which regulatory authority will be responsible for enforcement. Furthermore, companies with potential interest in the CVN 65 work may not be able to effectively estimate the workload and associated cost without a clearly identified regulatory authority. Resolution of this disagreement also has relevance for other future ship dismantlement and disposal activities, such as with the Surface Ship Support Barge in the near term and the Nimitz-class aircraft carriers in the long term.

²⁰Byproduct material includes certain material made radioactive by exposure to the operation of a nuclear reactor.

Naval Reactors' Position

Navy Surface Ship Support Barge

The Surface Ship Support Barge is a dockside refueling facility constructed from a converted Navy tanker vessel used to disassemble spent nuclear fuel for shipment within a water pool. Naval Reactors noted this facility is now obsolete, with no further use planned, and the Navy is interested in dismantling and disposing of it commercially. According to Naval Reactors officials, the barge contains very low radioactivity in the water pool and fluid systems, which requires appropriate dismantlement and disposal measures.

The Navy halted its pursuit of a contract award to dismantle and dispose of the barge in early 2017 based on NRC formally stating it has no regulatory authority over the dismantlement and disposal of naval vessels. A Naval Reactors official stated a request for information may be issued in 2018 to solicit input from commercial companies for dismantlement and disposal of this barge, but plans remain unsettled.

Source: GAO analysis of Navy information. | GAO-18-523

Naval Reactors could use its own authority to regulate a full commercial dismantlement of CVN 65. Naval Reactors officials stated, however, that NRC or agreement states—which regulate industrial, medical, and research uses of radioactive materials—also have authority to regulate commercial dismantlement and disposal of CVN 65, and the Navy would benefit from leveraging their regulatory experience and structure. In particular, Naval Reactors officials stated that for the full commercial option, their responsibility to provide for processing and disposal of the byproduct material—which Naval Reactors indicated is what remains on CVN 65—can be best met by contracting with commercial companies licensed by NRC or an agreement state.²¹

According to Naval Reactors officials, even if NRC maintains that it cannot regulate material from CVN 65, some states may do so under their own authority. Specifically, Naval Reactors' position is that states that had agreements with the old Atomic Energy Commission prior to its abolishment and the creation of NRC in 1974 were granted—and continue to maintain—authority to process naval nuclear propulsion waste. Accordingly, Naval Reactors officials stated that these states could serve as the sole regulatory authority over commercially-performed CVN 65 dismantlement and disposal.

Naval Reactors officials also asserted specific potential advantages of having NRC or an agreement state regulate commercial dismantlement and disposal of CVN 65. First, they said the regulatory structure that NRC and agreement states apply to commercial nuclear-related activities includes an enforcement process to impose fines for violations, which Naval Reactors does not have.²²

²¹The Atomic Energy Act authorizes the Atomic Energy Commission to provide for safe processing and disposal of waste resulting from naval nuclear propulsion programs. When the Atomic Energy Commission was abolished, NRC received its licensing and related regulatory functions while all other authorities generally devolved to the Department of Energy. Because the Navy's use of CVN 65 is exempt from licensing by NRC, the Department of Energy bears the responsibility to provide for its processing and disposal. As a joint program of the Department of Energy and the Navy, Naval Reactors carries out this responsibility for the Department of Energy.

²²In reviewing a draft of this report, DOD commented that Naval Reactors has the authority, deriving from the Department of Energy, to levy fines under the Price Anderson Amendments Act of 1988, but Naval Reactors has chosen not to utilize that authority. See 42 U.S.C. § 2273(a) (2018).

Additionally, Naval Reactors officials noted the Navy's contract strategy options could be improved if NRC or an agreement state serves as the regulatory authority for CVN 65. Specifically, they stated that a reason for the Navy's interest in using NRC or agreement state authority is the possibility of emulating the firm-fixed-price contract currently being used to decommission a commercial nuclear power plant. In this example, the operating license was transferred from the utility that owns the plant and site to a dismantlement contractor to more quickly complete the decommissioning. This effectively gave a dismantlement and disposal company the power plant owner's responsibility for the safe dismantlement and disposal of the power plant, with NRC continuing to act as the regulatory authority. According to Naval Reactors, the firm-fixed-price contract used in this case was viable because the dismantlement contractor had total responsibility independent of the plant owner to perform the work in accordance with the regulations and requirements of NRC. Naval Reactors officials stated that the firm-fixed-price contract created an incentive for the company to thoroughly understand what the work entailed and perform the work efficiently to maximize its profit.

Naval Reactors officials stated that a total separation of the owner from regulatory decisions and interpretations, like the one currently being used for the commercial nuclear power plant, is the Navy's best means to facilitate the potential use of a firm-fixed-price dismantlement contract for CVN 65. They further stated that an approach wherein Naval Reactors retained regulatory authority could undercut the prospect of a firm-fixed-price contract by eliminating the clear division between regulator and owner. In taking this position, Naval Reactors officials suggest that a conflict of interest exists in being both the owner who wants to establish a fixed price for the work as well as the regulator with the potential to affect costs. Naval Reactors officials also noted that if Naval Reactors were the regulator, with no experience in regulating this type of work, commercial companies could have difficulty pricing such regulatory risk. In contrast, they stated that in NRC-regulated commercial plant dismantlement, as well as agreement state-regulated, large-scale radioactive waste processing work, commercial companies have demonstrated that they are willing to accept this regulatory risk, agreeing to contracts on a fixed-price basis.

Nuclear Regulatory Commission's Position

In February 2017, NRC formally stated its position in a letter responding to a congressional inquiry that it has no regulatory authority for Navy

ships, such as CVN 65. NRC said that under the Atomic Energy Act it is the responsibility of the Department of Energy, and accordingly Naval Reactors, to provide for processing and disposal of naval nuclear propulsion waste.²³ NRC stated that agreement states also lack jurisdiction because their authority derives from NRC's authority. NRC officials we interviewed also disputed Naval Reactors' position that states have independent authority to process naval nuclear propulsion waste for two reasons. First, they stated that regulation of reactor dismantlement is not an activity that can be relinquished to the states.²⁴ Second, they pointed out that the authorities that can be relinquished to the states under the Atomic Energy Act are licensing activities conducted under specific provisions of the act, and that the responsibility to safely process and dispose of naval nuclear propulsion waste is conducted under a different set of provisions which are not subject to licensing.²⁵

NRC officials acknowledged that naval nuclear propulsion waste has been processed at facilities licensed by NRC or an agreement state, but distinguished such examples from CVN 65. Specifically, they noted that no additional regulatory oversight was required to process incidental amounts of such waste at facilities licensed to process commercial waste, but CVN 65 is not licensed by NRC or an agreement state and would involve only naval nuclear propulsion waste. NRC officials emphasized that the additional work that would be required to regulate the dismantlement of CVN 65—an unlicensed facility—puts it beyond NRC's jurisdiction. Additionally, NRC stated that while such work could be

²³As noted previously, this Department of Energy Authority has been delegated to Naval Reactors by Executive Order 12344.

²⁴The Atomic Energy Act prohibits relinquishment to states of authorities associated with the construction and operation of nuclear reactors, and NRC's position is that dismantlement would constitute construction and/or operation. Naval Reactors contends that CVN 65's reactors have been rendered inoperable by the defueling and deactivation process to the extent that they no longer constitute reactors.

²⁵The Atomic Energy Act allows for the relinquishment to states of authorities in chapters 6, 7, and 8 of the act related to licensing byproduct materials, source materials, and special nuclear materials in quantities not sufficient to form a critical mass. Naval Reactors' responsibility to provide for the safe processing and disposal of naval propulsion waste is located in chapter 9 of the act and is not subject to the licensing requirements of the act. The act also allows for the relinquishment of authorities under section 161 of the act, and section 161(b) of the act authorizes the establishment of standards governing the possession of byproduct material without regard to licensing. However, neither Naval Reactors nor NRC had analyzed the extent to which this provision was previously used by the Atomic Energy Commission or could be used by Naval Reactors to delegate authority to states over naval nuclear propulsion waste.

carried out by a contractor, including a contractor with an NRC or agreement state license, the work would not be covered by that license, as NRC and agreement states do not have authority to regulate such activity. Essentially, NRC's position is that while Naval Reactors can contract to have the dismantlement and disposal performed by a commercial entity, Naval Reactors would retain its own regulatory responsibility for enforcing that contract.

NRC stated that if Naval Reactors desired technical support in regulating a commercial dismantlement, NRC or an agreement state could provide such services through a contract. This approach, according to NRC officials, would offer Naval Reactors a regulatory consultant familiar with commercial dismantlement while maintaining Naval Reactors as the regulatory enforcement authority. In such an arrangement, NRC or an agreement state could identify regulatory concerns, but Naval Reactors would be responsible for determining what corrective action is taken to address those concerns. Naval Reactors officials stated they are in ongoing discussions with NRC about this potential approach. They also asserted that this potential approach is not optimal because, as previously discussed, it could create regulatory uncertainty for commercial companies by preventing a clear separation of the regulator and owner.

Naval Reactors Lacks Regulatory Experience and Structure for Commercial Dismantlement and Disposal

Since Naval Reactors has its own authority as part of the Department of Energy, it could choose to regulate a CVN 65 commercial dismantlement. However, with Puget Sound Naval Shipyard having performed the dismantlement and disposal work for previous nuclear-powered vessels, Naval Reactors lacks experience to draw upon for a full commercial option. It also cannot rely on the organizational structure and practices in place at Puget Sound Naval Shipyard to support a commercial CVN 65 dismantlement that will be conducted at an offsite facility. If Naval Reactors serves as the regulatory authority for a full commercial dismantlement, it will have to determine what mechanisms are needed to provide sufficient monitoring of the work and how they will fulfill the roles and responsibilities typically filled by the naval shipyard's support. These mechanisms may include elements similar to those used by the naval shipyard as well as new ones unique to the dismantlement practices used by commercial companies.

A significant consideration for Naval Reactors when working to establish an approach to monitor commercial dismantlement and disposal is the component-based dismantlement process that companies may use. This

process, which is commonly used to dismantle commercial nuclear power reactors, involves segmenting reactor components (i.e., cutting to reduce in size) so the pieces can be put in standardized containers for transport and disposal. This process is a contrast to the traditional dismantlement approach that Nuclear Reactors uses at Puget Sound Naval Shipyard—an approach that would leave CVN 65’s reactors largely intact by encasing them in packages for disposal. As noted by Naval Reactors officials, commercial dismantlement practices potentially could require the Navy to decide whether to adjust its standard radiological work practices to better align with different dismantlement and disposal activities or use the same practices it uses for work performed at Puget Sound Naval Shipyard. Using the same practices could affect cost expectations for the Navy and commercial companies by changing the way the work is performed. As an example, applying the Navy’s standard practices for total containment of radionuclides to a dismantlement process that involves increased cutting could require additional measures to control the work environment.

Conclusions

Over 50 years ago, CVN 65 set a precedent as the Navy’s first nuclear-powered aircraft carrier. The Navy’s plans and decisions for this aircraft carrier’s dismantlement and disposal represent an opportunity to create a standard that the Navy may use for decades to come as the Nimitz-class carriers enter retirement. As the Navy considers how to proceed, it will be critical to ensure that there is sufficient oversight and accountability for what likely will be an effort greater than \$1 billion that lasts the better part of a decade. Since budget exhibits are a primary tool to aid Congress in making well-informed funding decisions, without additional details, transparency and the ability to assess CVN 65 progress could be limited. In particular, a more robust budget exhibit for CVN 65 that includes cost and schedule information across the Future Years Defense Program, as well as the status of activities—including any contract awards and a tracking of high level changes in cost and schedule—could help increase transparency for oversight.

Reporting requirements for DOD acquisition programs, which are not required or currently planned for CVN 65 dismantlement and disposal, provide examples of the types of information that decision makers can use to ensure that resource-intensive programs are meeting expectations or make changes as necessary. Without establishing a cost and schedule baseline that has been validated by an independent cost estimate or assessment, it will be difficult for decision makers to track cost and schedule performance or have confidence in CVN 65 costs. The Navy

has indicated it is receptive to providing additional information to support oversight that is commensurate with other Navy programs of a similar funding level. However, the Navy also stated that it requires clear direction from DOD leadership or Congress on what additional accountability measures are desired before it would make any changes to current budget exhibits and reporting.

Naval Reactors is charged with cradle-to-grave responsibility for our nation's naval nuclear propulsion material. The disagreement between Naval Reactors and NRC about the regulatory authority for commercial dismantlement and disposal of Navy nuclear ships persists. Coordination between the two agencies to identify the applicable regulatory authority for a full commercial dismantlement and disposal of CVN 65 and to develop a regulatory plan would help establish which practices and standards will apply to uphold nuclear safety and security. It would also help ensure the Navy's selection of a dismantlement and disposal plan for CVN 65 is informed by well understood regulatory expectations and cost and schedule estimates that reflect those expectations.

Matter for Congressional Consideration

We are making one matter for congressional consideration.

Congress should consider requiring Naval Reactors to coordinate with the Nuclear Regulatory Commission for any CVN 65 dismantlement and disposal performed commercially to identify the applicable regulatory authority. In the event that an entity other than Naval Reactors will serve as the regulatory authority, Naval Reactors should submit to Congress a plan that identifies the regulatory authority for CVN 65 activities, and includes acknowledgement from that regulatory entity of its agreement with Naval Reactors and the legal basis for its authority. If the regulatory entity is an agreement state, such acknowledgment should be coordinated with the Nuclear Regulatory Commission. (Matter 1)

Recommendations for Executive Action

We are making the following four recommendations to DOD.

The Secretary of Defense should ensure that the Navy provides additional information in the annual President's budget exhibits associated with CVN 65 dismantlement and disposal to facilitate improved transparency and accountability. Additions should, at a minimum, include the CVN 65 funding estimate across the Future Years Defense Program, activities planned or performed for applicable fiscal years, tracking of total cost and high level changes in cost and schedule

from the prior year with explanations for changes, and if applicable, contract type, awardee, award value, and award and completion date estimates. (Recommendation 1)

The Secretary of Defense should require the Navy to obtain an independent cost estimate, performed by DOD's Office of Cost Analysis and Program Evaluation or the Naval Center for Cost Analysis, for both the naval shipyard and full commercial options before choosing a dismantlement and disposal approach for CVN 65. (Recommendation 2)

The Secretary of Defense should require the Navy to complete a risk management plan prior to beginning the CVN 65 dismantlement and disposal. (Recommendation 3)

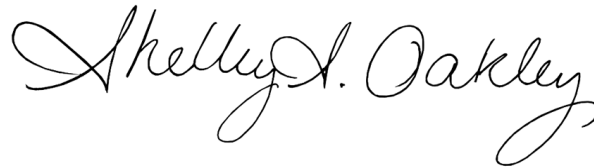
The Secretary of Defense should require the Navy to approve a cost and schedule baseline prior to beginning the CVN 65 dismantlement and disposal. (Recommendation 4)

Agency Comments

We provided a draft of this report to DOD and NRC for comment. Both DOD and NRC agreed with the draft report and its findings, and DOD concurred with the four recommendations we directed to the department. DOD and NRC provided written comments, which have been reproduced in appendix II and appendix III, respectively. DOD and NRC also provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to the appropriate congressional committees; the Secretary of Defense, the Secretary of the Navy, the Nuclear Regulatory Commission, and other interested parties. This report will also be available at no charge on GAO's website at <http://www.gao.gov>.

If you or your staff members have any questions regarding this report, please contact me at (202) 512-4841 or oakleys@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 the report are listed in appendix IV.

A handwritten signature in black ink that reads "Shelby S. Oakley". The signature is written in a cursive, flowing style.

Shelby S. Oakley
Director, Contracting and National Security Acquisitions

List of Committees

The Honorable John McCain
Chairman
The Honorable Jack Reed
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Richard Shelby
Chairman
The Honorable Dick Durbin
Ranking Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable Mac Thornberry
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Kay Granger
Chairwoman
The Honorable Pete Visclosky
Ranking Member
Subcommittee on Defense
Committee on Appropriations
House of Representatives

Appendix I – Objectives, Scope, and Methodology

This report (1) describes the differences between the dismantlement and disposal options under consideration, including cost and schedule as well as workload and facilities; (2) evaluates the Navy's funding and reporting practices for dismantlement and disposal activities; and (3) assesses the effect that nuclear regulatory authority considerations have on dismantlement and disposal options for CVN 65.

To identify the differences between the potential CVN 65 dismantlement and disposal options, we reviewed Navy documentation on prior, ongoing, and future dismantlement and disposal activities, as well as information related to the different options the Navy has considered or is considering for CVN 65. We interviewed Navy officials and reviewed documentation from the Naval Sea Systems Command, which includes Naval Reactors, and Puget Sound Naval Shipyard and Intermediate Maintenance Facility (hereafter referred to as Puget Sound Naval Shipyard). To obtain an understanding of the full commercial dismantlement and disposal approach, including work practices and potential work sites, we interviewed officials and reviewed documentation from commercial companies that the Navy identified as having involvement in shipbreaking or nuclear-related industries and potential interest in CVN 65. These companies include Atkins Global; EnergySolutions; Huntington Ingalls Industries (HII – Nuclear); International Shipbreaking Limited; NorthStar Group Services; and Waste Control Specialists.

For CVN 65 cost and schedule estimates, the Navy considers all estimates to still be preliminary because the Navy has yet to formally begin the environmental impact statement process and remains years away from a decision on its dismantlement and disposal approach. As a result, we did not formally evaluate the reasonableness of any cost or schedule estimates. However, we did review the initial estimates to gain insight on historical and current cost expectations. To assess the Navy's preliminary cost estimates for the naval shipyard option, we reviewed Navy data on the basis for the cost estimates, particularly estimates since 2011. This included reviewing the cost factors that contributed to each estimate to understand how the shipyard's increasing knowledge of CVN 65's ship characteristics and changes to the planned dismantlement approach fed into the different estimates. For the Navy's notional cost estimate of the CVN 65 full commercial option, we reviewed the data and approach used by the Navy to develop initial cost information. This included commercial decommissioning data, which the Navy used to establish a rough order of magnitude cost estimate based on the limited information available that is comparable to CVN 65 dismantlement and disposal.

We used the same data to generate our own notional estimated cost range based on a Nuclear Regulatory Commission (NRC) cost formula, as well as published data from the Organisation for Economic Co-operation and Development's Nuclear Energy Agency. This included analysis of costs reported by operating power reactor licensees in NRC's 2015 decommissioning funding status report to comply with decommissioning financial assurance reporting requirements. Our review of historical data from the Nuclear Energy Agency and a 2011 report on nuclear decommissioning by an independent panel established by the California Public Utilities Commission helped us identify cost drivers and categories of costs attributed to specific activities that occur when decommissioning commercial power plants.

To assess workload and facility considerations related to CVN 65, we analyzed Puget Sound Naval Shipyard workload and resource requirements data for fiscal years 2006 through 2025, and facility data for fiscal years 2018 through 2035. To assess the reliability of these data, we interviewed knowledgeable officials and reviewed documentation to verify the controls and measures used to validate and maintain the data. We determined these data to be reliable for our purposes of discussing the existing and planned workload at Puget Sound Naval Shipyard. We compared projections to actual workload when available to identify differences and compared the average amount of annual projected workload to the average amount of annual projected workforce available. We also reviewed a 2018 report on the Navy's strategic plan for addressing the infrastructure deficiencies at the public naval shipyards as well as the Navy's long-range shipbuilding plans for fiscal years 2011, 2016, and 2019. Additionally, we reviewed past GAO reports that addressed operation and maintenance activities at naval shipyards, and the related workload demands and facilities' requirements.¹

To identify the Navy's funding and reporting practices for dismantlement and disposal activities, we reviewed Navy documentation on prior, ongoing, and future ship dismantlement and disposal activities, as well as Navy procurement and operation and maintenance budget exhibits—fiscal years 2016 and 2017 for procurement exhibits and fiscal years 2007 through 2017 for operation and maintenance budget exhibits. We also

¹GAO, *Naval Shipyards: Actions Needed to Improve Poor Conditions that Affect Operations*, [GAO-17-548](#) (Washington, D.C.: Sept. 12, 2017) and *Depot Maintenance: Executed Workload and Maintenance Operations at DOD Depots*, [GAO-17-82R](#) (Washington, D.C.: Feb. 3, 2017).

reviewed Federal Acquisition Regulations, Office of Management and Budget guidance on budget information, and the Department of Defense and Navy acquisition regulations. We interviewed officials from Naval Reactors and the Program Executive Office for Aircraft Carriers. Based on these efforts, we evaluated the Navy’s historical approach for funding, conducting oversight, and reporting on dismantlement and disposal activities. We assessed the Navy’s approach against federal standards for internal control.² Additionally, we assessed how funding and typical reporting requirements for Department of Defense acquisition programs align with the potential need to facilitate oversight for CVN 65 dismantlement and disposal.

To determine the effect that nuclear regulatory authority considerations have on dismantlement and disposal for CVN 65, we examined applicable laws, regulations, executive orders, policies, and guidance documents related to nuclear-powered ships. We also reviewed past GAO reports related to environmental and nuclear requirements.³ We reviewed Navy documentation on prior, ongoing, and future ship dismantlement and disposal activities. We also interviewed officials and reviewed documentation from Naval Reactors; the Assistant Secretary of the Navy for Energy, Installations, and Environment; the Chief of Naval Operations Environmental Readiness Division; the Program Executive Office for Aircraft Carriers; Puget Sound Naval Shipyard; and the Nuclear Regulatory Commission. Additionally, we interviewed officials from the Washington State Departments of Health and Ecology, the Texas Commission on Environmental Quality, and the Texas Department of State Health Services—two states in which ship dismantlement activities have recently occurred and that have nuclear waste disposal sites.

We conducted this performance audit from August 2017 to August 2018 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

²GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: September 2014).

³GAO, *Nuclear Regulatory Commission: Regulatory Fee-Setting Calculations Need Greater Transparency*, [GAO-17-232](#) (Washington, D.C.: Feb. 2, 2017); *Nuclear Security: NRC Has Enhanced the Controls of Dangerous Radioactive Materials, but Vulnerabilities Remain*, [GAO-16-330](#) (Washington, D.C.: July 1, 2016); and *National Environmental Policy Act: Little Information Exists on NEPA Analyses*, [GAO-14-370](#) (Washington, D.C.: Apr. 15, 2014).

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.

Appendix II – Comments from the Department of Defense



ACQUISITION

THE ASSISTANT SECRETARY OF DEFENSE
3015 DEFENSE PENTAGON
WASHINGTON, DC 20301-3015

JUL 19 2018

Ms. Shelby Oakley
Director, Contracting and National Security
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Ms. Oakley:

This is the Department of Defense (DoD) response to the GAO Draft Report, GAO-18-523, 'AIRCRAFT CARRIER DISMANTLEMENT AND DISPOSAL: Options Warrant Additional Oversight and Raise Regulatory Questions,' dated June 18, 2018 (GAO Code 102258). Detailed responses to the report recommendations are enclosed.

In addition to the four recommendations, the GAO Draft Report recommended that Congress consider requiring Naval Reactors to coordinate with the Nuclear Regulatory Commission (NRC) for any CVN 65 dismantlement and disposal performed commercially to identify the applicable regulatory authority. Naval Reactors has been coordinating with the NRC on this matter for nearly two years. NRC believes it does not possess regulatory authority to govern dismantlement of CVN 65 by commercial entities. If this is accurate, the Navy would not be able to contract on a commercial basis for radiological dismantlement services for CVN 65 that are regulated by the NRC and NRC Agreement States. The Department is concerned that such an outcome effectively deprives the Navy of access to the same commercially available, safe, and well NRC-regulated services which the private sector may use, potentially affecting the Department's ability to efficiently balance industrial workload and make maximum use of the funds provided by Congress for the National Defense by requiring a less efficient and duplicative regulatory framework. Since the concern expressed by NRC is a lack of authority, and such a position severely impacts the Navy's ability to pursue a commercial option, we are highlighting it in our response while continuing to work with NRC to resolve.

Naval Reactors will continue to coordinate with the NRC and is currently engaged in developing a novel regulatory oversight arrangement concerning the Surface Ship Support Barge, a smaller radiological dismantlement project, which, if adopted, may serve as guidance for potential use in larger disposal applications.

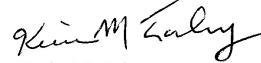
Finally, I would like to commend the GAO on the thoroughness of this review. This is a complex topic that has not been previously addressed. The GAO's investigators have been diligent in seeking all of the facts and perspectives from a wide range of people and organizations. Within the DoD, we have had very good discussions with GAO personnel, and we are satisfied that our concerns and opinions have been fairly considered. Hopefully, this

**Appendix II – Comments from the Department
of Defense**

GAO review will be helpful in moving forward on a matter that may have a major impact on the cost and efficiency of DoD radiological disposal.

The Department appreciates the opportunity to comment on the draft report. For further questions concerning this report, please contact Mr. John Christian at john.e.christian4.civ@mail.mil or 703-695-2757.

Sincerely,


Kevin M. Fahey

Enclosure:
As stated

GAO DRAFT REPORT DATED JUNE 18, 2018
GAO-18-523 (GAO CODE 102258)

“AIRCRAFT CARRIER DISMANTLEMENT AND DISPOSAL: OPTIONS
WARRANT ADDITIONAL OVERSIGHT AND RAISE REGULATORY
QUESTIONS”

DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATIONS

RECOMMENDATION 1: The Secretary of Defense should ensure that the Navy provides additional information in the annual President’s budget exhibits associated with CVN 65 dismantlement and disposal to facilitate improved transparency and accountability. Additions should, at a minimum, include the CVN 65 funding estimate across the Future Years Defense Program, activities planned or performed for applicable fiscal years, tracking of total cost and high level changes in cost and schedule from the prior year with explanations for changes, and if applicable, contract type, awardee, award value, and award and completion date estimates.

DoD RESPONSE: Concur. The Department agrees that the current format of budget exhibits associated with CVN 65 dismantlement and disposal limits transparency and accountability for the level of investment required for the effort. In accordance with this letter, the Navy agrees to develop and submit additional cost, schedule, and contract information to supplement existing budget exhibits and to continue such reporting through completion of the dismantlement and disposal of CVN 65. The information to be provided will include:

- A summary of activities and significant developments in connection with the dismantlement and disposal.
- A detailed description of cost and schedule performance against the baselines established for the dismantlement and disposal, including a description of and explanation for any variance from the cost or schedule baseline.
- A description of the amounts requested, or intended or estimated to be requested, for the dismantlement and disposal for each fiscal year covered by the future years defense program and any fiscal years prior to or after the period of the future-years defense program.

For reference purposes, this item will be identified as GAO-18-523-01.

RECOMMENDATION 2: The Secretary of Defense should require the Navy to obtain an independent cost estimate, performed by DoD’s Office of Cost Analysis and Program Evaluation or the Naval Center for Cost Analysis, for both the naval shipyard and full commercial options before choosing a dismantlement and disposal approach for CVN 65.

DoD RESPONSE: Concur. The Department agrees that the Navy should obtain an independent cost estimate for both the naval shipyard and the full commercial dismantlement and disposal options. In accordance with this letter, the Navy agrees to obtain both independent cost estimates through the Office of Cost Analysis and Program Evaluation (CAPE). The CAPE

ENCLOSURE

independent cost estimates will be completed in time to support the Navy's final decision on which option, naval shipyard or full commercial, will be pursued. For reference purposes, this item will be identified as GAO-18-523-02.

RECOMMENDATION 3: The Secretary of Defense should require the Navy to complete a risk management plan prior to beginning CVN 65 dismantlement and disposal.

DoD RESPONSE: Concur. The Department agrees that a risk management plan is needed. In accordance with this letter, the Navy agrees to prepare a risk management plan covering the selected dismantlement and disposal option. The risk management plan will be completed not less than 90 days before the award of a contract to a commercial entity or the provision of funds to a government owned naval shipyard for the dismantlement and disposal of CVN 65. For reference purposes, this item will be identified as GAO-18-523-03.

RECOMMENDATION 4: The Secretary of Defense should require the Navy to approve a cost and schedule baseline prior to beginning the CVN 65 dismantlement and disposal.

DoD RESPONSE: Concur. The Department agrees that a cost and schedule baseline is needed to ensure accountability in the CVN 65 dismantlement and disposal effort. In accordance with this letter, the Navy agrees to prepare and approve a cost and schedule baseline covering the selected dismantlement and disposal option and to monitor cost and schedule against the baseline for the duration of the dismantlement and disposal effort. The cost and schedule baseline will be approved not less than 90 days before the award of a contract to a commercial entity or the provision of funds to a government owned naval shipyard for the dismantlement and disposal of CVN 65. For reference purposes, this item will be identified as GAO-18-523-04.

ENCLOSURE

Appendix III – Comments from the Nuclear Regulatory Commission



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 18, 2018

Shelby S. Oakley, Director
Contracting and National Security Acquisitions
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20226

Dear Ms. Oakley:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to your email dated June 18, 2018, which provided the NRC with an opportunity to review and comment on the U.S. Government Accountability Office (GAO) draft report GAO-18-523, "Aircraft Carrier Dismantlement and Disposal: Options Warrant Additional Oversight and Raise Regulatory Questions."

The NRC appreciates the opportunity to review the draft report as well as the GAO staff's professionalism and many constructive interactions during this GAO engagement. Overall, the NRC agrees with the draft report and its findings. The draft report accurately describes the dismantlement and disposal options under consideration, the NRC's regulatory authority, and funding and reporting practices. In the enclosure to this letter, we have provided some minor comments and clarifications for your consideration.

Thank you again for the opportunity to provide comments on the GAO report. Please feel free to contact Mr. John Jolicoeur at (301) 415-1642 or John.Jolicoeur@nrc.gov if you have questions or need additional information.

Sincerely,

A handwritten signature in blue ink that reads "Margaret M. Doane".

Margaret M. Doane
Executive Director
for Operations

Enclosure:
NRC Comments on Draft Report
GAO-18-523

Appendix IV – GAO Contact and Staff Acknowledgments

GAO Contact

Shelby S. Oakley, (202) 512-4841 or oakleys@gao.gov.

Staff Acknowledgments

In addition to the contact named above, key contributors to this report were Diana Moldafsky, Assistant Director; Antoinette Capaccio; Kurt Gurka; Stephanie Gustafson; Kristine Hassinger; Jean Lee; Sean Merrill; LeAnna Parkey; Karen Richey; and Roxanna Sun.

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