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STATEMENT OF

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ON THE

**MINDING THE GAP:
HOW OPERATIONAL ENERGY CAN HELP
US ADDRESS LOGISTICS CHALLENGES**

BEFORE THE

**HOUSE ARMED SERVICES COMMITTEE
READINESS
SUBCOMMITTEE**

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Chairmen Garamendi, Ranking Member Lamborn, and distinguished members of the House Armed Services Subcommittee on Readiness, as the Deputy Chief of Naval Operations for Fleet Readiness and Logistics, I appreciate the opportunity to discuss how Operational Energy can help us address logistics challenges before this particular committee. My testimony will highlight the key enablers to delivering operationally-relevant logistics with respect to materiel and services, location, and timeliness. To achieve this, we need to fully integrate logistics into operational command and control, enable assured sea control and power projection from the homeland and across the inter-theater, strengthen sustainment for distributed operations, and improve logistics resiliency. Additionally, I plan to address the Navy's efforts on Operational Energy to achieve the Secretary of the Navy's goals. We've accomplished a lot since I last addressed this committee in 2019 and learned immensely from our efforts to continuously meet operational requirements, while simultaneously driving successful, innovative, and non-traditional solutions to global maritime logistics.

Persistent and Predictive Logistics

Joint Publication 4.0 describes the term "logistics" as the planning and executing the movement and support of forces. For the Navy, it is, in fact, the delivery of all things necessary to REFUEL, REARM, RESUPPLY, REPAIR and REVIVE our naval Forces. These five vectors of maritime logistics are reliant upon foundational cross-cutting enablers (such as digital Information Technology (IT) and shore platforms) to ensure persistent logistics, which allows our forces to compete, deter and win in unpredictable operational environments. Logistics in support of Distributed Maritime Operations (DMO), Littoral Operations in a Contested Environment (LOCE) and Expeditionary Advanced Base Operations (EABO) concepts must enable maneuverability, provide agile

sustainment, and ensure rapid recovery and resiliency both ashore and afloat. The framework for guiding this transformation is the Logistics Continuum that extends from acquisition and industrial base activities that precede naval actions to the distribution of commodities and logistics support across inter-theater, intra-theater and the last tactical mile.

Transforming Naval Logistics for Strategic Competition

For the first time in over three decades, the 2018 National Defense Strategy (NDS) and the Tri-Services Maritime Strategy – Advantage At Sea: Prevailing with Integrated All-Domain Naval Power, clearly and firmly orient the national security environment toward Strategic Competition (formerly Great Power Competition (GPC)). This environment comprises long-term global competition across multiple domains; spans the global industrial base and operational battlespace; and requires technological, operational, and strategic solutions amidst significant unpredictability and uncertainty. However, these achievements took place in the context of a permissive maritime environment against non-peer adversaries; our planning, resourcing, and warfighting assumptions are built for this permissive environment. The logistics enterprise developed a “hub-and-spoke” sustainment model reliant on land-based logistics hubs with spokes comprising a smaller Combat Logistics Force (CLF), supplemented by commercial carriers for “just-in-time” delivery.

Three decades of resourcing and structuring naval logistics for cost efficient operations in an uncontested environment has produced a logistics system adept at Phase 0 or day-to-day operations. The hub-and-spoke model works well; just-in-time delivery is sufficient – for a fleet that is not widely distributed or dynamically maneuvering under persistent, multi-domain attack. An uncontested environment is a forgiving one; it

provides the time, space and freedom of maneuver to compensate for gaps and seams in our logistics continuum.

Today's security environment exposes the hub-and-spoke model as fragile and highly vulnerable; just-in-time delivery cannot sustain a high-end maritime conflict with a peer competitor. It is incapable of achieving the agility, survivability and resilience to sustain DMO and LOCE/EABO.

Future Naval Logistics Enterprise

The Navy's mission is expeditionary and has long required the capability to conduct worldwide and sustained operations at sea. The Navy has been, and will always be, called upon to operate forward in areas where access to shore bases may be limited. Therefore, the ability to Refuel, Resupply, Rearm, Repair, and Revive our ships at sea is critical to the Navy's ability to project warfighting power from the sea.

The NLE and its hub-and-spoke sustainment model must be transformed if our forces are to prevail in a contested maritime environment. The naval services must reinvigorate their focus on and investments in naval logistics, including shore infrastructure and expeditionary forces, both to grow our advantage and to achieve the agility, survivability and resiliency demanded by DMO and LOCE/EABO. Today's security environment demands a naval logistics enterprise focused on sustainment as a warfighting function, with a warfighting approach to delivering combat-effective logistics. Currently optimized for Phase 0 or day-to-day operations, the logistics enterprise must be equally prepared to sustain our forces in a protracted high-end fight. Logistics is the pacing function for our naval forces and is fundamental to their ability to fight and win decisively. In today's strategic environment, the enterprise must be capable, across the competition continuum, providing:

- Efficient sustainment of our naval forces in day-to-day operations.
- Expansion of the competitive space through flexible, expeditionary logistics-based options and strengthening our network of Allies and Partners.
- Assured readiness and sustainment to strengthen and maintain the credibility of our naval combatants as a deterrent force.
- Logistics postured to increase speed and reach during escalation.
- Sustainment that permits our forces to prevail in prolonged conflict.
- Rapid reconstitution of the force and re-posturing.

Combat-effective sustainment and the organizational transformation necessary to achieve this require a comprehensive assessment of enterprise requirements across the logistics continuum. The logistics continuum provides a construct for visualizing and organizing the strategic guidance, operational concepts, kill chains/kill webs, critical mission threads and activities as they apply across the spatial-temporal continuum where the enterprise executes its mission. The continuum includes the planning, acquisition and industrial base activities that precede naval actions for routine, contingency and crisis deployments (“left of bang”), and three additional distinct segments or phases that complete the end-to-end chain: inter-theater, intra-theater and the last tactical mile. Each of these four segments is inter-dependent and is critical to the functioning of the logistics system, and to effective sustainment of the Fleet in a contested environment. Each segment requires unique concepts, capabilities, capacities, and competencies to support Naval and Joint operational concepts, to ensure the agility, survivability and resiliency necessary to prevail in combat.

Making Naval Logistics More Agile and Resilient

Leveraging the Power of the Integrated Fleet, Navy is introducing new intra-theater

combat-credible maritime force capabilities to ensure warfighters remain in the fight. In support of USN/USMC Integrated Warfighting Concepts of Operations including DMO, LOCE and EABO, we are pursuing experimentation, exercises and war games to develop and test innovative concepts that complement Combat Logistics and Strategic Sealift capabilities; enhancing overall naval combat force availability.

The Navy is developing the EPF Flight II, which will expand the logistics capability of these vessels to embark enhanced medical capability in support of DMO, LOCE and EABO. EPF 14 will be the first EPF Flight II and started construction in October 2020 for a June 2023 delivery.

Further, PB21 included RDTEN to commence concept studies in FY21 to evaluate next-generation medium-lift, intra-theater, amphibious platforms, and logistics ships. These studies focused on naval sustainment (Refuel, Resupply and Rearming), and movement and maneuver for our integrated naval forces. These efforts created cost-effective opportunities for our fleet to expand support missions and sustain global presence to ensure warfighters remain in the fight. The Navy also welcomes outside analysis and we're continuously assessing the findings of the Center for Strategic and Budgetary Assessment's report on resilient maritime logistics, as well as other recent studies, as the Navy pursues its overall logistics strategy.

Operational Energy

The Secretary of the Navy set operational energy priorities for the Department of the Navy in June of 2019. These include:

- Extend operational reach of current and future weapons systems through more effective use of energy.
- Reduce energy consumption and external energy logistics requirements to forward

deployed strike groups.

- Increased energy resilience of forward bases, supply depots, and cooperative security locations – Get more energy to the warfighter.
- Increase the effective use, conversion, storage, distribution, and control of energy to enable integration of future weapons and sensors onto platforms.
- Foster and guide an energy culture in our sailors and marines through policy, training and education.

The Secretary has directed CNO and CMC to develop detailed plans to achieve those goals in support of the National Defense Strategy. The Navy's resource sponsor for Operational Energy is N94, who partners with the Operational Energy staff working for DASN Sustainment. For integration of items like training, the N94 and DASN Sustainment team coordinates with the acquisition community, OPNAV N4, HQMC (both I&L and PP&O), the Systems Commands, and the Fleet and Fleet Marine Forces to ensure that operational energy goals are considered during acquisition of new platforms and as part of strategy development and concepts of operation.

With respect to our shore platforms, the Navy is exploring the concept of Smart Grid as an opportunity to increase installation resiliency, reliability, efficiency, and sustainability of those platforms to source the capabilities needed to support logistics in a contested environment. Smart Grid uses digital, analytical, and cyber capabilities and technologies to optimize Naval Shore infrastructure and operations across four objectives:

- Optimization of assets and systems, reducing operational and maintenance costs.
- Optimization of energy storage, reducing energy grid costs.
- Automation of business processes, optimizing resources and productivity.

The Navy has invested money over the past ten years to install technology,

infrastructure, and advanced metering, setting the foundational work required to feed into Smart Grid. Facility Engineering Operations Centers (FEOCs) are using the smart grid technology to increase installation resilience and mission assurance by providing a single platform for connecting workers, assets, processes, data, and decision-making capability. The FEOC uses advanced analytics and enables efficient and effective building operations management by optimizing resources across buildings at shore installations through collaboration between utility and energy leaders. Five FEOCs are currently constructed and deployed in Washington DC, Mid-Atlantic, Southwest, Northwest and Hawaii and four FEOCs are currently being planned and constructed in Southeast, Marianas, Far East and Europe.

The Department of Navy Operational Energy goals focus on closing technological gaps in the recently developed warfighting Concept of Operations (including DMO) which requires weapon systems and platforms with increased stand-off, greater range, increased time-on-station, and other energy-relevant operational energy capabilities. Unmanned platforms require longer ranges, greater persistence, and reduced detection profiles in order to reduce risk to manned platforms and provide persistent Intelligence, Surveillance, and Reconnaissance (ISR). Hydrogen and Fuel cells, which offer up to 2-5 times improvement in range compared to battery and fossil fuel analogues, lower heat and noise signature, provide greater reliability, and may provide an opportunity to address a number of these needs.

However, fielding of fuel cells has had limited success due to the following barriers:

- Concerns about hydrogen supply and logistics.
- Concerns with safely fielding fuel cells, hydrogen generation and storage on ships.
- Lack of demonstrated and common infrastructure at various scales.

- Lack of affordability for individual programs to overcome the above barriers.

While the Navy has had some success developing extended range, hydrogen fueled platforms, fielding requires overcoming the above challenges. In response, Navy has developed a tentative shipboard hydrogen roadmap that supports experimentation and fielding of future warfighting capabilities. The Department is aligning fuel cell and battery safety standards so that the Navy is prepared to deploy, employ, and support hydrogen powered ISR assets and forces on platforms. Finally, RDT&E is examining funding opportunities for safe and limited production, storage, and refueling of hydrogen onboard ship.

An additional item to highlight is that the authority of Title 10 §2912 subsection (c) allows the use of cancelled funds equivalent to the amount of operational energy cost savings realized by the Department to be used for the implementation of additional operational energy resilience, efficiencies, mission assurance, energy conservation, or energy security initiatives within the department, agency, or instrumentality that realized that savings. The DON Energy REACTS Program executes the authority of 10 U.S.C. § 2912 to invest in the timely development, implementation, and sustainment of innovative operational energy saving initiatives.

There have been several noted cost-savings captured from Energy REACTS: in FY20, there were \$20.39M of FY15 cost savings captured as a result of stern flap upgrades on 57 US Navy surface ships and, in FY21, the Navy retained savings of \$41.87M of FY 2016 funds. These funds were then used, for example, to invest in Naval Postgraduate School's Operational Energy curriculum development along with the following items:

- MSC Cargo Hold LED Lighting, LED Conversion, Cargo Refrigeration (TAKE) and

T-AO Class Magnetically Coupled Adjustable Speed Drive

- T-AKE Auxiliary Area Refrigeration
- Energy Command and Control Projects
- Distributed Fueling Modular Consolidated (CONSOL) Tanker
- DDG-51 class thermal insulation alt package
- Study to identify gaps in Power and Energy Standards
- Data Analysis for High Efficiency Super Capacity (HESC) Chiller
- Maneuver support, Sustainment, and Protection Integration
- Expeditionary Advanced Base Operations Power
- Last Tactical Mile Logistics
- Petroleum Undersea Sustainment Hose
- Upgrade of Gas Turbine Cyber Forensic Tool
- Study for shipboard integration of Embedded Batteries
- Industry Analysis of Battery Supply Chain

OSD, in coordination with the Navy and other services, submitted a Legislative Proposal change to the FY22 NDAA requesting an amendment to 10 U.S.C. § 2912 that would authorize moving energy cost savings from one type of appropriation to another in order to allow military departments the flexibility needed to fully implement subsection (c) of section 2912 based on following rationale:

- Energy cost savings accrue primarily in appropriations made for operation and maintenance (O&M), Navy (OMN) and O&M, Marine Corps (OMMC).
- Obligation of other appropriations may be necessary to properly execute certain requirements using authority conferred by section 2912 subsection (c).

Defense Industrial Base

The loss of domestic manufacturing capability and fragile global supply chains threaten national security and U.S. ability to meet national defense requirements. The U.S. must revitalize our ability to not only imagine, but produce, the technology and products of tomorrow. Leveraging broad political, international, and industrial support there are a number of concurrent efforts to address Defense Industrial Base (DIB) and supply chain vulnerabilities vital to the Navy's ability to provide logistics in a contested environment.

Using guidance from the DoD, the Navy is working to develop a framework to focus efforts to address and mitigate supply chain vulnerabilities for logistics and operational energy. The focus areas include select kinetic capabilities (hypersonics, directed energy); energy storage and batteries; microelectronics; castings and forgings; and strategic and critical materials.

A resilient DIB is key to preserving and extending U.S. competitive military dominance in the coming century and, with it, deterrence that will keep Americans safe and keep the peace. The Navy will continue to work with our interagency and industry partners as part of a whole of government approach to creating a robust, resilient, secure, and innovative industrial base in support of the Joint Force.

Next-Generation Logistics Ship as an Enabler

The Navy must transform its logistics enterprise to be more agile and resilient to ensure combat effective sustainment in a contested environment. Shifting to a "push logistics" model via an intra-theater distribution network will enable warfighters to remain in the fight in support of DMO, LOCE, and EABO. DMO aims at avoiding a situation in which an adversary could defeat U.S. naval forces by concentrating its attacks on a

relatively small number of large, high-value U.S. Navy ships. Under EABO, relatively small Marine Corps units armed with anti-ship cruise missiles and other weapons would hop on and off islands in the Western Pacific to conduct “shoot-and-scoot” operations against adversary ships.

Initiated in the Navy’s FY2021 budget submission, Next Generation Logistics Ships (NGLS) is intended to deliver new combat-credible, maritime force capabilities to ensure logistics are postured for operations in a contested logistics environment. Augmenting the traditional CLF, NGLS will refuel, rearm and resupply naval assets (afloat and ashore) near contested environments via ship-to-ship and ship-to-port operations. Potentially a family of vessels, NGLS will move fuel, personnel, equipment, and supplies between ships, advanced bases, ports, and dispersed nodes of the seabase; sustaining afloat (Surface Action Group) and ashore (Expeditionary Advanced Base) requirements.

PB22 continues R&D efforts initiated in FY21 to support concept evaluation, ship configuration development, Industry Studies, and demonstrations focused primarily on naval sustainment (Refuel, Resupply, and Rearming logistics missions) onboard Military Sealift Command’s Next Generation Logistics, Tactics, Techniques and Procedures charter ship. The Navy’s proposed FY2022 budget requests \$27.8 million in research and development funding for the program.

These capabilities are required to diversify distribution options for littoral sustainment and maneuver in littoral operating areas. Working with the Marine Corps, the Navy plans to modernize the prepositioning network and design the right mix of afloat and ashore capabilities. A family of uncrewed logistics systems is under development, which will provide the ability to reduce risk to stand-in forces by minimizing the use of heavy wheeled vehicles and replacing them with a variety of uncrewed logistics systems tailored

for sustainment missions.

Operational Energy Helps Us Address Logistics

The Secretary of the Navy's memorandum of 27 June 2019 entitled "Department of the Navy Operational Energy Goals" directed the CNO to establish measurable objectives to ensure naval operational energy challenges are addressed. In his initial guidance to the Fleet in December 2019, the CNO provided objectives within three areas of focus to achieve success in Strategic Competition - Warfighting, Warfighters, and Future Fleet. The Navy's warfighting strategy, principally distributed operations, prioritizes sustained operations forward in all domains and in denied environments. This concept stresses the force architecture and significantly challenges the operational energy network.

The Warfighting focus described requirements to surge and sustain the integrated naval force forward in an all-domain battlespace with agility and flexibility. The following objectives align our analytics and processes to enable integrated naval distributed operations. The CNO's FRAGO stressed recruitment, education, training, and retention to maintain a world-class naval force. From previous efforts, including the Great Green Fleet, we've learned that the energy culture has a significant impact on the energy system. We must ensure that fleet operators, requirements officers, and policy leaders understand the compounding nature of the energy supply chain. Fuel energy is still our primary source; however other sources, including batteries and hydrogen are becoming more prevalent and critical, especially to subsea and aviation platforms. Finally, the capabilities and force architecture necessary to execute our operating concepts is a function of numerous factors, including energy supply and demand. When fighting forward, the near-peer competitor has the benefit of a short supply chain, and the advantage in operational energy. To overcome this advantage, and maximize the benefits of distributed operations,

we must incorporate energy command and control, demand management, and resilient supplies. In his initial guidance to the Fleet in December 2019, the Chief of Naval Operations succinctly stated the required end state for the United States Navy in this strategic environment. Such an end state requires not just persistent, agile and flexible naval combatant forces, but also naval logistics forces and maritime logistics capabilities with these same attributes. Naval logistics must prioritize prepositioned forward stocks and munitions, strategic mobility assets, partner and allied support, as well as non-commercially dependent distributed logistics and maintenance to ensure logistics sustainment while under persistent multi-domain attack.

Achieving a Navy that is ready to win across the full range of military operations in competition, crisis and contingency by persistently operating forward with agility and flexibility in an all domain battlespace demands considerable work because naval logistics is not optimized for a near-peer operational environment. Global operations continue to assume an increasingly maritime focus. As we look to the future, we see a continued need for naval forces on station to meet the mission requirements of the Joint Force and combatant commanders. We will continue to support forward presence and relieve stress on the rest of the force through traditional and innovative approaches. Combat Logistics Forces, Service Support Ships, Special Mission Ships and NGLS are foundational to the National Defense Strategy. I want to thank you for your continued support of our Force. Also, thank you again for the opportunity to appear before the Committee.