

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK



**Department of Defense Budget
Fiscal Year (FY) 2024**

March 2023

The estimated cost of this report or study for the Department of Defense is approximately \$31,000 for the 2023 Fiscal Year. This includes \$80 in expenses and \$31,000 in DoD labor.
Generated on 2023Mar10 RefID: 6-B2B1FBF

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OVERVIEW

Increasing temperatures, changing precipitation patterns, and more frequent, intense, and extreme weather conditions are impacting military readiness and imposing significant costs on the Department while exacerbating risk and creating new challenges to U.S. interests around the world. To train, fight, and win in this increasingly complex environment, the Department must consider the effects of climate change across the enterprise and invest accordingly. The FY 2024 President’s budget request prioritizes Departmental investments that enhance operational capability, mission resilience, and readiness.

The Department is committed to solutions that are mission essential, such as increasing platform efficiencies to mitigate logistics risk in contested environments, hardening critical infrastructure, and deploying new technologies that strengthen capability. The budget request reflects that commitment and includes \$5.1 billion in investments that will bolster U.S. security in the near-term and lay the groundwork for a more capable future force. Each Service and many Defense Agencies play an important role in achieving these goals, as shown in Table 1.

TABLE 1. Funding by Component

| | FY 2024 \$ in thousands |
|--------------------------------|-----------------------------------|
| Department of Army | 1,357,085 |
| Department of Navy | 1,476,838 |
| Department of Air Force | 942,322 |
| Defense-Wide | 1,355,366 |
| Total | 5,131,611 |

These investments ensure the Department can meet all mission requirements and maintain the ability to operate in all conditions. While each Service funds specific missions within their respective topline, the Department’s efforts are coordinated across the enterprise. These investments are organized into four lines of effort and identified funding is shown in Table 2:

- *Installation Resilience and Adaptation* – investments are focused on (1) adapting military facilities to withstand increasingly challenging conditions and deploying advanced technologies to strengthen the ability to rapidly recover from disruptions to public infrastructure; (2) improving installation energy, mission resilience, and water resilience; and (3) modernizing Department operations to keep pace with industry.

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- *Operational Energy* – includes investments to improve the energy efficiency of existing operational platforms and propulsion systems. Investments are aimed at gaining capability and reducing logistics supply requirements for deployed forces and include digital flight planning tools, programs to optimize turbine engine compressor performance, and aircraft drag reduction technologies.
- *Research, Development, Test, and Evaluation (RDT&E)* – includes investments in basic and applied research and technology prototyping to keep the U.S. military at the cutting edge. This includes investments to accelerate development of hybrid tactical vehicles to strengthen capability through extended range and persistence, silent watch, and the ability to support advanced weapons. Investments also support the prototyping of new platforms like blended wing body aircraft that have the potential to increase range and payload. RDT&E also includes investments in technologies like advanced energy storage and energy management systems.
- *Contingency Preparedness* – includes investments to incorporate climate risks into wargames, exercises, and other planning tools to ensure the Department understands impacts on missions and is prepared to respond. This includes black-start exercises to identify vulnerabilities and remediate risks to installation power systems. As extreme weather is increasing demand for DoD support, Contingency Preparedness investments also include work with allies and partners, support for Humanitarian Assistance and Disaster Relief (HADR), and Defense Support to Civil Authorities (DSCA) activities.

TABLE 2. Funding by Line of Effort

| | FY 2024 \$ in thousands |
|--|-----------------------------------|
| Installation Resilience and Adaptation | 3,655,502 |
| Operational Energy | 106,187 |
| Research, Development, Test, and Evaluation | 1,315,298 |
| Contingency Preparedness | 54,624 |
| Total | 5,131,611 |

The four lines of effort are subdivided into categories to appreciate the focus areas within each effort, as described in the table below:

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TABLE 3. Category Fund Types

| Climate Category Fund Types | |
|-----------------------------|---|
| M01-M03 | Military construction (including minor MILCON) |
| O01-O11 | Operation and Maintenance |
| E01-E05 | Operational Energy |
| R01-R12 | Research, Development, Test and Evaluation |

The following sections provide supporting details of the investments in each climate line of effort.

***Note:** Tabularized amounts in this exhibit may only represent the fraction of each program element and budget line item that contributes to mitigating climate risk, not the total program element or budget line item.*

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CLIMATE LINES OF EFFORT

I. INSTALLATION RESILIENCE AND ADAPTATION

Installation Resilience and Adaptation (\$3,655.5 million) investments are focused on (1) adapting military facilities to withstand increasingly challenging conditions and deploying advanced technologies to strengthen the ability to rapidly recover from disruptions to public infrastructure; (2) improving installation energy, mission resilience, and water resilience; and (3) modernizing Department operations to keep pace with industry. Details by funding category are as follows:

- **Energy storage, micro-grids, energy efficiency and renewable energy, power distribution systems (M01) (\$1,063.9 million)**

Description: Designated for energy storage, micro-grids, renewable energy and energy or water efficiency improvements, including investments in electric power distribution systems.

Funding Details:

The \$147.0 million for Army funds cost increases due to inflation for a substation building and a net-zero building pilot project on Ft. Bragg. This is one of several such pilot projects across the Military Departments to demonstrate building design elements to increase energy efficiency and facility resilience.

The \$105.0 million for Navy is for two net-zero building pilot projects, construction of a Child Development Center at Joint Expeditionary Base, Little Creek-Fort Story (\$35 million), and design for the F-35 depot maintenance facility (\$70 million) at Marine Corps Air Station Cherry Point.

The \$127.1M for the Marine Corps is for a Water Treatment Plant at Marine Base Quantico to meet main-side (domestic, industrial and fire protection) water demand, pressure, flow and storage requirements.

The \$50.5 million for Air Force supports a net-zero building pilot at Hanscom Air Force Base for a Child Development Center (CDC) and planning for a future project.

The \$634.3 million for the Energy Resilience and Conservation Investment Program (ERCIP) improves the energy resilience and energy and water efficiency at DoD installations. Through ERCIP, DoD is meeting statutory and readiness requirements for installation resilience. A focus of ERCIP is the construction of cyber-secure micro-grids, prioritized by mission requirements, and supported by high-efficiency energy systems to include clean energy technologies. ERCIP funding includes:

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- The \$548.0 million in ERCIP major construction to fund high-priority, energy/water projects that improve installation resilience and include on-site, clean energy production, battery storage, cyber secure micro grids, and improvements to grid capability.
- The \$86.3 million of ERCIP planning and design (P&D) funds planning, architectural, and engineering services required to prepare ERCIP projects for execution. As the Department increases its focus on constructing cyber-secure micro-grids, the scale, scope, and complexity of projects will increase, necessitating an increase in P&D funding.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|--|------------------|--|-----------------------|--|-----------------|-------------------------|
| Installation Resilience and Adaptation | M01 | Military Construction, Army | Major construction | Barracks (Facility Prototyping) | 0202096A | 85,000 |
| | | | | Substation | 0702896A | 50,000 |
| | | | Planning | Planning and Design | 0901211A | 12,000 |
| | | Military Construction, Navy and Marine Corps | Major construction | Child Development Center | 0816176N | 35,000 |
| | | | | Water Treatment Plant | 0202176M | 127,120 |
| | | | Planning | Planning and Design | 0901211N | 70,000 |
| | | Military Construction, Air Force | Major construction | Child Development Center | 0901211F | 37,000 |
| | | | Planning | Planning & Design | 0901211F | 13,500 |
| | | | Major construction | Energy Resilience and Conserv. Invest. Prog. | 0904903D | 548,000 |
| | | Military Construction, Defense-Wide | Planning | ERCIP Design | 0901211D | 86,250 |
| | | | | | | |
| | | Total | | | | 1,063,870 |

- **Infrastructure to support the deployment of non-tactical electric vehicles (M03) (\$24.0 million)**

Description: Investments required to support infrastructure requirements for the deployment of non-tactical electric vehicles.

Funding Details:

The \$22.0 million for Army funds the planning and construction of ZEV charging infrastructure on Army installations to accelerate progress towards fielding an all-electric non-tactical light-duty vehicle fleet by 2027.

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The \$2.0 million for Air Force funds planning and design to accelerate the conversion of the non-tactical vehicle fleet to electric vehicles and to construct the installation-level charging infrastructure requirements to support it, as well as improve the resilience of the existing infrastructure.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|--|------------------|----------------------------------|-----------------------|---|-----------------|-------------------------|
| Installation Resilience and Adaptation | M03 | Military Construction, Army | Minor construction | Minor Construction | 0901211A | 22,000 |
| | | Military Construction, Air Force | Minor construction | Unspecified Minor Military Construction | 0901211F | 2,000 |
| Total | | | | | | 24,000 |

- **Energy saving performance contracts or utility energy services contracts (O01) (\$654.5 million)**

Description: Investments required to unlock third-party financing for DoD energy improvements initiatives through energy savings performance contracts (ESPC) and utility energy service contracts (UESC).

Funding Details:

The \$175.3 million for Army, Army Reserve, and Army National Guard funds existing and projected Army performance contract payments to energy service companies for UESCs and ESPCs at Army installations. The Army is leveraging private sector expertise and financing to reduce consumption and improve resilience with reliable and efficient systems. If these projects had not been completed, commodity bills would be increased by at least the funded amount.

The \$205.4 million for Navy and Navy Reserve funds Navy performance contract payments to energy service companies for UESCs and ESPCs at Navy installations. The Navy's total portfolio for capital investments made under third party financing, including the FY 2024 budget request, is \$1.6 billion for 38 ESPCs and \$295 million for 43 UESCs. If these projects had not been completed, commodity bills would be increased by at least the funded amount.

The \$4.1 million for the Marine Corps supports the delivery of energy resilience and utilities infrastructure modernization projects in support of critical missions. Funding provided covers pre-award costs covering acquisition planning, preliminary assessment, and investment grade audit.

The \$264.1 million for Air Force funds existing and projected Air Force performance contract payments to energy service companies for UESCs and ESPCs at Air Force installations. By modernizing energy infrastructure, the Department of the Air

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Force (DAF) creates energy savings and adds resilience to its installations. If these projects had not been completed, commodity bills would be increased by at least the funded amount.

The \$5.6 million in Operations and Maintenance (O&M), Defense-Wide for UESCs and ESPCs is to accelerate the execution of performance contracts in support of climate and energy resilience, primarily through the deployment of energy conservation measures on existing buildings. These funds will expand DoD's capacity to execute performance contracts by adding dedicated staff and engineering capabilities.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|--|------------------|--|--|------------------------------------|-----------------|-------------------------|
| Installation Resilience and Adaptation | O01 | Operation and Maintenance, Army | Operating forces | Base Operations Support | 0202079A | 157,534 |
| | | Operation and Maintenance, Navy | Operating forces | Base Operating Support | 0703879N | 203,648 |
| | | Operation and Maintenance, Marine Corps | Operating forces | Base Operating Support | 0206479M | 4,113 |
| | | Operation and Maintenance, Air Force | Operating forces | Base Support | 0207479F | 264,100 |
| | | Operation and Maintenance, Army Reserve | Operating forces | Base Operations Support | 0532079A | 7,845 |
| | | Operation and Maintenance, Navy Reserve | Operating forces | Base Operating Support | 0703879N | 1,743 |
| | | Operation and Maintenance, Army National Guard | Operating forces | Base Operations Support | 0522079A | 9,899 |
| | | Operation and Maintenance, Defense-Wide | Administration and service-wide activities | Office of the Secretary of Defense | 0903399D8Z | 5,600 |
| Total | | | | | | 654,482 |

- **Renewable energy power purchases (O02) (\$93.4 million)**

Description: Management and procurement of renewable and clean energy.

Funding Details:

The \$35.7 million for Army funds Installation Energy Enterprise to support the development and execution of installation energy alternative financing contracts; energy efficiency projects; resilience projects; water conservation projects; energy program strategic initiatives and priority installation resilience initiatives.

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The \$3.0 million for the Navy funds planning for financed energy project development to enable increased technology solutions for improving the energy security posture on Navy installations.

The \$44.8 million for Air Force funds obligations under existing renewable energy power purchase contracts.

The \$9.9 million for Defense Logistics Agency (DLA) Energy includes \$8.3 million in Working Capital Fund, Defense-Wide and \$1.6 million in O&M, Defense-Wide funding. The funds will support renewable energy power purchases, including the Department's efforts to transition its current U.S. electricity portfolio to 24/7 CFE. Streamlining the management and procurement of the Department's electricity portfolio will enable the Department and its Government partners to leverage their collective buying power across the U.S. electricity markets.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|--|---|--|------------------------------------|---|-----------------|-------------------------|
| Installation Resilience and Adaptation | 002 | Operation and Maintenance, Army | Operating forces | Facilities Sustainment, Restoration & Modernization | 0202176A | 35,703 |
| | | Operation and Maintenance, Air Force | Operating forces | Base Support | 0207479F | 44,800 |
| | Operation and Maintenance, Navy | Operating forces | Base Operating Support | 0205079N | 3,000 | |
| | Operation and Maintenance, Defense-Wide | Administration and service-wide activities | Office of the Secretary of Defense | 0903399D8Z | 1,600 | |
| | Working Capital Fund, Defense-Wide | Energy Management - Defense | Energy Management - Def | 0708205S | 8,300 | |
| Total | | | | | | 93,403 |

- **Increase resilience and modernize infrastructure by deploying renewable energy, energy storage, or energy/water efficiency (O04) (\$601.2 million)**

Description: Deploy renewable energy, energy storage, and energy or water efficiency improvements to increase installation resilience and modernize infrastructure.

Funding Details:

The \$238.4 million for Army, Army Reserve and Army National Guard funds renewable energy, energy storage, and energy and water efficiency improvements to support installation resilience, mitigate supply chain vulnerabilities, and reduce

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installation greenhouse gas emissions. These investments also fund an Army Depot pilot that will explore ways to modernize industrial base activities using electric technology alternatives.

The \$181.5 million for Navy will fund an island power study on reliable and efficient power systems at Pacific-posture locations; analytics for clean energy procurement and third party financing; analytical tools to leverage metering data; and infrastructure upgrades to improve water efficiency and resilience.

The \$36.4 million for the Marine Corps will fund Marine Corps Facilities Restoration and Facilities Operations investments with a focus on projects to address cybersecurity and improve water and electrical systems including locations such as Marine Corps Air Station (MCAS) Cherry Point (North Carolina), Marine Corps Base (MCB) Hawaii, Marine Corps Mountain Warfare Training Center Bridgeport (California), Marine Corps Logistics Base (MCLB) Albany (Georgia), MCB Camp Lejeune (North Carolina), MCAS Beaufort (South Carolina), Marine Corps Recruiting Depot Parris Island (South Carolina), and MCB Camp Butler (Japan). These investments will improve efficiency and mission resilience and include:

- \$3.7 million to modernize energy and water infrastructure to support the operating forces, reduce dependence on external suppliers, increase on-site storage and generation assets, and minimize energy and water consumption.
- \$0.9 million for the Family of Mobile Power Systems to maintain program operational readiness for mobile power generation, storage, distribution systems and environmental control equipment to provide continuous, uninterrupted electrical power and climate control in austere environments. These capabilities reduce the Warfighter's energy logistics burden and enable dispersed units to operate longer between refueling iterations, decreasing exposure to supply line threats, increasing combat effectiveness, and saving lives.
- \$0.2 million for the Medium Tactical Vehicle Replacement (MTVR) program for the installation and sustainment of fuel-efficient modifications to the MTVR Program.

The \$132.1 million for Air Force enables increased energy and climate resilience through greater resource efficiency by adding renewable energy and battery energy storage systems, installing advanced metering, and increasing water resilience with measures like xeriscaping and gray water reuse.

The \$10.6 million for the Office of the Secretary of Defense (OSD) will provide the planning tools, analytic capabilities and coordination mechanism required to deploy advanced energy systems across the enterprise.

The \$2.2 million for Washington Headquarters Services (WHS) supports the Department's priority to protect the workforce while performing their national security mission. Funding supports space reconfiguration for tenant consolidation within spaces leased by WHS on behalf of other DoD agencies.

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| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|--|------------------|--|--|---|---|-------------------------|
| Installation Resilience and Adaptation | 004 | Operation and Maintenance, Army | Operating forces | Base Operations Support | 0202079A | 2,000 |
| | | | | Facilities Sustainment, Restoration & | 0202176A | 164,950 |
| | | Operation and Maintenance, Navy | Administration and service-wide activities | Planning, Engineering, and Program Support | 0708012N | 850 |
| | | | | | | 0708018N |
| | | | Operating forces | Base Operating Support | 0205079N | 9,924 |
| | | | | | | 0208535N |
| | | | | | 0208550N | 10,538 |
| | | | | | 0703879N | 4,683 |
| | | | | Combat Support Forces Sustainment, Restoration and | 0708012N | 2,000 |
| | | | | | | 0203176N |
| | | Operation and Maintenance, Marine Corps | | | | 0702776N |
| | | | | Operating forces | Base Operating Support | 0206479M |
| | | | | | | Field Logistics |
| | | | | | 0702808M | 201 |
| | | | | Sustainment, Restoration & Other Servicewide Activities | 0202176M | 31,560 |
| | | Operation and Maintenance, Air Force | Administration and service-wide | | 0905015F | 16,600 |
| | | | | Operating forces | Facilities Sustainment, Restoration & Modernization | 0202176F |
| | | | | | | |
| | | Operation and Maintenance, Army Reserve | Operating forces | Facilities Sustainment, Restoration & | 0502576A | 9,883 |
| | | Operation and Maintenance, Army National Guard | | | Facilities Sustainment, Restoration & | 0502276A |
| | | Operation and Maintenance, Defense-Wide | Operating forces | Office of the Secretary of Defense Washington Headquarters Services | 0903399D8Z | 10,600 |
| | | | | | Administration and service-wide | |
| | | | | | Total | 601,242 |

- Resilience improvements (O05) (\$553.6 million)**

Description: To increase resilience and maintain installation operations.

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Funding Details:

The \$217.1 million for Army, Army Reserve, and Army National Guard funds installation energy and utility restoration and modernization efforts that adapt systems to withstand climate hazards and maintain installation operations. This funding also supports development and execution of a review to plan and begin capital investments for a future power option at Fort Wainwright, Alaska and assess options for non-coal based power at Camp Grafton, Holston Army Ammunition, and Iowa Army Ammunition.

The \$210.9 million for Navy funds a variety of infrastructure upgrades designed to improve energy security and increase grid capacity at critical locations as well as facility investments to address degraded conditions at austere locations. Additionally, it funds expertise to support Navy's development, planning, design, and execution of future environmental resilience projects including shoreline stabilization and erosion mitigations.

The \$30.6 million funds Marine Corps' natural resources projects that support installation and training area resilience. This includes natural resources-based solutions to increase carbon sequestration while addressing erosion and sea level rise through riverine and coastal shoreline restoration; land and forest management and habitat conversion of non-forested land to forests to address severe storm events; habitat management and fuels reduction to decrease wildland fire; restore riparian and submerged aquatic vegetation enhancement/restoration; and soil management conservation to increase water retention.

The \$76.2 million for the DAF support planning, design and execution of environmental resilience projects to ensure installations and facilities are resilient and able to adapt to the impacts of extreme weather events, sea level rise, drought, recurrent flooding, extreme temperatures, and permafrost melt.

The \$10.0 million O&M, Defense-Wide funding for the Office of Local Defense Community Cooperation (OLDCC), an independent field activity under the Under Secretary of Defense (Acquisition & Sustainment). OLDCC maintains several program authorities that assist state and local governments with planning, design, and program implementation of projects that address challenges that could impair the operational utility of a military installation, range, military training route, special use airspace, or military operations areas. Technical and financial assistance is provided to state and local governments to assess the extent of threats, to create plans to mitigate threats, and to carry out those plans.

The \$8.7 million in O&M, Defense-Wide funding will support integration of climate and extreme weather impacts into installation master planning, with particular attention to extreme heat, ice storms, and wildfire. Enhancing installation master planning is necessary to enable installations to support the mission in changing climate conditions. This funding also supports development of policy, plans, and approaches to improve environmental resilience.

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| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands | |
|--|------------------|--|--|------------------------------------|---|---|---|
| Installation Resilience and Adaptation | O05 | Operation and Maintenance, Army | Operating forces | Base Operations Support | 0202079A | 69,554 | |
| | | | | | 0208853A | 64,558 | |
| | | | | | Facilities Sustainment, Restoration & Modernization | 0202176A | 19,115 |
| | | Operation and Maintenance, Navy | Operating forces | Base Operating Support | 0205079N | 35,000 | |
| | | | | | 0708053N | 4,015 | |
| | | | | | Sustainment, Restoration and Modernization | 0202578N | 17,030 |
| | | | | | 0203176N | 154,875 | |
| | | Operation and Maintenance, Marine Corps | Operating forces | Base Operating Support | 0206479M | 411 | |
| | | | | | 0208853M | 30,167 | |
| | | Operation and Maintenance, Air Force | Administration and service-wide activities | Other Servicewide Activities | 0905015F | 70,000 | |
| | | | | | | Facilities Sustainment, Restoration & Modernization | 0202176SF |
| | | Operation and Maintenance, Space Force | Operating forces | Base Operations Support | 0532079A | 8,740 | |
| | | | | | Operation and Maintenance, Army Reserve | Operating forces | 0538853A |
| | | | | | | | Facilities Sustainment, Restoration & Modernization |
| | | Operation and Maintenance, Army National Guard | Operating forces | Base Operations Support | 0522079A | 10,322 | |
| | | | | | 0528853A | 20,272 | |
| | | | | | Facilities Sustainment, Restoration & Modernization | 0502276A | 9,564 |
| | | Operation and Maintenance, Air National Guard | Operating forces | Mission Support Operations | 0509399F | 250 | |
| | | | | | Operation and Maintenance, Defense-Wide | Administration and service-wide activities | Office of the Local Defense Community Cooperation |
| | | | | Office of the Secretary of Defense | | | 0903399D8Z |
| Total | | | | | | 553,560 | |

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- **Deployment of non-tactical electric vehicles (O06) (\$299.4 million)**

Description: Planning, equipment installation and leasing to support non-tactical electric vehicles.

Funding across all accounts will support the planning and installation of Electric Vehicle Support Equipment (EVSE) and leasing non-tactical ZEV. This supports the Department's efforts to deploy a non-tactical ZEV fleet designed to modernize the non-tactical vehicle fleet and meet Administration goals.

- EVSE projects: New and replacement of EVSE stations (including project planning, design, coordination, and execution).
- ZEVs: Vehicle lease costs (including any associated surcharge).
- ZEV/EVSE initiatives: Deployment of telematics, engineering support, and conducting analysis to optimize vehicle location and usage.

The funding will accelerate modernization of the non-tactical fleet vehicle with offsets for lease incremental costs, managing the telematics program with engineering support, provide analysis to optimize vehicle location and usage, and train the workforce to maintain ZEVs.

Funding Details:

The \$6.7 million for Army supports planning and installation of EVSE, incremental costs for EV leases, and adding one additional full-time equivalent (FTE) for charging infrastructure planning.

The \$131.3 million for Navy supports the planning and installation of EVSE, to include required infrastructure upgrades, and leasing non-tactical ZEV.

The \$31.5 million for the Marine Corps supports the planning and installation of EVSE, to include required infrastructure upgrades, and leasing non-tactical ZEV.

The \$127.6 million for the DAF supports the planning and installation of EVSE, to include required infrastructure upgrades, and leasing non-tactical ZEV.

The \$2.2 million for OSD will provide for the planning and oversight necessary to coordinate the deployment of non-tactical electric vehicles. This funding focuses on the reinforcement of the electric grid to support the required infusion of ZEV charging infrastructure to meet the requirements to deploy ZEVs over the next five years.

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| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|--|------------------|---|--|--|-----------------|-------------------------|
| Installation Resilience and Adaptation | O06 | Operation and Maintenance, Army | Operating forces | Base Operations Support | 0208542A | 6,753 |
| | | Operation and Maintenance, Navy | Operating forces | Base Operating Support | 0205079N | 500 |
| | | | | | 0708542N | 11,773 |
| | | | | | Restoration and | 0203176N |
| | | Operation and Maintenance, Marine Corps | Operating forces | Base Operating Support | 0708542M | 1,502 |
| | | | | Sustainment, Restoration & Modernization | | |
| | | | | | 0202176M | 30,000 |
| | | Operation and Maintenance, Air Force | Operating forces | Base Support | 0208542F | 7,633 |
| | | | | | 0901279F | 120,000 |
| | | Operation and Maintenance, Defense-Wide | Administration and service-wide activities | Office of the Secretary of Defense | | |
| | | | | | 0903399D8Z | 2,200 |
| | | | | | Total | 299,361 |

- **Impact planning; installation master plans / energy plans (O07) (\$245.6 million)**

Description: Planning to address climate and extreme weather impacts, including updates to installation master plans and installation energy plans.

Funding Details:

The \$98.7 million for Army, Army Reserve and Army National Guard funds engineering and planning services at installations to update current master plans, energy plans, and climate plans to increase installation resilience against threats including extreme weather events.

The \$32.0 million for Navy enables the revision of installation master plans to incorporate impacts from climate change and execute assessments to identify energy savings opportunities at installations. Efforts will inform and enable the development, planning, design, and execution of future projects to make installations more resilient.

The \$24.8 million for the Marine Corps will support alignment with Congressional legislation, DoD strategic direction, and Fleet Marine Force requirements targeting climate, energy resilience, and Force Design. Primary objectives target enhancing

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the energy security posture of Marine Corps installations, leveraging third-party financing contracts, and accelerating advanced micro-grid deployment.

The \$5.0 million for Air Force supports analysis of climate impacts on installations and missions, critical to ensuring installation plans effectively address such threats. Funding will also assist in the implementation of installation climate resilience plans that are incorporated into installation energy plans.

The \$85.0 million dollars for OSD funding will be used to support and expand the Department’s Readiness and Environmental Protection Integration (REPI) program. The REPI program, executed in partnership with local communities, funds off-base natural infrastructure projects to address key installation risks. These nature-based solutions are focused on promoting installation resilience, preserving access to critical installation and range assets and capabilities, and enhancing DoD’s core training, testing and operational missions. Examples include constructing living shorelines, restoring dunes and wetlands, recharging aquifers and installing storm-water drainage basins, removing hazardous fuels, and conducting prescribed burns. The REPI program will also invest in expanding installation resilience opportunities by building capacity across key areas of strategic importance, including the Indo-Pacific region, to further increase installation and partnership capacity.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|--|------------------|--|---------------------------------|------------------------------------|-----------------|-------------------------|
| Installation Resilience and Adaptation | 007 | Operation and Maintenance, Army | Operating forces | Base Operations Support | 0202079A | 53,976 |
| | | Operation and Maintenance, Navy | Operating forces | Base Operating Support | 0204079N | 1,737 |
| | | | | | 0205079N | 1,043 |
| | | | | | 0206079N | 28,100 |
| | | | | Ship Operations Support & Training | 0202056N | 1,100 |
| | | Operation and Maintenance, Marine Corps | Operating forces | Base Operating Support | 0206479M | 24,800 |
| | | Operation and Maintenance, Air Force | Administration and service-wide | Other Servicewide Activities | 0905015F | 5,000 |
| | | Operation and Maintenance, Army Reserve | Operating forces | Base Operations Support | 0532079A | 12,172 |
| | | Operation and Maintenance, Army National Guard | Operating forces | Base Operations Support | 0522079A | 32,641 |
| | | Operation and Maintenance, Defense-Wide | Administration and service-wide | Office of the Secretary of Defense | 0903399D8Z | 85,000 |
| Total | | | | | 245,569 | |

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- **Personnel to support climate change mitigation or adaptation (O09) (\$40.6 million)**

Description: Personnel to support the Department's capabilities to conduct climate mitigation and adaptation.

Funding Details:

The \$5.3 million for Army and Army National Guard funds current staff and additional civilians to increase climate change expertise related to infrastructure planning, energy, and environmental resilience projects. This funding also provides for regional climate expertise for combatant commands and expands the Army National Guard state partnership program.

The \$14.2 million for Navy provides manpower to increase energy efficiency expertise within the Navy's energy offices. This also includes funding to optimize energy and utilities usage and performance, including energy audits, retro-commissioning, and studies.

The \$0.5 million for the Marine Corps will provide manpower to support resident expertise and advisory capability across energy generation, storage, and distribution capability for expeditionary operations. The additional manpower will allow generation of energy efficiency system capabilities that are compatible with Marine Corps concepts and systems, and compliant with energy and climate goals.

The \$3.0 million for Department of the Air Force provides personnel to support resilience, including planning, evaluating and executing energy resilience, climate-resilience, and carbon-free energy projects based on Executive Orders and law. These positions will support the central management of initiatives to enable climate resilience and the planning and implementation of new technologies in support of Department objectives. The funding includes military pay for the Air National Guard and civilian personnel spread amongst U.S. Strategic Command, U.S. Northern Command, U.S. Central Command, U.S. Transportation Command and U.S. Space Command.

The \$10.0 million for OSD is for Defense Operational Resilience International Cooperation (DORIC) pilot program to support engagement with military forces of partner countries on defense-related environmental and operational energy issues in support of the theater campaign plans of the geographic combatant commands.

The \$4.0 million for OSD is for Regional Climate Expertise at Combatant Commands to increase understanding of the climate impacts on DoD operations, missions, activities, and partnerships outside the homeland. These positions will develop relationships with key defense allies and partners, build the security cooperation priorities in the climate resilience domain, and execute the DORIC program.

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK

The \$3.3 million in O&M, Defense-Wide funding will add personnel to accelerate the Department's capabilities to conduct climate mitigation and adaptation.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands | |
|--|------------------|--|--|--|--|-------------------------|--------|
| Installation Resilience and Adaptation | O09 | National Guard Personnel, Army | Reserve Component Training and Support | - | 0509399A | 750 | |
| | | | National Guard Personnel, Air Force | Reserve Component Training and Support | - | 0888888F | 750 |
| | | Operation and Maintenance, Army | | Administration and service-wide activities | Administration Base Operations Support | 0902398A | 1,656 |
| | | | Operating forces | 0208542A | | 127 | |
| | | | | Force Readiness Operations Support | 0202218A | 300 | |
| | | | | US Africa Command | 0201990A | 750 | |
| | | | | US European Command | 0201390A | 750 | |
| | | | | US Southern Command | 0201590A | 750 | |
| | | Operation and Maintenance, Navy | Administration and service-wide activities | Administration Base Operating Support | 0902398N | 7,551 | |
| | | | Operating forces | | 0205079N | 4,941 | |
| | | | | 0206079N | 985 | | |
| | | Operation and Maintenance, Marine | | Combatant Commanders Core Operations | 0201490N | 750 | |
| | | | Operation and Maintenance, Air Force | Operating forces | Operational Forces | 0208015M | 500 |
| | | | | Mobilization | Airlift Operations | 0408020F | 250 |
| | | | | Operating forces | US CENTCOM | 0201690F | 750 |
| | | | | | US NORTHCOM/NORAD | 0201890F | 750 |
| | | | | | US STRATCOM | 0101890F | 250 |
| | | | | | USSPACECOM | 1202190F | 250 |
| | | Operation and Maintenance, Army National Guard | | Administration and service-wide activities | Administration Office of the Secretary of Defense | 0509399A | 250 |
| | | | Operation and Maintenance, Defense-Wide | Administration and service-wide activities | | 0903137D8Z | 10,000 |
| | | | | | 0903399D8Z | 3,336 | |
| | | | | | 0907388D8Z | 4,000 | |
| | | | | | Special Operations Command Management/Operational Headquarters | 1150498BB | 250 |
| | | Total | | | | | |

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK

- **Renewable energy or energy storage systems (E03) (\$17.7 million)**

Description: Renewable energy or energy storage systems.

Funding Details:

The \$0.2 million for Army funds training and manpower requirements for future potential installation energy management activities.

The \$17.5 million for Air Force will enable grid security of building control systems connected to renewable generation and energy storage systems, enabling advanced systems to be paired with renewable and energy storage systems across the DAF.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|--|------------------|--------------------------------------|-------------------------|----------------------------|-----------------|-------------------------|
| Installation Resilience and Adaptation | E03 | Operation and Maintenance, Army | Operating forces | Echelons Above Brigade | 0202156A | 100 |
| | | | Training and Recruiting | Specialized Skill Training | 0804731A | 107 |
| | | Operation and Maintenance, Air Force | Operating forces | Cyberspace Activities | 0207572F | 17,509 |
| | | | | | Total | 17,716 |

- **Energy management or measurement software and systems (E04) (\$61.7 million)**

Description: Improve energy management, data availability, and decision support capabilities; improve capacity, capability and efficiency of measurement software and systems.

Funding Details:

The \$52.0 million for Army, Army Reserve, and Army National Guard funds data-driven system management and decision support across energy systems to improve reliability and efficiency. This includes upgrades to facility related control systems, building control systems, and utility monitoring and control systems, as well as efficient and smart grid metering. RDT&E functional costs include systems engineering, systems analysis, and software engineering.

The \$9.6 million Navy investment to develop higher efficiency Gallium Nitride (GaN) High Power Amplifiers (HPA). GaN HPAs are used in maritime advanced technology radar and surface electronic warfare systems. For radar and electronic warfare systems, this will yield technology to incorporate and integrate in radar and electronic warfare Transmit/Receive

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK

Module designs, with a beneficial impact of improved Power Added Efficiency (PAE) for radar systems that result in a reduction in power draw from ship's service electrical power while providing radar and electronic warfare system performance. Funding for Global Energy Information System (GENISYS) fielding and sustainment to support the Navy's digital transformation, enable distributed maritime operations and fulfill the Navy's operational energy management system requirement. Funding supports GENISYS transition out of the Research and Development phase, including shipboard installations, user training events, critical/routine maintenance requirements (e.g., cybersecurity), and periodic updates. Additionally, Navy is funding studies supporting water security efforts to collect and assess water infrastructure data and conduct a water-harvesting pilot.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|--|------------------|--|--|---|-----------------|-------------------------|
| Installation Resilience and Adaptation | E04 | Operation and Maintenance, Army | Operating forces | Facilities Sustainment, Restoration & Modernization | 0202176A | 40,549 |
| | | Operation and Maintenance, Navy | Administration and service-wide activities | Planning, Engineering, and Program Support | 0708018N | 7,304 |
| | | | Operating forces | Ship Depot Operations Support | 0708020N | 2,322 |
| | | Operation and Maintenance, Army Reserve | Operating forces | Facilities Sustainment, Restoration & Modernization | 0502576A | 3,838 |
| | | Operation and Maintenance, Army National Guard | Operating forces | Facilities Sustainment, Restoration & Modernization | 0502276A | 7,640 |
| | Total | | | | | 61,653 |

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK

II. OPERATIONAL ENERGY

Operational Energy (\$106.2 million) includes investments to improve the energy efficiency of existing operational platforms and propulsion systems. Investments are aimed at gaining capability and reducing logistics supply requirements for deployed forces and include digital flight planning tools, programs to optimize turbine engine compressor performance, aircraft drag reduction technologies and hybrid propulsion. Details by funding category are as follows:

- **Energy efficiency gains, existing platform (vehicles, ships and airplanes) (E01) (\$70.5 million)**

Description: Operational energy efficiency improvements to existing platforms, including tactical vehicles, ships and airplanes.

Funding Details:

The \$5.5 million for Navy funds modernizations for Littoral Combat Ship (LCS) propulsion systems and research and development efforts for the Navy's Main Propulsion Systems Subproject. This funding will support the test and evaluation of various gas turbine fuel efficiency concepts and identify energy capability improvement technologies and energy monitoring methodologies. It will also support development of proposals and business case analyses for promising technologies that can to reduce fuel demand and enhance capability by increasing time on station and/or enabling future combat system improvements.

The \$7.3 million for the Marine Corps Medium Tactical Vehicle Replacement (MTVR) Family of Vehicles funds fuel efficiency (FE) upgrades installed on the MTVR fleet. The upgrades produce significant cost savings over the life of the MTVRs and improve combat effectiveness by reducing logistics requirements, increasing expeditionary capability and extending operational range.

The \$57.7 million for Air Force funds operational energy investments to modify in-service aircraft with commercially proven drag reduction technologies and modernize mission planning software and engine sustainment technology. This will improve aircraft performance, increase aircraft efficiency, and reduce maintenance and sustainment costs.

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|----------------------|------------------|--------------------------------------|--|---|-----------------|-------------------------|
| Operational Energy | E01 | Operation and Maintenance, Navy | Operating forces | Mission and Other Ship Operations | 0204441N | 1,500 |
| | | Operation and Maintenance, Air Force | Administration and service-wide activities | Administration | 0902398F | 500 |
| | | | | Other Servicewide Activities | 0905015F | 16,700 |
| | | | Operating forces | Combat Enhancement Forces | 0305207F | 6,600 |
| | | | | Contractor Logistics Support and System Support | 0401130F | 9,501 |
| | | | | US NORTHCOM/NORAD | 0201130F | 4,400 |
| | | Other Procurement, Navy | Ships support equipment | DDG Mod | 0204228N | 4,000 |
| | | Procurement, Marine Corps | Support vehicles | Motor Transport Modifications | 0206315M | 7,337 |
| | | Aircraft Procurement, Air Force | Modification of inservice aircraft | C-135 | 0401218F | 15,000 |
| | | | | C-17A | 0401130F | 5,000 |
| Total | | | | | | 70,538 |

- **Electric / hybrid propulsion systems (vehicles, ships, airplanes) (E02) (\$15.9 million)**

Description: Electric or hybrid electric propulsion systems, including systems for tactical vehicles, ships, and airplanes.

Funding Details:

The \$1.5M for the Marine Corps is for Family of Expeditionary Fuel Systems, which supports materiel solutions that enable fuel foraging capabilities, including procurement of the Expeditionary Mobile Fuel Additive Capability (EMFAC) which provides the ability to inject additives to commercial jet fuel to produce military specifications fuel. It also provides modernized fuel-testing capabilities through the consolidation of multiple testing kits into a portable Petroleum Enhanced Analysis Kit (PEAK), enhancing the future force's ability to conduct comprehensive fuel quality surveillance in support of distributed operations. Additionally, the program enables support to distributed operations by disaggregating and modernizing existing large Tactical Fuel Systems into tailored Expeditionary Fuel Dispensing Systems (EFDS) and expedient refueling capabilities. These modernization efforts include the ability to track fuel data near real time, providing the future force with the

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK

ability to manage and track fuel consumption more comprehensively, reduce storage size, improve accountability, and reduce maintenance time.

The \$14.4 million funds Air Force discovery, development, and delivery of energy and climate science, technology, and innovation through electrification of vehicles and electric or hybrid propulsion systems. Efforts include execution of critical science and technology prototype development and proof of concept demonstrations.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|----------------------|------------------|--------------------------------------|------------------------------|-----------------------|-----------------|-------------------------|
| Operational Energy | E02 | Operation and Maintenance, Air Force | Mobilization | Airlift Operations | 0401897F | 6,000 |
| | | | Operating forces | Base Support | 0604860F | 8,400 |
| | | Procurement, Marine Corps | Engineer and other equipment | Tactical Fuel Systems | 0206315M | 1,500 |
| Total | | | | | | 15,900 |

- Carbon sequestration (O11) (\$19.7 million)**

Description: Carbon sequestration is the process of capturing and storing atmospheric carbon dioxide.

Funding Details:

The \$19.7 million for Navy will fund projects, such as wetland and forest restoration, that increase base resilience. It also funds efforts to restore arid landscapes to improve watershed function and xeriscaping efforts on Navy installations with a focus on bases in current/future drought regions.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|----------------------|------------------|---------------------------------|-----------------------|------------------------|-----------------|-------------------------|
| Operational Energy | O11 | Operation and Maintenance, Navy | Operating forces | Base Operating Support | 0204079N | 5,000 |
| | | | | | 0708053N | 14,749 |
| Total | | | | | | 19,749 |

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK

III. RESEARCH, DEVELOPMENT, TEST and EVALUATION

Research, Development, Test and Evaluation (\$1,315.3 million) includes investments in basic and applied research and technology prototyping to keep the U.S. military at the cutting edge. This includes investments to accelerate development of hybrid tactical vehicles to strengthen capability through extended range and persistence, silent watch, and the ability to support advanced weapons. Investments also support the prototyping of new platforms like blended wing body aircraft that have the potential to provide capability through increases in range and payload while improving efficiency. RDT&E also includes investments in technologies like advanced energy storage, fuel cells, and energy management systems. Details by funding category are as follows:

- **Renewable and alternative energy (R01) (\$8.1 million)**

Description: Assess and develop renewable energy sources and alternative energy solutions.

Funding Details:

The \$7.0 million for Army largely funds construction-scale additive manufacturing and a compost pilot.

The \$1.0 million for DLA’s energy readiness program includes collaboration with the DLA military partners for research in alternative energy solutions relating primarily to bulk fuel. Research includes the conversion of renewable materials to useable energy, such as investigating waste-based feedstocks for sustainable aviation fuel production.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|-----------------------------------|------------------|--|--------------------------------------|---|-----------------|-------------------------|
| Development, Test, and Evaluation | R01 | Research, Development, Test and Evaluation, Army | Component Development and Prototypes | Environmental Quality Technology - Dem/Val | 0603779A | 7,013 |
| | | Research, Development, Test and Evaluation, Defense-Wide | Advanced technology development | Generic Logistics R&D Technology Demonstrations | 0603712S | 1,041 |
| | | | | | Total | 8,054 |

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK

- **Energy Storage (R02) (\$59.3 million)**

Description: Advanced energy storage and battery development.

Funding Details:

The \$32.8 million for Army funds research on efficient power, robotics and mobile energy, innovative power generation and alternative energy technologies for individual Soldier and squad equipment, as well as fundamental research in power and energy concepts.

The \$22.7 million total for Navy funds basic research in energy storage and power generation materials, development of advanced naval power systems with low fuel consumption, the development of a battery safety program, the fielding of high energy batteries through a rigorous certification process, and development of modular building blocks to enable energy infrastructure necessary to support electronic warfare system integration onto ships. Funding total includes:

- \$5.5 million for Materials Power and Energy fund research on electrochemical materials, and functional polymeric and organic materials, to understand phenomenology that can be applied to more efficient energy capture and power storage for a wide application to emerging naval requirements.
- \$12.3 million for Naval Power Systems research to enhance energy supportability and demand reduction in new capabilities or current platform upgrades through acquisition support and studies, development of ship energy optimization projects, and a pilot program to test commercial energy technologies on Navy ships.

The \$3.8 million for Defense-wide supports Defense Logistics Agency's manufacturing technology in the Battery Network Program. The program conducts advanced battery manufacturing research to improve battery performance and efficiency, reduce costs, and minimize hazardous wastes and impact on the environment. Key areas of research include lightweight, advanced bipolar lead-acid batteries; replacing nickel-cadmium batteries; and innovating or automating key manufacturing processes.

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| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|---|---------------------------------|--|--|--|----------------------------------|-------------------------|
| Research, Development, Test, and Evaluation | R02 | Research, Development, Test and Evaluation, Army | Advanced Component Development and Prototypes | Environmental Quality Technology - Dem/Val | 0603779A | 1,500 |
| | | | Advanced technology development | Soldier Lethality Advanced Technology | 0603118A | 9,310 |
| | | | | Soldier Applied Research | 0602184A | 2,442 |
| | | | | Soldier Lethality Technology Defense Research Sciences | 0602143A | 6,911 |
| | | | | | | |
| | | | Basic research | | 0601102A | 12,634 |
| | | Research, Development, Test and Evaluation, Navy | Advanced Component Development and Prototypes | Navy Energy Program | 0603724N | 4,933 |
| | Advanced technology development | | Force Protection Advanced Technology Defense Research Sciences | 0603123N | 12,250 | |
| | | | | 0601153N | 5,498 | |
| | | | Research, Development, Test and Evaluation, Defense-Wide | Advanced technology development | Manufacturing Technology Program | 0603680S |
| Total | | | | | 59,270 | |

- Fuel Cells (R03) (\$1.1 million)**

Description: Fuel cell development.

Funding Details:

The \$1.1 million for Navy funds benthic microbial fuel cells (BMFCs), an energy resource that can operate in marine sediments and provide underwater power. Microbes present in the environment use organic matter in the sediment to generate energy densities ranging from 10's to 100's of milliwatts per square meter of organic matter. This Navy program aims to develop technologies capable of powering undersea devices and sensors for environmental monitoring.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|---|------------------|--|-----------------------|---|-----------------|-------------------------|
| Research, Development, Test, and Evaluation | R03 | Research, Development, Test and Evaluation, Navy | | Warfighter Sustainment Applied Research | | |
| | | | Applied Research | Defense Research Sciences | 0602236N | 620 |
| | | | Basic research | | 0601153N | 499 |
| | | | | | Total | 1,119 |

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK

- **Low carbon fuels (R04) (\$112.2 million)**

Description: Development of low carbon fuels, including hydrogen.

Funding Details:

The \$2.0 million for Army funds hydrogen science and technology efforts for alternative fuel capability to improve operational energy capability.

The \$8.0 million for Navy funds the advanced mobility fuels program which is responsible for the development and sustainment of qualification protocols, fuel testing, analysis and coordination between Navy, other DoD entities, industry, and international partners to qualify the use of Low Carbon Tactical Fuels for Navy aircraft and ships. This effort will position the Navy to procure low carbon tactical fuels, ensure operational flexibility, and take advantage of reductions in life-cycle Greenhouse gas (GHG) emissions without impacting platform performance or durability. Also funds hydrogen production development system to support unmanned systems fueled on and off Navy ships.

The \$102.2 million for the OSD Research and Engineering for the complete engineering design. Preliminary Safety Analysis Report (PSAR), initial hardware procurement, and fuel fabrication for a prototype transportable nuclear micro reactor. The goal of the effort is a reactor capable of generating 1-5 MW of electrical power that is transportable in standard shipping containers and that meets all safety, legal, and regulatory requirements.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|---|------------------|--|---|--|-----------------|-------------------------|
| Research, Development, Test, and Evaluation | R04 | Research, Development, Test and Evaluation, Army | Applied Research | Soldier Applied Research | 0602184A | 2,000 |
| | | Research, Development, Test and Evaluation, Navy | Advanced Component Development and Prototypes | Navy Energy Program Ocean Warfighting Environment Applied Research | 0603724N | 6,447 |
| | | | Applied Research | | 0602435N | 1,600 |
| | | Research, Development, Test and Evaluation, Defense-Wide | Advanced Component Development and | Advanced Innovative Technologies | 0604250D8Z | 102,200 |
| | | | | | Total | 112,247 |

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK

- **Improving energy efficiency of platforms, operations or installations (R05) (\$278.2 million)**

Description: Improving energy efficiency of platforms, operations, or installations.

Funding Details:

The \$10.2 million for Army funds the advancement and transition to improved energy efficient devices and fuel metering and monitoring.

The \$115.6 million in Navy funding supports the demonstration of advanced engine technologies for naval aviation platforms; integration of weather and ocean forecasts into ship routing, response and propulsion efficiency, and Refueling at Sea logistics planning; the integration of energy data and force modeling capabilities to support real-time energy command and control and acquisition decision making; optimized inlet design to reduce drag and improve efficiency; power and energy science conductor and permanent magnet materials, energy conversion, combustion, and cyber physical system modeling; and thermal science and technology studies to meet power and energy needs of the Navy's next-generation weapons and platforms. Also funds adoption of shipboard zonal distribution as well as demonstrations and studies of marine and green concrete.

The \$15.4 million for the Marine Corps is for the Family of Medium Tactical Vehicle Replacements (MTVR) (\$9.7M) and the Family of Mobile Power Systems (\$5.7M). MTVR funding supports Medium Tactical Trucks (MTT) competitive prototype efforts. Family of Mobile Power Systems funding supports technology development and technical reviews for the energy storage unit in support of Intelligent Power Management System (IPMS) and initiation of developmental efforts to produce a new hybrid environmental control unit capability.

The \$54.0 million in Air Force funding supports improving flight line energy efficiency, including investments in state-of-the-art software, engine sustainment technologies to improve performance, increased use of simulation and augmented reality systems, and energy-aware behavior reducing unnecessary fuel consumption.

The \$36.6 million for the Environmental Security Technology Certification Program (ESTCP) funds deployment of innovative technologies that improve installation energy efficiency and security. The program, working closely with the Department of Energy and DoD labs, demonstrates and transitions technologies focused efficiency, reducing the time and cost to implement and operate micro-grids, and improved planning and design for installation energy resilience projects.

The \$11.3 million for The Defense-wide Manufacturing Science and Technology (DMS&T) program will expand manufacturing research across the manufacturing technology ecosystems of five DoD Manufacturing Innovation Institutes (MIIs): Projects are focused on reductions in manufacturing energy usage, greenhouse gas emissions, and material waste via

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK

process improvements and incorporation of advanced manufacturing technologies. DMS&T Advanced Technology Development supports research and development activities within MII ecosystems located across the country, including:

- The \$1.5 million at America Makes, dedicated to accelerate the adoption of additive manufacturing (AM) in the United States industrial base, will conduct projects to seek sustainable AM to mitigate climate change by improving engine thermal management, eliminating toxic, long-lead, and expensive materials like Beryllium in the production of optical components, or exploring novel application of AM technologies.
- The \$3.5 million at AIM Photonics, organized to incorporate integrated photonics device manufacturing and packaging will conduct integrated photonic circuits climate change mitigation projects to improve silicon photonics packaging, develop and demonstrate efficient digital transceivers for communications applications to pave the way to reduce input-output power consumption in data centers by approximately 30%, and develop and demonstrate highly efficient optical switches for data communications applications to reduce power consumption in data centers by as much as 50% by reducing system idle time and mitigating system architecture inefficiencies.
- The \$1.8 million at NextFlex, established to expand flexible hybrid electronics (FHE) manufacturing to create highly tailorable devices on non-traditional, compliant substrates, will pursue environmentally sustainable FHE device development and initiate a project to develop a cold chain monitor as a demonstrator focused on climate change and environmental sustainability. The technology could support environmentally-friendly production and monitoring of shipping packages.
- The \$1.0 million at AFFOA, helping the domestic textile industry by accelerating transformation in the manufacture of traditional fibers, yarns, and textiles into highly sophisticated, integrated, and networked devices and systems, will mitigate climate change in a project to explore and select clothing and textile fibers (organic and synthetic) that meet military uniform performance criteria and that can be disposed of or recycled without negative ecological impacts, such as clogging waterways, contaminating soil, or polluting the air.
- The \$3.5 million at BioMADE aims to harness bioindustrial manufacturing to create new materials or sustainable alternatives to existing petroleum-based materials using biological systems including microbes and feed stocks, will conduct an open project call to positively impact climate change by removing risk in innovative green bioindustrial techniques and food security.

The \$33.0 million for the Operational Energy Capability Improvement Fund (OECIF) is to accelerate the deployment of innovative technologies that improve operational energy efficiency and promote long-term enhancements to military energy capabilities in accordance with the Department's operational energy strategy. This funding includes efforts for powering the

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK

force, electrifying the battlespace, commanding energy, and nuclear development. Special focus areas include investment in power and energy for the Arctic; transforming battlespace waste to energy, heat, and power; and ensuring the warfighter has operational energy information to enable command and control for mission planning and operations at all echelons – this includes metering and monitoring, data security and transformation to information, modeling and simulation tools, and warfighter training and education across the emerging technology energy domain.

The \$2.2 million for Real Property Information Management will provide funding for the Military Aviation and Installation Assurance Siting Clearinghouse program to enhance review process efficiencies. This ensures that energy development proceeds in a way that minimizes or mitigates potential adverse impacts on military operations and readiness.

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| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|--|------------------|---|---|---|-----------------|-------------------------|
| Research, Development, Test, and Evaluation | R05 | Research, Development, Test and Evaluation, Army | Advanced technology development | Ground Advanced Technology | 0603119A | 4,200 |
| | | | Applied Research System development and demonstration | Network C3I Technology | 0602146A | 5,589 |
| | | | Advanced Component Development and | Information Technology Development | 0605013A | 403 |
| | | Research, Development, Test and Evaluation, Navy | | Advanced Surface Machinery Systems | 0603573N | 70,700 |
| | | | | Navy Energy Program | 0603724N | 27,485 |
| | | | | Ship Preliminary Design & Feasibility Studies | 0603564N | 250 |
| | | | Applied Research | Force Protection Applied Research | 0602123N | 12,407 |
| | | | | Ocean Warfighting Environment Applied Research | 0602435N | 3,815 |
| | | | | Sustainment Applied Research | 0602236N | 900 |
| | | | Operational system development | Marine Corps Combat Services Support | 0206624M | 15,390 |
| | | Research, Development, Test and Evaluation, Air Force | Advanced Component Development and Prototypes | Operational Energy and Installation Resilience Tech Transition Program | 0604860F | 38,200 |
| | | | | | 0604858F | 1,000 |
| | | | Advanced technology development | Aerospace Technology Dev/Demo | 0603211F | 12,000 |
| | | | Operational system development | Aircraft Engine Component Improvement Program | 0207268F | 2,000 |
| | | | System development and demonstration | Agile Combat Support | 0604617F | 750 |
| | | Research, Development, Test and Evaluation, Defense-Wide | Advanced Component Development and Prototypes | Environmental Security Technical Certification Program | 0603851D8Z | 36,595 |
| | | | Advanced technology development | Manufacturing Science and Technology Program | 0603680D8Z | 11,300 |
| | | | | Operational Energy Capability Improvement | 0604055D8Z | 33,000 |
| | | | System development and demonstration | DoD Enterprise Energy Information Management (EEIM) | 0305304D8Z | 2,200 |
| Total | | | | | | 278,184 |

ENHANCING COMBAT CAPABILITY – MITIGATING CLIMATE RISK

- **Energy efficient new platforms (R06) (\$241.6 million)**

Description: Applied research and advanced technology development for new platforms.

Funding Details:

The \$20.0 million for Army funds modernization of priority future vertical lift and air platforms through development of power dense, fuel-efficient, durable propulsion technologies that offer significant operational capability improvements in terms of range, speed, and payload lift.

The \$70.9 million for Navy funds the assessment, development, maturation, and transition of power (batteries and fuel cells), thermal management (models and fluid transfer), and engine and airframe efficiency technologies to increase the mission capability of Naval aircraft. The program will increase range and payload capacity of unmanned aerial vehicles (UAVs), significantly reduce time and cost to optimize power and thermal solutions to current aircraft, increase emergency capability, reduce total ownership costs and future non-recurring engineering costs for aircraft batteries, and increase aircraft range and time on station.

The \$26.0 million for the Marine Corps supports development of technologies including Cold Weather and Mountaineering equipment, Family of Shelters, Family of Medium Tactical Vehicle Replacements, and the offices that conduct this research.

The \$82.6 million for Air Force supports the Service Climate Action Plan to include pursuing energy efficiencies in aircraft. These include:

- Prototyping new platforms like blended wing body aircraft that targets a 30% improvement in aerodynamic efficiency to increase range and payload,
- Drag reduction efforts to improve efficiency and combat effectiveness of legacy aircraft,
- Enhanced software and scheduling efforts to maximize aircraft utilization,
- Improved maintenance processes that provide increased efficiency and aircraft availability, and
- The electric vertical take-off and landing (eVTOL) system development to leverage dual-use emerging commercial technologies.

The \$42.1 million for Defense Advanced Research Projects Agency (DARPA) includes funding for several Science and Technology (S&T) programs to address innovative approaches to more energy efficient platforms. These include the Manta Ray, Sea Train, and Persistent Optical Wireless Energy Relay (POWER) programs:

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- The \$19.8 million request for the Manta Ray program supports the development and demonstration of a new class of long-duration, long-range unmanned underwater vehicles (UUVs) at an acquisition and lifecycle cost significantly less than current payload-capable UUVs. This new class of UUV will give the combatant commander an amplification of capacity without disrupting current operations by remaining independent of manned vessels and ports once deployed. The primary goal of the Manta Ray program is to open a design space for future UUVs capable of both long duration missions and large payload capacity. A secondary goal of the program is to advance key technologies benefiting other naval designs such as low lifecycle cost UUV operations, energy management technologies to enable long-duration operations, biofouling reduction technologies, and long-duration navigational enablers. This program is increasing the energy efficiency of undersea travel and enables energy harvesting in the undersea environment to create energy independent underwater vehicles.
- The \$5.9 million request for the Sea Train program is supporting the delivery of masses of Unmanned Surface Vessels (USVs) into theater, without reliance on large, manned capital assets. The Sea Train program is developing and demonstrating approaches to exploit the efficiencies of longer slender hulls, while enabling a distributed fleet of tactical USVs. The Sea Train concept enables vessels that are efficient for transoceanic transport while enabling dispersed operations as individual vessels. The Sea Train program is developing and demonstrating connectors and approaches to couple the vessels, the control laws required to drive the vessel in open ocean conditions, sensor approaches to understand the wave environment to efficiently navigate the vessel, and the autonomy required to connect and disconnect the vessels without human intervention. The goal of this effort is to improve transport efficiency over what can be achieved with current monohull designs. This allows for the efficient transport of smaller vessels into and out of theater, an operation that is normally accomplished today by carrying smaller vessels on board larger vessels or reliance on at-sea refueling of smaller vessels.
- The \$16.4 million request for the POWER program will advance the development and demonstration of low-loss redirection relays to enable architectures where the beam propagates predominantly at high altitudes, minimizing atmospheric absorption and scattering. By developing wavefront correction, this program will demonstrate long-range power beaming using small, militarily relevant apertures. Investing in scalable and selectable energy harvesting will ensure the persistent operation of the network. The POWER program will enable a distributed network of high-altitude persistent UAVs that direct laser energy through a network of ground, sea, and air-based assets to meet energy needs of a dynamic future battlespace. The key enabling technology is a scalable airborne optical energy relay node that can redirect, correct, and selectively harvest energy from a directed energy source. These technologies will enable a flexible, resilient, reconfigurable, persistent, and distributed energy network.

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| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands | | | |
|---|---|--|--|--|---------------------------------|-------------------------|--|----------|--------|
| Research, Development, Test, and Evaluation | R06 | Research, Development, Test and Evaluation, Army | Advanced technology development | Future Vertical Lift Advanced Technology Air Platform Applied Research | 0603465A | 4,294 | | | |
| | | | Applied Research | | 0602183A | 3,560 | | | |
| | | | | | Future Verticle Lift Technology | 0602148A | 9,766 | | |
| | | Research, Development, Test and Evaluation, Navy | Operational system development | Enduring Turbine Engines and Power Systems | 0607315A | 2,400 | | | |
| | Advanced Component Development and Prototypes | | Marine Corps Ground Combat/Support System | | 0603635M | 3,000 | | | |
| | | | | | Navy Energy Program | 0603724N | 24,514 | | |
| | Advanced technology development | | USMC Advanced Technology Demonstration (ATD) | 0603640M | | 6,420 | | | |
| | Applied Research | | | | | | Force Protection Applied Research | 0602123N | 34,339 |
| | | | Marine Corps Landing Force Technology | 0602131M | 2,080 | | | | |
| | | | Defense Research Sciences | 0601153N | 12,037 | | | | |
| | Basic research | | Marine Corps Combat Services Support | 0206624M | | 38 | | | |
| | Operational system development | | | | | | Marine Corps Communications Systems | 0206313M | 13,769 |
| | | | | | | | Marine Corps Ground Combat/Supporting Arms Systems | 0206623M | 657 |
| | | Research, Development, Test and Evaluation, Air Force | Component Development and Prototypes | Tech Transition Program | 0604858F | 82,562 | | | |
| | | Research, Development, Test and Evaluation, Defense-Wide | Advanced technology development | Network-Centric Warfare Technology | 0603766E | 25,749 | | | |
| | | | Applied Research | Tactical Technology | 0602702E | 16,380 | | | |
| Total | | | | | 241,565 | | | | |

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- **Electrification of vehicles, ships, and airplanes (R07) (\$458.6 million)**

Description: Operational energy capability improvements funding across all appropriations to meet operational energy objectives and enhance military capabilities in accordance with Department's operational energy strategy.

Funding Details:

The \$270.6 million for Army funds the modernization of priority next-generation combat vehicles providing silent watch and mobility, increased operational duration, and more on-board electrical power for ground tactical and combat vehicles through electrification architecture and hybrid electric combat vehicle research. This funding also enables ground vehicle power and energy concepts and technology development.

The \$135.2 million for OECIF is to accelerate the deployment of innovative technologies that improve operational energy efficiency and promote long-term enhancements to military energy capabilities in accordance with the Department's operational energy strategy. Approximately 70 percent of Services' operational energy consumption is spent on aviation. The baseline funding allows coordinated investment across the Services for aviation efficiencies that were previously not possible. This funding focuses on common efficiency opportunities for aviation, and electrification of aviation, tactical vehicles, and ensures learning and partnership across the services while driving down duplication of efforts. OECIF investments made under R07 include other areas such as Aviation and Ground Vehicle R&D in Renewable Energy (R01), Energy Storage (R02), Fuel cells (R03), Low carbon fuels including hydrogen (R04), Energy efficiencies for new platforms (R06), and Measurement or modeling of climate impacts (R08). OECIF projects are competitively awarded with approximately one-third of the budget going to new starts and two-thirds of the budget request going to continuing efforts. OECIF also include investments in novel distribution methods in contested, denied, and hard to reach locations such as space.

The \$52.8 million for the Operational Energy Capability Improvement – Non-S&T (Operational Energy Prototyping Fund) program prototypes, validates, and demonstrates the most promising, innovative, and cost-effective technologies addressing joint, high-priority, and operations energy requirements. Operational Energy Prototyping serves as the program by which operational energy technology advances made under the Operational Energy Capability Innovation (OECI) program can transition to military services acquisition programs. Program efforts will identify and mitigate energy-related risks and increase warfighting capabilities and resilience in the areas of battlefield electrification, powering the force, and commanding energy. Specific FY24 projects are competitively awarded and are expected to provide impacts across several climate reporting categories in addition to (R05) Improving energy efficiency of platforms, operations or installations to include: Renewable Energy (R01); Energy Storage (R02); Energy efficient new platforms (R06); Electrification of vehicles, ships, and airplanes (R07); and Climate change-related modeling, simulation, wargames, exercises (R09). These investments will improve the

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planning, programming, and budgeting for technology transition to programs of record, thus increasing warfighter transition speed by up to two years.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|---|------------------|--|--------------------------------------|---|-----------------|-------------------------|
| Research, Development, Test, and Evaluation | R07 | Research, Development, Test and Evaluation, Army | Advanced technology development | Ground Advanced Technology | 0603119A | 2,783 |
| | | | | Next Generation Combat Vehicle Advanced Technology | | |
| | | | Applied Research | Ground Technology | 0602144A | 2,605 |
| | | | | Next Generation Combat Vehicle Technology | 0602145A | 13,763 |
| | | | System development and demonstration | Emerging Technology Initiatives | 0605054A | 124,600 |
| | | | | Vehicle (JLTV) Engineering and Manufacturing | 0605812A | 25,300 |
| | | | | Light Tactical Wheeled Vehicles | 0604642A | 43,700 |
| | | | | Medium Tactical Vehicles | 0604604A | 25,000 |
| | | Research, Development, Test and Evaluation, Defense-Wide | Component Development and Prototypes | Operational Energy Capability Improvement - Non S&T | 0604555D8Z | 52,800 |
| | | | Advanced technology development | Operational Energy Capability Improvement | 0604055D8Z | 135,200 |
| Total | | | | | 458,637 | |

- Measurement or modeling of climate impacts (R08) (\$22.5 million)**

Description: Research to improve preparedness with advanced sensing and monitoring of climate data to provide warning and mitigate negative consequences.

Funding Details:

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The \$1.5 million for Navy funds Power Systems for Air, Ground and Sea Vehicles research relevant to the power, energy and propulsion of naval systems, including: research to improve understanding of the environmental impacts on future platforms and reduce the impact of platforms on the environment.

The \$0.5 million for Air Force supports the development of modern weather sensors and components to mitigate risk due to lack of warning of impending severe weather. More accurate weather information integrated into mission planning and execution can reduce fuel consumption, decrease re-attack sorties, and improve mission effectiveness.

The \$13.8 million for ESTCP increases research supporting the ability to rapidly model impacts to installation infrastructure from climate change. The program promotes demonstrations to collect data using analytical tools, techniques and technologies to improve installation infrastructure modeling to prepare for climate related threats.

The \$4.7 million in RDT&E, Defense-wide funding is for the Providing Research and End-user Products to Accelerate Readiness and Environmental Security (PREPARES) program. PREPARES will leverage and build upon Minerva Research Initiative products (social science research in support of U.S. national security policy) by incorporating their findings into operationally-relevant planning scenarios that accelerate the Department's understanding of the social, cultural, behavioral, and political dynamics most likely to be affected by climate and environmental change in strategically important areas.

The \$1.9 million for Pacific Disaster Centers (PDC) will be used for applied science, information, and technology to reduce worldwide disaster risks and impacts on life, property, and economies.

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| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|---|------------------|---|--|--|--|-------------------------|
| Research, Development, Test, and Evaluation | R08 | Research, Development, Test and Evaluation, Navy | Advanced Component Development and Prototypes | Environmental Protection | 0603721N | 250 |
| | | | Applied Research | Ocean Warfighting Environment Applied Research | 0602435N | 350 |
| | | | | Defense Research Sciences | 0601153N | 931 |
| | | Research, Development, Test and Evaluation, Air Force | Basic research | Weather Service | 0305111F | 549 |
| | | | Operational system development | | 0603851D8Z | 13,847 |
| | | | Research, Development, Test and Evaluation, Defense-Wide | Advanced Component Development and | Social Sciences for Environmental Security | 0602675D8Z |
| | | | Applied Research | Pacific Disaster Centers | 0708012S | 1,905 |
| | | | Operational system development | | | |
| Total | | | | | | 22,523 |

- **Climate change-related modeling, simulation, wargames, exercises (R09) (\$17.2 million)**

Description: Advanced demonstrations to collect data for modeling, simulation, wargames, and exercises to identify and respond to risks.

Funding Details:

The \$3.0 million for Army supports studies to increase infrastructure adaptation and mitigation measures.

The \$0.3 million for Navy continues fundamental research in climate-related understanding of environmental changes, predictions, and energy efficiencies where modeling parameters are used. Research can cross between environmental science, ocean sciences, atmosphere sciences, and polar science as examples. Also continues early applied research in climate-related modeling for applications. Research can include analytical tools, techniques and technologies for undersea, surface, and atmosphere applications.

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The \$13.8 million for ESTCP increases research supporting rapid application of infrastructure resilience and adaptive measures. The program promotes demonstrations to collect data using analytical tools, techniques and technologies to improve installation infrastructure resilience to climate related threats.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands | |
|---|------------------|--|------------------------------------|--|---------------------------|-------------------------|--------|
| Research, Development, Test, and Evaluation | R09 | Research, Development, Test and Evaluation, Army | Management support | Materiel Systems Analysis | 0605706A | 3,000 | |
| | | Research, Development, Test and Evaluation, Navy | Applied Research | Warfighter Sustainment Applied Research | 0602236N | 149 | |
| | | | | Basic research | Defense Research Sciences | 0601153N | 185 |
| | | Research, Development, Test and Evaluation, Defense-Wide | Advanced Component Development and | Environmental Security Technical Certification Program | | | |
| | | | | | | 0603851D8Z | 13,846 |
| Total | | | | | | 17,180 | |

- Adaptation (R10) (\$116.0 million)**

Description: Innovation to develop and demonstrate solutions to increase DoD’s ability to meet environmental challenges and adapt to climate change. In addition to monitoring and mitigation of heat illness in training settings, requirements are increasing for technologies that help reduce Soldier risks from worsened air quality, vector-borne disease, and food-related infections.

Funding Details:

The \$12.2 million for Army funds the development of the carbon sequestration toolkit, low carbon/carbon neutral sequestration building materials, and standards for additive construction, as well as environmental conservation, pollution prevention, and environmental compliance.

The \$14.2 million for Navy funds an effort to improve integration of weather and ocean forecasts into ship routing, ship response and propulsion efficiency planning, and Refueling at Sea logistics planning, as well as prediction of hazardous and extreme weather events and trends for climate adaptation, resilience, and mitigation. This effort also includes an assessment of the need and viability of mission adaptation and/or potential relocation of installations at risk, provides funds to plan, develop,

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contract and execute for environmental resilience project (shoreline stabilization and erosion mitigation), and funds a pilot project to develop and install small-scale water production systems at tactical training facilities that require significant logistics to provide externally sourced and relatively small quantities of water.

The \$1.0 million in Air Force funding supports the integration of host nation weather radar data into the United States Air Force data display, interrogation, and exploitation platforms. This funding will greatly improve the forecasting and warning for severe or extreme weather events for defense facilities outside the continental United States.

The \$61.8 million for DARPA includes funding for several S&T programs to address innovative approaches to mitigate or adapt to climate change. These include the Atmospheric Water Extraction (AWE), Bio-Inspired Coastal Defense, Food and Feedstocks on Demand, and Materiel Protection through Biologics programs:

- The \$13.3 million request for the AWE program supports efforts to enable water harvesting directly from the atmosphere by leveraging new materials and advanced engineering and manufacturing techniques to alleviate the logistical and tactical burden of the water supply chain.
- The \$11.4 million request for the Bio-Inspired Coastal Defense program supports the development of self-sustaining, hybrid man-made, and biological reef structures to fortify and defend DoD bases in low-lying coastal regions. Military assets in these coastal regions are vulnerable to storm surges, wave action, and sea-level rise that cause erosion, degrade infrastructure, and impede operations. Innovative coastal defense will require major technological advances in (1) design, construction, and placement of manufactured reef primers, (2) accelerated recruitment and/or growth of reef species, and (3) sustained, zero-cost natural maintenance and improvement (e.g., increased durability after challenge) of the defensive reef.
- The \$17.0 million request for the Food and Feedstocks on Demand program which advances the development of biological technologies to support the DoD's need to strengthen local resource security for the warfighter. Research in this program will provide a versatile system that delivers food, water, and petroleum, oils, and lubricants (POLs) so that warfighters can independently produce material support to extend mission duration and expand operational flexibility in resource-limited environments.
- The \$20.1 million request for the Materiel Protection through Biologics program which will develop approaches to sustain military infrastructure and systems by developing biological or bio-inspired technologies to imbue beneficial functions into existing systems, resulting in benefits such as, but not limited to, reducing drag, mitigating corrosion, or

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repairing concrete. These bio-inspired interventions will protect and sustain equipment and infrastructure, reducing operation costs and increasing service lifetime.

The \$26.9 million in RDT&E, Defense-Wide is comprised of \$13.1M for the Strategic Environmental Research and Development Program (SERDP), and \$13.8M of ESTCP funding to developing technologies that enhance knowledge of climate adaptation and enable planners and managers to more efficiently prepare installations to avoid disruptions to operations resulting from climate change.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|---|------------------|--|---|--|-----------------|-------------------------|
| Research, Development, Test, and Evaluation | R10 | Research, Development, Test and Evaluation, Army | Advanced Component Development and Prototypes | Environmental Quality Technology - Dem/Val | 0603779A | 11,000 |
| | | | Management support | Army Kwajalein Atoll | 0605301A | 1,224 |
| | | Research, Development, Test and Evaluation, Navy | Applied Research | Force Protection Applied Research | 0602123N | 10,659 |
| | | | | Warfighter Sustainment Applied Research | 0602236N | 2,000 |
| | | Research, Development, Test and Evaluation, Air Force | Management support | Test and Evaluation Support | 0605864N | 1,500 |
| | | | Operational system development | Weather Service | 0305111F | 950 |
| | | Research, Development, Test and Evaluation, Defense-Wide | Advanced Component Development and Prototypes | Environmental Security Technical Certification Program | 0603851D8Z | 13,846 |
| | | | Advanced technology development | Strategic Environmental Research Program | 0603716D8Z | 13,075 |
| | | | Applied Research | Materials and Biological Technology | 0602715E | 61,765 |
| | | Total | | | | 116,019 |

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- **Adaptation (R12) (\$0.5 million)**

Description: Personnel to support the Department's capabilities to conduct climate mitigation and adaptation.

Funding Details:

The \$0.5 million for Army is for operational energy additional manpower support.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|---|------------------|--|-----------------------|---------------------------|-----------------|-------------------------|
| Research, Development, Test, and Evaluation | R12 | Research, Development, Test and Evaluation, Army | Management support | Materiel Systems Analysis | 0605706A | 500 |
| Total | | | | | | 500 |

IV. CONTINGENCY PREPAREDNESS

Contingency Preparedness (\$54.6 million) includes investments to incorporate climate risks into wargames, exercises, and other planning tools to ensure the Department understands impacts on missions and is prepared to respond. This includes black-start exercises to identify vulnerabilities and remediate risks to installation power systems. Contingency Preparedness investments also include support for Humanitarian Assistance and Disaster Relief (HADR) and Defense Support to Civil Authorities (DSCA) activities. Details by funding category are as follows:

- **Modeling, simulation, wargames, exercises (e.g., black start exercises) (O08) (\$47.6 million)**

Description: Exercises, wargames, and simulations to better understand the impact of climate on the strategic environment. Black start exercises to assess installation readiness. Also includes program for defense-related operational resilience engagement activities with international partners.

Funding Details:

The \$18.6 million for Navy funds critical infrastructure protection. The program supports all-hazards threat and vulnerability assessments across the Shore enterprise and facility related control systems at installations to improve cybersecurity and energy savings.

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The \$8.2 million for Air Force supports efforts for black-start exercises to assess installation readiness and capability to withstand utility disruptions caused by extreme weather or malevolent acts. These exercises highlight needed utility improvements to support mission assurance, energy resilience, and climate-response. Funding will also model energy logistics for installations within INDOPACOM.

The \$12.5 million for OSD funds the acceleration of climate preparedness and resilience through improved understanding of changing conditions. This information is required for installation infrastructure resilience and climate-resilient mission activities through the Natural and Cultural Heritage Program (NCHP), emerging chemicals program, and the GHG mitigation program. Anticipated focal areas include regionally specific wildfire and flooding impacts, internal GHG reporting practices, and best practices for clean energy transition, carbon sequestration and circular economy practices.

The \$8.0 million for the Joint Training Exercise and Evaluation Program (JTEEP) funds Joint Exercises at Combatant Commands and incorporates joint context into Service training programs. The FY 2024 funding request for JTEEP builds on FY 2023 investments to support severe weather-related exercises. In FY 2024, funding will be applied to US Southern Command and US Northern Command exercises. The US Southern Command exercises, CENTAM GUARDIAN and RESOLUTE SENTINEL, will improve combined responsiveness with partners to execute humanitarian assistance and disaster recovery. Funding applied to US Northern Command exercises will improve efforts to prepare for Arctic Homeland Defense operations under severe climate conditions. This funding will help shape the strategic environment in ways favorable to U.S. and Allied interests and influence Joint Force design to address the full spectrum of emerging and future military requirements.

The \$0.3 million for U.S. Cyber Command will support the central management of a variety of initiatives to enable climate resilience and the planning and implementation of new technologies in support of Department objectives.

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| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|--------------------------|------------------|---|--|--|-----------------|-------------------------|
| Contingency Preparedness | O08 | Operation and Maintenance, Navy | Administration and service-wide activities | Planning, Engineering, and Program Support | 0708017N | 9,314 |
| | | | Operating forces | Base Operating Support | 0708018N | 1,500 |
| | | | | Cyberspace Activities | 0305125N | 7,779 |
| | | | | Ship Operations Support & Training | 0202056N | 40 |
| | | Operation and Maintenance, Air Force | Administration and service-wide activities | Other Servicewide Activities | 0905015F | 5,000 |
| | | | Operating forces | Base Support | 0901279F | 3,200 |
| | | Operation and Maintenance, Defense-Wide | Administration and service-wide activities | Office of the Secretary of Defense | 0903399D8Z | 12,500 |
| | | | Operating forces | Joint Chiefs of Staff - JTEEP | 0804768J | 8,000 |
| | | | | USCYBERCOM Headquarters | 0202890JCY | 250 |
| | | | | | Total | 47,583 |

- HADR and DCSA for extreme weather events (O10) (\$7.0 million)**

Description: Humanitarian Assistance and Disaster Relief and Defense Support to Civil Authorities for extreme weather events.

Funding Details:

The \$0.5 million for the Marine Corps will support installation adaptation to climate change to include natural infrastructure and carbon sequestration initiatives and development of Installation Climate Resilience Plans.

The \$1.2 million for Air Force enhances the Artificial Intelligence and Machine Learning Global Synthetic Weather Radar project to reduce gap coverage of global radar mosaics and mitigate risk due to lack of warning of impending severe weather. These modernization efforts will enhance capability for the timely identification of environmental events affecting military operations globally. Funding will also ensure proper sustainment of climate services to Combatant Commands, the

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Intelligence Community, advanced acquisition programs, and planning communities. It also includes necessary cybersecurity oversight to protect defense information systems from cyber threats.

The \$5.4 million is for Pacific Disaster Center (PDC), an applied research center managed by the University of Hawaii that develops new technologies and best practices to advance the field of disaster mitigation, preparedness, response and recovery. PDC supports the needs of nonprofits and government organizations worldwide to create a safer, more disaster resilient world through its DisasterAWARE geospatial information technology platform that provides early warning, hazard monitoring; and impact estimation for decision makers.

| Climate Effort Title | Climate Category | Account Title | Budget Activity Title | Line Item Title | Program Element | FY 2024 \$ in thousands |
|--------------------------|------------------|---|--|------------------------------|-----------------|-------------------------|
| Contingency Preparedness | O10 | Operation and Maintenance, Marine Corps | Operating forces | Base Operating Support | 0208853M | 500 |
| | | Operation and Maintenance, Air Force | Operating forces | Global C3I and Early Warning | 0305111F | 1,160 |
| | | Operation and Maintenance, Defense-Wide | Administration and service-wide activities | Defense Logistics Agency | 0708012S | 5,381 |
| Total | | | | | | 7,041 |

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CLIMATE BUDGET BACKUP EXHIBITS

TABLE 4. Climate Funding by Appropriation

| Public Law Title | Appropriation | FY 2024 \$ Thousands |
|--------------------------------|--|---------------------------------|
| Military Construction | Military Construction, Army | 169,000 |
| | Military Construction, Navy and Marine Corps | 232,120 |
| | Military Construction, Air Force | 52,500 |
| | Military Construction, Defense-Wide | 634,250 |
| | Military Construction total | 1,087,870 |
| Military Personnel | National Guard Personnel, Army | 750 |
| | National Guard Personnel, Air Force | 750 |
| | Military Personnel total | 1,500 |
| Operation & Maintenance | Operation and Maintenance, Army | 619,232 |
| | Operation and Maintenance, Navy | 826,081 |
| | Operation and Maintenance, Marine Corps | 128,385 |
| | Operation and Maintenance, Air Force | 724,841 |
| | Operation and Maintenance, Space Force | 5,970 |
| | Operation and Maintenance, Army Reserve | 57,495 |
| | Operation and Maintenance, Navy Reserve | 1,743 |
| | Operation and Maintenance, Army National Guard | 152,225 |
| | Operation and Maintenance, Air National Guard | 250 |
| | Operation and Maintenance, Defense-Wide | 169,584 |
| | Operation & Maintenance total | 2,685,806 |
| Procurement | Other Procurement, Navy | 4,000 |
| | Procurement, Marine Corps | 8,837 |
| | Aircraft Procurement, Air Force | 20,000 |
| | Procurement total | 32,837 |
| RDT&E | Research, Development, Test and Evaluation, Army | 358,383 |
| | Research, Development, Test and Evaluation, Navy | 275,672 |
| | Research, Development, Test and Evaluation, Air Force | 138,011 |
| | Research, Development, Test and Evaluation, Defense-Wide | 543,232 |
| | RDT&E total | 1,315,298 |
| Revolving and Management Funds | Working Capital Fund, Defense-Wide | 8,300 |
| Grand Total | | 5,131,611 |

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TABLE 5. Climate Funding by Line of Effort and Category

| Climate Lines of Effort | Climate Categories | Climate Category Code | FY 2024 \$ Thousands |
|---|---|-----------------------|----------------------|
| Installation Resiliency and Adaptation | Renewable energy, Storage, Microgrids, Efficiency Gains, Pwr Distr Systems | M01 | 1,063,870 |
| | Infrastructure ISO the deployment of non-tactical electric vehicles | M03 | 24,000 |
| | Energy savings performance contracts (ESPC) or utility energy services contracts (UESC) | O01 | 654,482 |
| | Renewable Energy Power Purchases | O02 | 93,403 |
| | Deploy renewable energy, storage, energy/water efficiency gains | O04 | 601,242 |
| | Resilience improvements impacting climate change | O05 | 553,560 |
| | Deployment of non-tactical electric vehicles | O06 | 299,361 |
| | Climate impact planning; installation master plans / energy plans | O07 | 245,569 |
| | Personnel ISO climate change mitigation or adaptation | O09 | 40,646 |
| | Renewable energy or energy storage systems | E03 | 17,716 |
| | Energy management or measurement software and systems | E04 | 61,653 |
| | Installation Resiliency and Adaptation total | | 3,655,502 |
| Operational Energy | Energy efficiency gains, existing platform (vehicles, ships and airplanes) | E01 | 70,538 |
| | Electric / hybrid propulsion systems (vehicles, ships, airplanes) | E02 | 15,900 |
| | Carbon sequestration | O11 | 19,749 |
| | Operational Energy total | | 106,187 |
| Research, Development, Test and Evaluation | Renewable energy | R01 | 8,054 |
| | Energy storage | R02 | 59,270 |
| | Fuel cells | R03 | 1,119 |
| | Low carbon fuels, including hydrogen | R04 | 112,247 |
| | Improving energy efficiency of platforms, operations or installations | R05 | 278,184 |
| | Energy efficient new platforms | R06 | 241,565 |
| | Electrification of vehicles, ships, and airplanes | R07 | 458,637 |
| | Measurement or modeling of climate impacts | R08 | 22,523 |
| | Climate change-related modeling, simulation, wargames, exercises | R09 | 17,180 |
| | Adaptation to climate change | R10 | 116,019 |
| | Personnel ISO climate change mitigation or adaptation | R12 | 500 |
| | Research, Development, Test and Evaluation total | | 1,315,298 |
| Contingency Preparedness | Climate change modeling, simulation, wargames, exercises (e.g. black start exercises) | O08 | 47,583 |
| | HADR and DCSA for extreme weather events | O10 | 7,041 |
| | Contingency Preparedness total | | 54,624 |
| Grand Total | | | 5,131,611 |