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Statement of

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(Sustainment)

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Subcommittee on Intelligence and Emerging Threats and Capabilities and

Subcommittee on Readiness

Resiliency of Military Installations to Emerging Threats

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Chairmen Langevin and Garamendi, Ranking Members Stefanik and Lamborn, and distinguished members of the Subcommittees: Thank you for the opportunity to discuss the Department's efforts to enhance installation resiliency.

Our installations are key platforms for our nation's defense. They are our power projection platforms and support every mission the DoD Components undertake to defend this nation. Therefore, we must work to ensure installations and infrastructure are resilient to a wide range of challenges—regardless of the source—to include weather, climate, natural events, disruptions to energy or water supplies, and direct physical or cyber attacks. We have been and will continue to be proactive in developing comprehensive policy, guidance, and tools to mitigate these impacts, with a focus on robust infrastructure, sound land management policies, and increased energy resilience.

Building Installation and Range Resiliency

To ensure that our installations are prepared to support the defense of this nation, the Department takes a broad, systemic approach that considers threats to both built and natural infrastructure. Not only must we ensure that facilities themselves are resilient in the face of a range of threats, but we must also ensure that the surrounding land, water, and airspace can support mission-essential activities.

Facilities

Regarding the built environment, the Department pursues resilience through application of its building codes in both installation planning, and design and construction of individual facilities. The Department updates these building codes, collectively known as Unified Facilities Criteria and Unified Facilities Guide Specifications, on a regular basis to reflect revised industry and federal standards. As building technologies improve and data from natural disasters increases over time, these standards become more stringent towards protecting life and property in these types of events. Examples of this include criteria for civil engineering related to flood mitigation and structural engineering related to earthquake resilience—both of which the Department has updated in the last year. In the case of earthquake codes, the Department's structural criteria actually surpass the national codes in several areas, and even exceed those of California in a couple of areas (hospital retrofits and long-span structures such as aircraft hangars).

Beyond the use of current industry standards, the Department is pursuing other initiatives to improve the resilience of its built environment. These include the following:

- The Department is incorporating analysis of climate-related risks specific to an installation into the master plan for that installation, to better guide development and facility design.
- As reported by the Government Accountability Office, the Department is moving towards incorporating forward-looking projections of climate-related data into its planning and design criteria, starting with projections of sea level change for coastal installations that will increase areas of inundation and expand floodplains at many locations. We are also

pursuing the development of a tool to identify additional sources of forward-looking climate-related data projections that will impact other aspects of installation planning and building design ranging from floodplain mapping to heating and cooling requirements.

- The Air Force recently completed a comprehensive analysis of severe weather events and their impact on built infrastructure that will further inform additional refinements in our criteria to improve resilience of future projects.
- The Army Corps of Engineers is testing a screening tool developed in-house to efficiently identify buildings at extremely-high risk in an earthquake event. This tool would sharply reduce the time and resources needed for such assessments compared with conventional methods.

Environmental Conservation and Compatible Development

The Department's lands and waters are vital to readiness. As training, testing, and operational requirements expand and new weapons systems are introduced, access and use of ranges becomes increasingly important. However, they also support a diverse array of fish and wildlife species, including nearly 500 that are federally protected under the Endangered Species Act, and over 550 that are at risk of needing listing protection. Managing for healthy and resilient natural landscapes, such as reducing fire risks, avoiding wildlife conflicts, removing invasive species, and improving range and training areas, provides the conditions necessary for mission-essential activities.

The Department continues to invest its Conservation funds to maximize our flexibility to use lands for military purposes and to address incompatible land uses beyond our fence lines. We are also developing policy providing governance within and across DoD, coordinating with other federal agencies, and interfacing with state and local governments and developers to counteract ever-increasing encroachment and promote compatible development to preserve mission capabilities.

To assist installations in developing plans to manage the evolving natural resources challenges, the DoD worked with the National Wildlife Federation to develop planning guidance – "Climate Adaptation for DoD Natural Resource Managers." The guide, published in June 2019, provides an overview of how a changing climate may affect military lands and other resources, and outlines a process to incorporate adaptation strategies into Integrated Natural Resource Management Plans (INRMP). The approach outlined in the guide can be used by installations to help improve land and natural resource resilience.

Two key programs that facilitate these sustainment efforts are the Readiness and Environmental Protection Integration Program (REPI) and the Military Aviation and Installation Assurance Siting Clearinghouse.

Readiness and Environmental Protection Integration Program (REPI) – The REPI program preserves test, training, and operational capabilities that enable readiness, strengthens strategic partnerships, and supports test, training, and operational capability. The REPI program stimulates innovative and diverse partnerships between local communities and military installations that increase collaboration and promote installation resilience. Partnership

agreements provide installation commanders, trainers, testers, and operators with increased mission flexibility by preventing, mitigating, or removing restrictions that can result from nearby incompatible development. In the last 16 years, REPI partnerships have protected more than 586,000 acres of land around 106 installations in 33 states.

In FY 2019, the Department was provided expanded authority under 10 U.S.C. 2684a to specifically address military installation resilience as a key element of the REPI program. This authority further enhances the REPI program's ability to engage in collaborative land protection and natural resource management activities to help installations avoid, prepare for, minimize the effect of, adapt to, and recover from extreme weather events, or from anticipated or unanticipated changes in environmental conditions.

This includes opportunities to maintain and improve "natural infrastructure," implementing solutions outside installation boundaries to enhance the benefits provided by natural systems. Natural infrastructure solutions encompasses a wide range of possible actions that can help promote installation resilience and preserve access to critical installation and range assets and capabilities. For example: restoring historical hydrology (e.g., wetlands and coastal marshes) can help prevent flooding impacts on coastal infrastructure; reestablishing oyster reefs and restoring shoreline and dune vegetation can help minimize impacts of storm surge on low-lying installations; restoring high-value habitat can enhance wildlife corridors for threatened, endangered, or at-risk species and avoid or mitigate regulatory restrictions on training, testing, and operations; and removing vegetation and managing fuel loads can minimize wildfire risk to infrastructure, personnel, and operations.

Military Aviation and Installation Assurance Siting Clearinghouse – Energy and energy-related projects, such as wind farms and transmission lines, present a major encroachment concern for DoD. In January 2011, Congress directed establishment of the Clearinghouse, focusing DoD's official engagement within the Federal Aviation Administration (FAA) Obstruction Evaluation Airport and Airspace Analysis (OE/AAA) program and setting clear guidelines for DoD's review and response to energy project proposals. Recently, the Clearinghouse also assumed the role of coordinating offshore energy and energy-related programs, helping ensure consistency both within the Department and in DoD's engagements with external entities.

The Clearinghouse supports the Department's efforts to create resilient installations and ranges, protecting operating areas and missions that directly support National Defense Strategy objectives and efforts to build a more lethal force. Through the Clearinghouse the Department develops and articulates its position on proposed energy projects, determining whether or not they are compatible with training, testing and operations. In addition to coordinating with the FAA, the Clearinghouse responds to inquiries from federal agencies, state governments, tribal governments, energy developers and others seeking a DoD mission compatibility assessment. By working closely with the Military Departments, Joint Staff and other DoD components, the Clearinghouse has successfully avoided unacceptable risks to missions and national security. This builds upon the department's successes on land by ensuring all stakeholders are engaged in the process to preserve and enhance our offshore ranges and operating areas.

In FY 2019, the Clearinghouse coordinated reviews for over 5,000 energy projects, including over 750 wind farms. Wind energy development continues to be a concern for training, testing, and operations as wind turbines often exceed 500 feet in height and have the potential to adversely affect low-level training routes, air traffic control and weather radars, as well as military-unique radars across the country. In coordination with the Military Departments the Clearinghouse reviews each project to identify adverse impacts, and when necessary, engages with developers to seek mitigation strategies.

Because FAA determinations on energy projects are advisory in nature, developers may be able to construct projects even when DoD voices concern over risks to national security. As such, the Clearinghouse seeks state-level protections in areas with a large military footprint and high potential for wind energy development. Recently, Oklahoma enacted legislation that requires a mission compatibility review from the Clearinghouse for wind projects proposed within low-level military training routes. Oklahoma officials halted the construction of the wind energy project and protected the military training route for future use. While most wind energy developers are good partners and supportive of DoD missions, the Oklahoma example underscored the need for state-level support. The Clearinghouse will continue these outreach efforts to support and enhance resiliency.

Climate and Extreme Weather

The effects of a changing climate are a national security issue with potential impacts to the Department's built and natural infrastructure, as well as missions and operational plans. In January 2019, the Department submitted a Report to Congress on Effects of a Changing Climate to the Department of Defense. This report represented a high-level assessment of the vulnerability of DoD installations (based on operational roles) to five climate/weather impacts: recurrent flooding, drought, desertification, wildfires, and thawing permafrost. The report also provided an overview of efforts to increase installation resiliency.

The Department incorporates climate resilience as a cross-cutting consideration for our planning and decision-making processes, and not as a separate program or specific set of actions. Specifically, the Department considers resilience in the installation planning and basing processes. This includes consideration of environmental vulnerabilities in installation master planning, management of natural resources, design and construction standards, utility systems and service, as well as emergency management operations.

From a policy perspective, the Department has published several issuances to ensure the Services and Joint Staff integrate climate scenarios into planning. DoD Directive 4715.21, Climate Change Adaption and Resilience, assigns responsibilities to components to incorporate climate considerations into planning for infrastructure and operations. DoD Instruction 4715.03, Natural Resources Conservation Program, requires consideration of climate impacts during development of Installations Natural Resources Management Plans. In 2017, the Department updated DoDI 6055.17, DoD Emergency Management Program, to ensure the consideration of an all hazards approach to manage risks, including weather and climate related impacts on military installations.

It is important that our installations be resilient to a wide-range of vulnerabilities, including climate factors such as changing sea level, coastal and riverine flooding, drought, desertification, wildfires, thawing permafrost, select historic extreme weather events, and reduced aviation lift capacity due to air quality. The Department is deploying a number of tools to assist the DoD Components and installations in planning for these vulnerabilities:

- The Coastal Assessment Regional Scenario Database provides regionalized sea level scenarios for three future time horizons (2035, 2065, and 2100) for 1,774 DoD sites worldwide. The Database also contains extreme water levels statistics (storm surge without waves and wave run up) for annual exceedance probabilities (1, 2, 5 and 20 percent) based on historical tide gauge data. This information can be used to establish base flood elevation and potential future flood inundation areas of concern for installations in coastal and tidal areas.
- To provide assistance in conducting consistent analysis of risks based on prevailing scientific analysis, my office has funded U.S. Army Corps of Engineers (USACE) to build on the climate exposure tool originally developed for the Army to evaluate its installations. The DoD Climate Assessment Tool (Tool) will be expanded to include select historic extreme weather events and effects on aviation lift capacity. We have also funded USACE to apply the Tool to selected sites in the United States and overseas – 50 in the United States and 10 overseas for each Military Department. USACE will produce a summary report for each Military Department and a report for each site. The reports will include background information on the climate factors, the methods used in the assessment, preliminary results, and examples of resilience measures for consideration at specific installations. All work is scheduled to be completed by September 2020.

Research

DoD's Strategic Environmental Research and Develop Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) invest in research focused on improving DoD understanding of environmental risks to installations and mission. SERDP and ESTCP investments support the development of the science, technologies, and methods needed to manage and enhance the resilience of DoD installation infrastructure with the goal of maximizing mission readiness. The following are a few examples of SERDP research efforts related to infrastructure and mission resiliency:

- In response to drought risk, SERDP initiated a study to understand and assess environmental vulnerabilities on installations in the desert southwest. This research seeks to detect and assess drought response of sensitive riparian forests to drought stress over recent decades and will be carried out within three DoD bases in the Southwest, with widely applicable results.
- In response to wildfire risk, SERDP developed a Fire Science Strategy in 2014 focused on the following: improved characterization, monitoring, modeling, and mapping of fuels to support enhanced smoke management and fire planning at DoD installations; enhanced smoke management using advanced monitoring and modeling approaches; and research to quantify, model, and monitor post-fire effects.

- SERDP and ESTCP investments seek to understand changes to the Arctic terrestrial environment relevant to DoD infrastructure. Permafrost degradation can impact soil, vegetation, buildings, roads, and airfields. SERDP and ESTCP investments are leading to tools for making Arctic infrastructure more "aware" of permafrost changes before costly failures occur. An example is Lawrence Berkeley National Laboratory's fiber-optic geophysical sensing package capable of providing real-time information on subsurface conditions relevant to infrastructure performance and failure in Arctic environments.

Water Vulnerability

The Department must take adequate measures to plan, prepare, and provided for an adequate water supply to meet mission needs. Increasing demand for water places stress on the same finite supplies of water that DoD installations depend on to fulfill their missions. In addition, the effects of a changing climate, along with near-term weather variability, may exacerbate water shortages and makes the management of water resources in the future more challenging. DoD must have a thorough understanding of its current and future water needs for each military installation. It is imperative that DoD plan and manage its water resources to ensure the sustainment of our mission and enhance our water security.

It is the policy of the DoD that each installation and range:

- Preserve its water rights under Federal and State law as is necessary to support the mission requirements; and
- Identify, as needed, additional water quantities required to meet reasonably foreseeable mission requirements and water resources that may be available to fulfill the requirements.

To be prepared for water vulnerabilities, including water shortages, the Military Departments must ensure that installations have programs and procedures to document access to water/water sources, to resolve conflicts, and to prioritize water usage during periods of scarcity.

Department of Defense Energy Programs

Energy is an essential enabler of military capability and the Department depends on energy-resilient forces and installations to achieve its mission. In FY 2018, the Department spent $3.4 billion on energy to power over 585,000 facilities and 160,000 non-tactical vehicles at over 500 worldwide military installations. Additionally, the Department consumed over 85 million barrels of fuel to power ships, aircraft, combat vehicles, and contingency bases at a cost of nearly $9.2 billion.

As described in the National Defense Strategy, the Nation's critical infrastructure, particularly energy assets, is being targeted by a range of adversaries. Recent events at Tyndall AFB, Offutt AFB, and Camp Lejeune also are sober reminders of the catastrophic effects that weather can have on the Department's missions. To address all hazards, both man-made and climate related,

my office has worked proactively to lay the policy groundwork needed to ensure that energy resilience and cybersecurity are integrated across our full portfolio of appropriated and third-party financed programs.

These efforts described below are part of a broader "energy resilience roadmap" to ensure that our forces remain ready both now and in the future. These initiatives are supported by our Components and bolstered by key legislative requirements passed by Congress over the past several years. The Department appreciates the support received from this committee, and recognizes that your contributions have been invaluable in helping the Department strengthen its energy posture in support of mission readiness.

Energy Resilience Policies, Programs, and Tools

As defined in Section 101 of Title 10, energy resilience is the "ability to avoid, prepare for, minimize, adapt to, and recover from anticipated and unanticipated energy disruptions in order to ensure energy availability and reliability sufficient to provide for mission assurance and readiness, including mission essential operations related to readiness, and to execute or rapidly reestablish mission essential requirements."

The Department utilizes a portfolio of appropriated and third party financed programs to pursue energy resilience. These programs are governed by key instructions and policies to ensure warfighter requirements are addressed holistically and in a prioritized and cost effective manner.

Policies and Programs

Department of Defense Instruction 4170.11, Installation Energy Management – This formal policy provides guidance, assigns responsibilities, and prescribes procedures for all DoD installation energy management activities to include energy resilience requirements. It is currently being rewritten to further strengthen the role of installation energy plans and the inclusion of energy resilience and cybersecurity provisions.

Installation Energy Plans – Through the Installation Energy Planning (IEP) process, military installations are tasked with identifying mission critical loads, assessing energy resilience and cybersecurity gaps, and developing scalable and cost effective solutions to close those gaps. The Services have begun to submit IEPs for priority mission installations and will submit plans for top energy consuming installations by the end of FY20. All remaining installations will be required to complete IEPs by the end of FY21. To guide the IEPs, the Military Services have developed portfolio-level tools such as the Air Force's Mission Thread Analysis and the Navy's Energy Security Assessment tool to identify and prioritize gaps and investments. The Army also is leveraging OSD-provided tools to help prioritize investments.

Energy Resilience and Conservation Investment Program (ERCIP) – ERCIP is a subset of the Defense-Wide Military Construction Program, specifically intended to fund projects that improve energy resilience, contribute to mission assurance, save energy, and reduce DoD's energy costs. ERCIP accomplishes these goals through construction of new, high-efficiency energy systems or through modernizing existing energy systems. For example, at Beale AFB,

ERCIP funding will construct an electrical substation to provide a secondary source of power to the Global Hawk mission. At Anniston Army Depot, ERCIP funding will establish on-site generation and grid controls to assure critical production and maintenance of combat vehicles during extended grid outages.

Energy Savings Performance Contracts (ESPC)/Utility Energy Savings Contracts (UESC) – ESPCs and UESCs continue to be important tools for financing resilient and efficient energy solutions. In November 2018, the Department updated ESPC/UESC policy to include resilience and cybersecurity requirements, better align these programs with the IEP process, and add post-award management requirements to maximize the full operational value from each project. For example, an ESPC at MCRD Parris Island enhances readiness through the installation of a 3.5 megawatt combined heat and power plant, 6.7 megawatts of solar photovoltaic panels with integrated energy storage, and a microgrid control system. These and other equipment upgrades will reduce energy consumption by 88% and water consumption by 25%. The Air Force is implementing a $262 million ESPC at Tinker AFB to modernize 50 buildings with energy conservation measures expected to increase energy efficiency, reliability, and resiliency, and support critical industrial processes at the depot.

Other Alternative Financing Authorities – The Department continues to leverage other alternative financing authorities to implement energy resilience and cybersecurity. These include power purchase agreements, enhanced use leases, and utilities privatization, when supported by the business case and/or IEP. For example, at Schofield Barracks in Hawaii, the Department is utilizing an enhanced use lease to gain access to a 50MW multi-fuel power generation plant that provides black-start capability for three critical Army installations during disruptions to the grid. Utilities privatization at Hill AFB also is improving the reliability of the energy distribution infrastructure needed to support critical missions at the Ogden Air Logistics Center and the 388th Fighter Wing (F-35). To accelerate the use of alternative financing mechanisms for energy resilience, DoD recently completed a review of best practices from the commercial finance industry and lenders. Based on stakeholder input across government and industry, the recommendations from the *Defense Energy Resilience Bank* study will inform how the Department achieves energy resilience through alternative finance.

Micro-reactor Demonstration – As directed in the FY 2019 National Defense Authorization Act, the Department of Defense will demonstrate a commercially developed, Nuclear Regulatory Commission (NRC) licensed, very Small Modular Reactor (vSMR) to power critical loads at a permanent domestic military installation by December 2027. Industry is making steady progress in developing advanced micro-reactors with the potential to enhance installation resilience through assured access to power in support of critical missions and remote operations. The Department will use the proposed demonstration to assess the energy resilience capability and the cost effectiveness of vSMR technology.

Exercises and Tools

To facilitate the implementation of energy resilience policy, the Department is utilizing exercises and analysis tools to continually improve our approach.

Energy Resilience Readiness Exercises (ERRE) – In accordance with U.S. Code Title 10 Section 2911 and DoD instruction 4170.11, the Department is performing ERREs to evaluate energy resilience risks to readiness while completely separated from the commercial electric grid. ERREs identify critical energy vulnerabilities and interdependencies that could degrade critical missions, assess latent risks in an installations energy resilience posture, and inform the development of appropriate mitigations. The Department has facilitated the planning and execution of exercises at Fort Stewart, Fort Greely and Fort Bragg. Looking ahead, the Department will complete three more ERREs at Hanscom AFB, Vandenberg AFB, and MCAS Miramar in FY20, and the Services are planning and budgeting to conduct future ERREs at priority installations. Based on best practices and lessons learned, my office will issue policy and guidance in the near future with the goal of enabling the Services to independently and routinely perform their own ERREs.

Energy Resilience Analysis Tool (ERAT) – To enable the identification and development of critical energy requirements, models, and metrics, my office commissioned the Massachusetts Institute of Technology Lincoln Laboratory (MIT-LL) to create the Energy Resilience Analysis Tool (ERAT). Fielded in the latter part of 2018, ERAT helps Military Components develop scalable and cost effective energy projects by providing a range of resilient alternatives based on technical and cost factors to address critical loads. Due in part to the transparency of this analysis, the use of ERAT is now required for ERCIP project submissions starting in FY22.

Cyber Secure Facilities

Given the importance of energy resilient facilities as nodes for projecting and sustaining power, the Department is reducing the cyber risks to facility related control systems (FRCS). Building on the July 2018 Deputy Secretary of Defense memorandum, *Enhancing Cybersecurity Risk Management for Control Systems (CS) Supporting DoD Owned Defense Critical Infrastructure*, my office has integrated the cyber security of industrial control systems into energy policies and guidance.

FRCS Cyber Security Plans – To build a FRCS defense posture, Components are refining cybersecurity plans to account for the capabilities and resources required to implement controls on highest priority assets, systems, and supporting systems. As a complement to overall installation energy plans, Components will update FRCS cybersecurity plans by April 2020.

Aligning Resources to Requirements – My office also is developing the framework for identifying the required resources for inventorying, assessing, mitigating, and sustaining FRCS Programs, and then arraying these requirements against component resources. Including staff training and the funding for "cyber hygiene," the FRCS budget exhibit will not only confirm what is needed to ensure the cyber security of control systems, but also enable appropriate oversight and governance during program and budget reviews.

Cybersecurity in ESPCs, UESCs, and Utilities Privatization – My office is taking the lead in issuing internal policy and governance for DoD Services and Components as well as requiring a cybersecure posture from partners. The Department is developing internal requirements for 'inside the fence' as well as requirements for external partners 'outside the fence' to be cyber-

secure and cyber-resilient. For example, military installations are including cyber security considerations in the development of their installation energy plans, and FRCS considerations are now required for utility privatization agreements, ESPCs, and UESCs.

We will continue to work with the Department's Chief Information Officer and Principal Cyber Advisor toward solutions and resources ensuring FRCS are defensible, survivable, and resilient to operate and sustain critical functions in a cyber-contested environment.

Conclusion

Thank you for the opportunity to testify on the Department's efforts to build resilient installations. Your continued support of Department of Defense's mission and for our military members and their families is appreciated.