MEETING THE CLIMATE CHALLENGE

Department of Defense Budget
Fiscal Year (FY) 2023

Office of the Under Secretary of Defense (Comptroller)
April 2022
The estimated cost of this report or study for the Department of Defense is approximately $24,000 for the 2022 Fiscal Year. This includes $280 in expenses and $24,000 in DoD labor.
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OVERVIEW

Climate change is reshaping geostrategic, operational, and tactical environments with significant implications for U.S. national security and defense. Increasing temperatures, changing precipitation patterns, and more frequent, intense, and unpredictable 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 at every level of the enterprise and invest accordingly. The FY 2023 President’s budget request prioritizes Departmental investments that enhance operational capability, mission resilience, and readiness.

Through increasing platform efficiencies to mitigate logistics risk in contested environments, hardening critical infrastructure against climate impacts, and deploying new technologies that strengthen capability, the Department is committed to solutions that are mission essential and provide climate benefits. The budget request reflects that commitment and includes $3.1 billion of 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 to achieve these goals, as shown in Table 1.

TABLE 1. Climate Funding by Component

<table>
<thead>
<tr>
<th>Component</th>
<th>FY 2023 $ in thousands</th>
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</thead>
<tbody>
<tr>
<td>Department of Army</td>
<td>725,648</td>
</tr>
<tr>
<td>Department of Navy</td>
<td>718,830</td>
</tr>
<tr>
<td>Department of Air Force</td>
<td>389,502</td>
</tr>
<tr>
<td>Office of Secretary Defense/Defense-Wide</td>
<td>1,221,575</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,055,555</strong></td>
</tr>
</tbody>
</table>

The Department’s Climate investment is intended to ensure the Department can meet all mission requirements and maintain the ability to operate under changing climate conditions. The investments will improve installation energy and physical resilience, increase operational energy efficiency and resiliency, develop new capabilities to keep the U.S. military at the cutting edge, and reduce future operational costs. Investments also seek to modernize Department operations to keep pace with industry, including the auto sector’s rapid shift to electric transportation.

The Department’s efforts to address the national security challenge presented by Climate change are reflected in a $3.1 billion subset of the FY 2023 budget request. While each Service funds specific missions within their respective topline, the Department’s efforts are coordinated across the enterprise. Climate investments are organized into four lines of effort and identified funding is shown in Table 2:
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- **Installation Resiliency and Adaptation** – to adapt military facilities to withstand increasingly challenging conditions and strengthen their ability to rapidly recover from disruptions to public infrastructure.
- **Operational Energy and Buying Power** – to improve the energy efficiency of existing operational platforms and propulsion systems to enhance capability and reduce logistics supply requirements for deployed forces.
- **Science and Technology** – for basic and applied research focused on technology prototyping, energy demand reduction and management, advanced energy supply, and energy storage to keep the U.S. military at the cutting edge.
- **Contingency Preparedness** – for wargames, exercises, and other planning tools to ensure the Department understands climate impacts on missions and is prepared to respond.

**TABLE 2. Funding by Climate Line of Effort**

<table>
<thead>
<tr>
<th>Climate Line of Effort</th>
<th>FY 2023 $ in thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation Resiliency and Adaptation</td>
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<tr>
<td>Operational Energy and Buying Power</td>
<td>247,095</td>
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<tr>
<td>Science and Technology</td>
<td>806,961</td>
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<tr>
<td>Contingency Preparedness</td>
<td>27,623</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>3,055,555</strong></td>
</tr>
</tbody>
</table>

The four climate lines of effort are subdivided into categories to appreciate the focus areas within each effort. The category code nomenclature relates the type of funding supporting the lines of effort, as described in the table below:

**TABLE 3. Climate Category Fund Types**

<table>
<thead>
<tr>
<th>Climate Change Category Fund Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>M01-M03</td>
</tr>
<tr>
<td>O01-O11</td>
</tr>
<tr>
<td>R01-R12</td>
</tr>
<tr>
<td>E01-E05</td>
</tr>
</tbody>
</table>

In the following sections, supporting details of the investments in each climate line of effort are provided.
CLIMATE LINES OF EFFORT

I. INSTALLATION RESILIENCY AND ADAPTATION

Installation Resiliency and Adaptation ($1,973.9 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 from climate-induced extreme weather; (2) ensuring the Department can leverage private sector investment to improve installation energy and mission resilience; and (3) modernizing Department operations to keep pace with industry, including the auto sector’s rapid shift to electric transportation. Details by climate funding category follow:

- **Renewable energy, storage, micro-grids, efficiency gains, power distribution systems (M01)** ($553.3 million)

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

  *Funding Details:* The $553.3 million 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 while also pursuing ways to significantly lower the Department’s carbon emissions. The central effort of this program will be to build cyber-secure micro-grids, prioritized by mission requirements. Key components of this program include construction of new, high-efficiency energy systems and the improvement and modernization of existing systems to include clean and renewable energy technologies. The ERCIP program funds construction projects that would not necessarily be candidates for other types of funding, like Operation & Maintenance or third-party financing.

  The $329.0 million in ERCIP major construction funds high-priority, energy/water projects that improve installation resilience from all threats, natural and man-made, and include increased on-site, clean energy production, battery storage, cyber secure micro grids, and improvements to grid capability in order to allow the deployment of Zero Emission Vehicle (ZEV) charging infrastructure.

  The $224.3 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. These funds are required to enable the most efficient and effective project execution. This year’s P&D funding is increased to help establish a pipeline of projects with more accurate designs, generate more accurate cost estimates, and improve project execution. Funding will support projects that
have more complex design requirements, to include cyber, measurement and verification, and infrastructure to support ZEV charging.

<table>
<thead>
<tr>
<th>Climate Effort Title</th>
<th>Climate Category</th>
<th>Account Title</th>
<th>Budget Activity Title</th>
<th>Line Item Title</th>
<th>Program Element</th>
<th>FY 2023 $ in thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Total</td>
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<td>553,250</td>
</tr>
</tbody>
</table>

- **Increase installation resilience for impacts of climate change (M02) ($7.0 million)**

  *Description*: To increase resilience or address impacts or expected impacts of climate change, including sea level rise, drought, or extreme weather.

  *Funding Details*: The $7.0 million in Military Construction, Defense-Wide funding will provide for updated standards and criteria and provide advanced planning and design to improve installation resilience to climate change impacts. This military construction addresses both built and natural infrastructure. Built infrastructure serves as the staging platform for the Department’s national defense and humanitarian missions. Natural infrastructure supports military combat readiness by providing realistic operational testing and combat environments and conditions. Installations and their built and natural infrastructure also serve as the platforms from which the DoD cares for its people and projects and sustains forces.
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- **Infrastructure in support of the deployment of non-tactical electric vehicles (M03) ($23.0 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 toward fielding an all-electric non-tactical light-duty vehicle fleet by 2027.

  The $1.0 million for Air Force funds evaluation of the conversion of the non-tactical vehicle fleet to electric vehicles and installation-level charging infrastructure requirements to support it, as well as improve existing infrastructure. This funding enables the Air Force to move towards a zero-emission vehicle fleet.

<table>
<thead>
<tr>
<th>Climate Effort Title</th>
<th>Climate Category</th>
<th>Account Title</th>
<th>Budget Activity Title</th>
<th>Line Item Title</th>
<th>Program Element</th>
<th>FY 2023 $ in thousands</th>
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</thead>
<tbody>
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<td>Military Construction, Air Force</td>
<td>Minor Construction</td>
<td>Unspecified Minor Military Construction</td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>22,980</strong></td>
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</tbody>
</table>

- **Energy saving performance contracts or utility energy services contracts (O01) ($476.0 million)**

  *Description:* Energy savings performance contracts (ESPC) and utility energy service contracts (UESC) that enable the execution of climate and energy resilience initiatives.

  *Funding Details:* The $173.6 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 $190.6 million for Navy and Navy Reserve funds existing and projected Navy performance contract payments to energy service companies for UESCs and ESPCs at Navy installations. Including the FY 2023 budget request, the Navy’s total portfolio for capital investment is $1.6 billion for 45 ESPCs and $294.1 million for 56 UESCs.

  The $3.1 million for the Marine Corps funds existing and projected Marine Corps performance contract payments to energy service companies for UESCs and ESPCs at Marine Corps installations.
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The $105.0 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.

The $3.7 million in O&M, Defense-Wide for UESCs or 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. This enhancement accelerates contract throughput of third-party investment in demand reduction, energy resilience, and clean energy solutions in support of installation mission requirements.

<table>
<thead>
<tr>
<th>Climate Effort Title</th>
<th>Climate Category</th>
<th>Account Title</th>
<th>Budget Activity Title</th>
<th>Line Item Title</th>
<th>Program Element</th>
<th>FY 2023 $ in thousands</th>
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<tr>
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<td>Base Operations Support</td>
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- **Renewable energy power purchases (O02) ($102.3 million)**

  **Description:** Management and procurement of renewable and clean energy.

  **Funding Details:** The $79.8 million for Army funds obligations under existing clean energy power purchase contracts to deliver assured and resilient electricity in support of installation resilience and the 24/7 carbon pollution-free electricity (CFE) objective under the Army Climate Strategy.

  The $14.2 million for Air Force funds obligations under existing renewable energy power purchase contracts, where available, enabling 24/7 CFE in combination with innovative technology solutions.

  The $8.3 million in Working Capital Fund, Defense-Wide funding will support the DoD’s and Defense Logistics Agency (DLA) Energy efforts in renewable energy power purchases, including the Department’s efforts to transition its current U.S. electricity portfolio to 24/7 CFE. By streamlining the management and procurement of the Department’s electricity portfolio, the Department and its Government partners can leverage buying power across the U.S. electricity markets. This funding will also enable increased acquisition throughput of DLA managed utility, energy performance, and commercial contracts for on- and off-site 24/7 CFE electricity initiatives.

<table>
<thead>
<tr>
<th>Climate Effort Title</th>
<th>Climate Category</th>
<th>Account Title</th>
<th>Budget Activity Title</th>
<th>Line Item Title</th>
<th>Program Element</th>
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<td>102,263</td>
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</table>
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- **Deploy renewable energy, energy storage, or energy/water efficiency gains (O04) ($296.1 million)**

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

  *Funding Details:* The $199.2 million for Army, Army Reserve and Army National Guard funds renewable energy, energy storage, and energy and water efficiency improvements to support installation resilience, reduce energy and water consumption and related supply chain vulnerabilities, and reduce installation greenhouse gas emissions.

  The $33.9 million for Navy will support facility consolidation efforts, advanced metering initiatives, and the Utilities Infrastructure Condition Assessment Program (UICAP).

  The $16.9 million for Marine Corps will modernize infrastructure to ensure an adequate and dependable energy and water supply to support the operating forces, reduce dependence on external suppliers, increase on-site storage and generation assets, and minimize energy and water consumption. These include:

  - $15.8 million for base operations support and facilitates sustainment, restoration and maintenance projects to repair improve water and electrical systems at Marine Corps Air Station (MCAS) Yuma, Arizona; Marine Corps Recruiting Depot (MCRD) San Diego, California; Marine Corps Air Ground Combat Center Twentynine Palms, California; Marine Corps Base Hawaii; MCAS Iwakuni, Japan; MCAS Cherry Point, North Carolina, and MCRD Parris Island, South Carolina. These investments will improve efficiency while also supporting resiliency.

  - $0.9 million for Family of Mobile Power Systems to maintain program operational readiness for mobile power generation, storage, and distribution systems and environmental control equipment necessary to provide continuous, uninterrupted electrical power and climate control in austere environments. Capabilities reduce the Warfighter’s energy logistics burden and enable dispersed units to operate longer between refueling iterations by reducing fuel resupply needs, which decreases the exposure to supply line threats, increases combat effectiveness, and saves lives.

  - $0.2 million for Medium Tactical Vehicle Replacement (MTVR) to support the installation and sustainment of fuel efficient modifications to the MTVR Program. The continued installation of these modifications onto the MTVR Family of Vehicles will further increase the overall fuel efficiency of the fleet.

  The $36.2 million for Air Force enables increased energy and climate resilience through greater resource efficiency by establishing renewable energy paired with battery energy storage systems to meet mission requirements.

  The $7.8 million for the Office of the Secretary of Defense will provide the Department the planning tools, analytic capabilities and coordination mechanism required to deploy advanced energy systems across the enterprise. These funds will enable and
integrate the deployment of resilient energy solutions from a variety of funding sources to include; ERCIP, ESPC/UECCs and power purchase agreements.

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

<table>
<thead>
<tr>
<th>Climate Effort Title</th>
<th>Climate Category</th>
<th>Account Title</th>
<th>Budget Activity Title</th>
<th>Line Item Title</th>
<th>Program Element</th>
<th>FY 2023 $ in thousands</th>
</tr>
</thead>
<tbody>
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<td>Installation Resiliency and Adaptation</td>
<td>O04</td>
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<td>296,144</td>
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- **Resilience improvements impacting climate change (O05) ($322.1 million)**

  *Description:* Improvements in resilience to the expected impacts of climate change, including sea level rise, drought, or extreme weather.

  *Funding Details:* The $8.1 million for Army funds installation energy and utility restoration and modernization efforts that adapt systems to withstand climate impacts and maintain installation operations.

  The $108.5 million for Navy funds a wide variety of Facility Sustainment, Restoration and Modernization projects designed to mitigate the impacts of climate change. Projects include erosion control projects and seawall repair. In addition, the Navy will develop, plan, design, and execute additional future environmental resilience projects.

  The $13.2 million funds Marine Corps' natural resources projects that support installation and training resiliency to climate change. 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 $36.0 million for Air Force allows for planning, design and execution of environmental resilience projects. These projects will ensure installations and facilities are climate-responsive and able to adapt to the evolving impacts of climate change, including but not limited to extreme weather events, sea level rise, drought, recurrent flooding, extreme temperatures, and permafrost melt.

  The $10.0 million for the Office of Local Defense Community Cooperation (OLDCC), an independent field activity aligned under the Under Secretary of Defense (Acquisition & Sustainment), maintains several program authorities that assist state and local governments with planning, design, and program implementation of projects that address climate-related and manmade resiliency challenges. The O&M, Defense-Wide funding is for the installation resilience program which responds to climate-related and/or man-made threats that are likely to impair the operational utility of a military installation, range, military training route, special use airspace, or military operations area. Technical and financial assistance is provided to state and local governments to assess the extent of threats, determine plans to mitigate threats, and carry out those plans. The program represents the only DoD source of technical and financial resources for state and local government efforts to partner with local installations to ensure mission readiness and assurance, in light of present or likely resiliency threats. The Military Departments may nominate installations and ranges for this program based upon concerns over installation resilience, or state and local governments may request community planning assistance for studies to address resiliency concerns, including energy resiliency, and community infrastructure resiliency.
The $146.3 million dollars in O&M, Defense-Wide 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 climate risks. These nature-based solutions will be 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.

This funding also accelerates 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 environmental resilience program, Natural and Cultural Heritage Program (NCHP), emerging chemicals program, and Greenhouse gas (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.
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<table>
<thead>
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<th>Climate Effort Title</th>
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<th>Budget Activity Title</th>
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- **Deployment of non-tactical electric vehicles (O06) ($38.8 million)**

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

  *Funding Details*: 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 Department’s non-tactical vehicle fleet, meet Administration goals, and curtail greenhouse gas emissions.
MEETING THE CLIMATE CHALLENGE

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

Services and Agencies will place orders with the General Services Administration (GSA) to meet all Service requirements while replacing internal combustion engine non-tactical vehicles with ZEVs.

Additionally, $0.5 million in O&M, Defense-Wide funding 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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<thead>
<tr>
<th>Climate Effort Title</th>
<th>Climate Category</th>
<th>Account Title</th>
<th>Budget Activity Title</th>
<th>Line Item Title</th>
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MEETING THE CLIMATE CHALLENGE

- Climate impact planning; installation master plans / energy plans (O07) ($114.2 million)

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

*Funding Details:* The $69.8 million for Army, Army Reserve and Army National Guard funds engineering and planning services at installations to update current plans in order to mitigate the effects of increased climate change risks.

The $17.9 million for Navy enables revised installation master plans to incorporate impacts from climate change, and the development, planning, design, and execution of future projects to address climate impacts.

The $16.5 million for the Marine Corps will support alignment with Congressional legislation, DoD strategic direction, and Fleet Marine Forces (FMF) requirements targeting climate, energy resilience, and force design. Primary objectives target enhancing 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 furthers the analysis of climate impacts on installations and missions, which is critical to ensuring installation development and installation energy plans effectively address such impacts. Funding will also assist in the implementation of installation climate resiliency plans which are incorporated into installation energy plans.

The $5.0 million in O&M, Defense-Wide funding will support resilience of energy components to climate related disruptions. This is critical to overall energy resilience, while also improving the ability of installations to respond, recover, and adapt to changing climate. The integration of climate and extreme weather impacts into installation master planning, with particular attention to climate effects such as increasing extreme heat, ice storms, and wildfire, is key to planning future energy resilience measures. This enhanced installation master planning is necessary to continue to enable installations to support the mission in changing climate conditions.
### Personnel in support of climate change mitigation or adaptation (O09) ($21.1 million)

**Description:** Personnel to accelerate the Department's capabilities to conduct effective, efficient, and immediate climate mitigation and adaptation.

**Funding Details:** The $2.1 million for Army funds current staff and additional civilians to increase climate change mitigation and adaptation expertise within the Army’s energy and land management offices.

The $12.9 million for Navy provides manpower to increase energy efficiency expertise within the Navy's energy offices and supports efforts to increase energy efficiency expertise. This includes funding efforts to optimize energy and utilities usage and performance, including energy audits, retro-commissioning, and studies.

<table>
<thead>
<tr>
<th>Climate Effort Title</th>
<th>Climate Category</th>
<th>Account Title</th>
<th>Budget Activity Title</th>
<th>Line Item Title</th>
<th>Program Element</th>
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MEETING THE CLIMATE CHALLENGE

The $1.6 million for Air Force provides Headquarters-level personnel to support climate 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 a variety of initiatives to enable climate resilience and the planning and implementation of new technologies in support of Department climate objectives.

The $5.5 million in O&M, Defense-Wide funding will add additional personnel to accelerate the Department's capabilities to conduct effective, efficient, and immediate climate mitigation and adaptation. This funding provides staff across the Department to execute various climate programs described throughout this document.

<table>
<thead>
<tr>
<th>Climate Effort Title</th>
<th>Climate Category</th>
<th>Account Title</th>
<th>Budget Activity Title</th>
<th>Line Item Title</th>
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- **Renewable energy or energy storage systems (E03) ($12.9 million)**
  
  *Description:* Renewable energy or energy storage systems.
MEETING THE CLIMATE CHALLENGE

**Funding Details:** The $12.9 million for Army funds carbon sequestration data collection, modeling, and decision support tools for Army’s land holdings. The toolkit will visualize carbon sequestration potential over the military installations’ landscapes, as well as compare predicted carbon sink capacity based on future potential installation management activities.

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<th>Climate Effort Title</th>
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- **Energy management or measurement software and systems (E04) ($7.2 million)**

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

**Funding Details:** The $0.9 million for Army funds data-driven system management and decision support across energy systems to improve reliability and efficiency. O&M functional costs include non-labor program management, business process re-engineering (change management), help desk, system administration, technology refresh, and life cycle upgrades. RDTE functional costs include systems engineering, systems analysis, and software engineering.

The $6.3 million Navy investment will initiate projects 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 Module designs, with a beneficial impact of improved Power Added Efficiency (PAE) for radar systems that result in reduction in power draw from ship’s service electrical power for the same radar performance.

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II. OPERATIONAL ENERGY AND BUYING POWER

Operational Energy and Buying Power ($247.1 million) includes investments to optimize the use of operational energy and increase combat capability in the legacy aircraft fleet. Investments are aimed at gaining capability and reducing logistics supply requirements for deployed forces and digital flight planning tools, programs to optimize turbine engine compressor performance, and aircraft drag reduction technologies. Details by climate funding category follow:

- **Energy efficiency gains, existing platform (vehicles, ships and airplanes) (E01) ($75.6 million)**

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

  *Funding Details:* The $59.8 million for Air Force funds operational energy investments to modify in-service aircraft with commercially-proven drag reduction technologies, modernizing the 21st century mission planning software and engine sustainment technology. This will improve aircraft performance, increase aircraft efficiency, and reduce maintenance and sustainment costs.

  The $8.6 million for Navy funds $1.3 million in operational energy upgrades provides modernizations for Littoral Combat Ship (LCS) propulsion systems and $7.3 million in research and development efforts for the Navy’s Integrated Power System (IPS). Similar to what is on the Zumwalt-class destroyers, the IPS would use all the ship’s engines to produce electricity for propulsion, weapon systems, and sensors.

  The $7.9 million for the Marine Corps Medium Tactical Vehicle Replacement (MTVR) Family of Vehicles focuses on the next generation vehicle which will provide significant improvements in fuel efficiency and vehicle hybrid electrification in order to reduce dependence on petroleum fuels. The funding request in FY 2023 will support industry studies to inform requirements documentation in support of competitive prototyping commencing in FY 2024.
Electric / hybrid propulsion systems (vehicles, ships, airplanes) (E02) ($161.0 million)

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

Funding Details: The $52.7 million for Army funds the design, prototype and testing of electrification efforts for the Joint Light Tactical Vehicle (JLTV) and Family of Medium Tactical Vehicles (FMTV) to include Tactical Vehicle Electrification Kits (TVEK) for both systems, Transmission Integrated Generators (TIG) for FMTV, and development of Hybrid Electric engineering change proposals.

The $13.5 million for Marine Corps programs include the Family of Mobile Power Systems, Family of Medium Tactical Vehicle Replacement, and Family of Expeditionary Fuel Systems. The development and fielding of these equipment sets are related to enabling the persistence of distributed forces operating in a contested environment. These systems also create a demand reduction benefit, reducing overall GHG emissions of ground forces. In FY 2023, the Marine Corps begins development of the replacement for its legacy Medium Tactical Vehicle Replacement (MTVR) Family of Vehicles (FoV). The Key Performance Parameters (KPPs) for the next generation vehicle, Medium Tactical Truck (MTT) FoV, will require significant improvements in fuel efficiency and vehicle hybrid electrification in order to reduce dependence on petroleum fuels and associated logistics.
MEETING THE CLIMATE CHALLENGE

MTT FoV will have an improved operational reach while maintaining operational effectiveness and suitability. FY 2023 activities will focus on studies to assess the readiness of industry to meet the Marine Corps’ needs and identify opportunities to improve the KPPs. The FY 2023 activities will inform requirements documentation in support of competitive prototyping commencing in FY 2024.

The $94.8 million for Navy’s Integrated Power System (IPS), similar to what is on the Zumwalt-class destroyers, would use all the ship’s engines to produce electricity that turns the propellers and powers the weapons and sensors.

<table>
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<tr>
<th>Climate Effort Title</th>
<th>Climate Category</th>
<th>Account Title</th>
<th>Budget Activity Title</th>
<th>Line Item Title</th>
<th>Program Element</th>
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- **Carbon sequestration (O11) ($10.5 million)**

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

  *Funding Details:* The $10.5 million for Navy will fund priority projects, such as wetland and forest restoration, that increase base resiliency. It will also support prototyping, integrated testing, and scaled removal of carbon dioxide.
III. SCIENCE AND TECHNOLOGY

Science and Technology ($806.9 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. S&T also includes investments in climate modeling and technologies like advanced energy storage, fuel cells, and energy management systems. Details by climate funding category follow:

- **Renewable energy (R01) ($37.9 million)**

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

  *Funding Details:* The $36.3 million for Space Force funds the assessment of renewable energy capabilities, such as renewable-powered micro-grids with battery energy storage systems and geothermal technology, meeting 24/7 mission requirements and enabling demonstration and development of prototypes.

  The $1.0 million for DLA’s energy readiness program includes collaboration with the DLA military partners for research in alternative energy solutions and climate change initiatives 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.

  The $0.6 million for DoD Enterprise Energy Information Management (EEIM) will provide funding for the Military Aviation and Installation Assurance Siting Clearinghouse program to enhance review process efficiencies as the demand for renewable energy increases. It is an objective of the DoD to ensure that robust development of renewable energy sources and the increased resiliency of the commercial electrical grid may move forward in the United States, while minimizing or mitigating any adverse impacts on military operations and readiness. The Siting Clearinghouse operates under Title 10, Sec 183A, to assess energy projects so as to minimize or avoid degradation of military missions.
**MEETING THE CLIMATE CHALLENGE**

<table>
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<tr>
<th>Climate Effort Title</th>
<th>Climate Category</th>
<th>Account Title</th>
<th>Budget Activity Title</th>
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- **Energy Storage (R02) ($30.6 million)**

  *Description:* Advanced energy storage and battery development.

  *Funding Details:* The $23.8 million for Army funds research on efficient power, advanced energy storage, innovative power generation and alternative energy technologies for individual Soldier and Squad equipment, as well as fundamental research in power, energy conversion, and fuel efficiency concepts to improve lethality.

  The $5.4 million for Navy funds the battery development safety program that focuses on the safe implementation and fielding of high energy batteries through a rigorous certification process.

  The $1.4 million for Defense-wide supports Defense Logistics Agency’s manufacturing technology in the battery network program, which conducts advanced battery manufacturing research in materials and processes that improve performance, improve efficiency, reduce cost, and reduce harmful waste and impact on the environment. Key areas of research include: light-weight, advanced bipolar lead-acid batteries; designing and testing advanced battery capabilities to replace nickel-cadmium batteries.
### Fuel Cells (R03) ($0.9 million)

**Description:** Fuel cell development.

**Funding Details:** The $0.9 million for Navy funds microbial fuel cells (MFCs), 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 electricity capable of powering undersea devices and sensors for environmental monitoring. This program aims to develop technologies to increase the power density of these devices.
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- Low carbon fuels (R04) ($7.3 million)

  *Description:* Development of low carbon fuels, including hydrogen, as a substitute for traditional fossil fuels.

  *Funding Details:* The $7.3 million for Navy funds advanced the mobility fuels program which is responsible for the development and sustainment of qualification protocols, testing and analysis and coordination with between Navy, other DoD entities, industry, and international partners to qualify the use of Low Carbon Tactical Fuels, both aircraft and ship, for Naval Tactical applications. The Navy procures 1 billion gallons of tactical fuels per year. This effort will position the Navy to procure low carbon tactical fuels, keep pace with global markets to ensure operational flexibility, and, as production increases, take advantage of significant reductions in life-cycle GHG emissions (estimated at over 50 percent) with no impact to platform performance or durability.

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- Improving energy efficiency of platforms, operations or installations (R05) ($317.0 million)

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

  *Funding Details:* RDT&E funding across all appropriations supports research and deployment activities to enhance both installation energy performance and resilience as well as providing technical solutions that promote long-term operational energy solutions and military capability in accordance with the Department’s operational energy strategy.

  The $5.5 million for Army funds new materials, devices, and architectures to increase the battery life of Soldier radios and electronic equipment while providing low signature transmissions to enable Soldier survivability.

  The $43.2 million in Navy funding will expedite maturation and implementation of efficiency technologies such as micro-vanes, refueling drogue stabilization, engine wash, blade coatings, and mission planning to increase the efficiency of Naval aircraft.
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The program will improve engine specific fuel consumption, increase aircraft time on station and/or range, and reduce time and fuel needed to aerial refuel in non-optimal weather conditions.

The Navy Shore Energy Technology Transition and Integration program tests, evaluates, validates, and transitions innovative energy technologies to shore facilities that demonstrate cost-effectiveness and technical viability of energy security, efficiency, resiliency, and reliability. The program supports energy goals to reduce the Department of Navy’s reliance on fossil fuels, decrease energy-related strategic vulnerabilities (especially island and forward operating bases), demonstrate sustainability features for new and existing facilities, and reduce the logistic tail for forward operating bases.

The $4.8 million for Marine Corps’ Family of Mobile Power Systems consists of a wide range of current and emerging technologies for mobile power generation, storage, and distribution systems and environmental control equipment necessary to provide continuous, uninterrupted electrical power and climate control in austere and expeditionary advanced base operations environments.

The $21.0 million in Air Force funding supports improving flight line energy efficiency, by enabling the determination of appropriate energy efficiency improvements needed to meet mission requirements and climate related goals. This includes investments in state-of-the-art software, employing engine sustainment technologies to improve performance, increased use of simulation and augmented reality systems, and energy-aware behavior reducing unnecessary fuel consumption.

The $38.8 million for the Environmental Security Technology Certification Program (ESTCP) is to accelerate the deployment of innovative technologies that improve installation energy efficiency and security. The program, working closely with the Department of Energy and across all DoD labs, demonstrates and transitions technologies focused on component and system efficiency, solutions to reduce the time and cost to implement and operate micro-grids, and improved planning and design for installation energy resilience projects.

The $44.2 million for the Operational Energy Capability Improvement – Non-S&T (Operational Energy Prototyping Fund) is intended to help bridge the valley-of-death for prototyping successful operational energy technology development ahead of transition to a Service program. This program was directed by Congress in FY 2020 to improve the demonstration of operational energy technology and validating prototyping. The program collects cost and performance data to overcome barriers against employing an innovative technology stemming from concerns regarding technical or programmatic risk and ensures that the Department has time to establish new requirements, where necessary. This will improve the planning, programming, and budgeting for technology transition to programs of record, thus increasing warfighter transition speed by up to 2-years.

The $142.8 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 baseline OECIF funding for
powering the force, electrifying the battlespace, commanding energy, and nuclear development. Approximately 70 percent of Services’ operational energy consumption is spent on aviation. The increase in baseline funding allows coordinated investment across the Services for aviation efficiencies that was previously not possible.

The $11.3 million in Advanced Technology Development expands research with clear climate benefits, including reductions in energy usage, greenhouse gas emissions and material waste at the following DoD Manufacturing Innovation Institutes: America Makes, NextFlex, AIM Photonics and BioMade.

The $1.4 million in the Manufacturing Technology Program supports the Defense Logistics Agency’s battery network program to conduct advanced battery manufacturing research in advanced materials and processes. Key areas of research include improving low cost and energy manufacturing technologies, managing specific small business innovation projects, and battery recycling projects.

The $4.0 million for EEIM will provide funding for the Military Aviation and Installation Assurance Siting Clearinghouse program to enhance review process efficiencies as the demand for renewable energy increases. It is a DoD objective to ensure that the robust development of renewable energy sources and the increased resiliency of the commercial electrical grid may move forward in the United States, while minimizing or mitigating any adverse impacts on military operations and readiness. The Siting Clearinghouse operates under Title 10, Sec 183A requirement to assess energy projects so as to minimize or avoid degradation of military missions.
## MEETING THE CLIMATE CHALLENGE

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MEETING THE CLIMATE CHALLENGE

• **Energy efficient new platforms (R06) ($177.9 million)**

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

  *Funding Details:* The $2.0 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 improvements in range, speed, and payload lift.

  The $10.5 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 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 $10.8 million for the Marine Corps supports development of a variety of technologies including Cold Weather and Mountaineering equipment, Family of Shelters, and the offices that conduct this research. One example is Marine Air-Ground Task Force (MAGTF) Sustainment (Hybrid Expeditionary Power). Systems will be MV-22 transportable and capable of drawing upon multiple power sources (self-generated & scavenged), in order to provide electrical power to an onboard battery bank from which loads will be powered in real-time, or on which power will be stored for future use.

  The $55.0 million for Air Force supports the Service Climate Action Plan to include pursuing energy efficiencies in aircraft, such as the electric vertical take-off and landing (eVTOL) system development to leverage dual-use emerging commercial technologies. One such technology, the Series Hybrid Electric Propulsion Aircraft Demonstrator (SHEPARD), is a step towards aircraft electric propulsion that could prove a pollution free air travel option and increase the energy efficiency of air travel.

  The $22.0 million for Defense Advanced Research Projects Agency (DARPA) also funds the SHEPARD program. The SHEPARD program is designing and developing an efficient hybrid electric propulsion system and integrating it into a unique military aircraft application. The innovative aircraft design will include essential operational considerations and mission system components. The program employs a rapid development framework that capitalizes on maturing mission-enabling technologies to quickly meet emergent mission needs while overcoming significant system-level technical challenges. The result will be a flight-demonstrated system with a minimal viable mission capability that is developed quickly and at relatively low cost.

  The $74.2 million funds the Manta Ray ($38.7 million) and Sea Train ($38.7 million) programs:

  o The Manta Ray Program is developing and demonstrating 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
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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. The anticipated transition partner is the Navy. 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 Sea Train Program is supporting the delivery of masses of unmanned surface vessels 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 Unmanned Surface Vessels (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 mono-hull 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 anticipated transition partner is the Navy. This program is investigating novel methods to enable multiple ships to travel in formation to reduce wave making drag and increase energy efficiency of sea travel.
## MEETING THE CLIMATE CHALLENGE

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• **Electrification of vehicles, ships, and airplanes (R07) ($147.5 million)**

*Description:* Operational energy capability improvements funding across all appropriations improves DoD capabilities to meet operational energy objectives and promote long-term enhancements to military energy capabilities in accordance with Department's operational energy strategy.

*Funding Details:* The $64.0 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.

The $49.0 million for Navy funds the Naval Platform Operational Endurance & Climate Resiliency Science project to advance design tools focused on climate resilience and predicting emissions from platforms. Pursuing technology development efforts to impact climate remediation, including evaluation of Low Global Warming Potential refrigerants, Subsea & Seabed Warfare Energy Harvesting, and Direct Air Capture & Blue Carbon fuel synthesis. Funding also supports electrical and auxiliary system and component technology to dramatically improve naval capabilities by providing energy and power resiliency. The Navy is looking at energy efficiency and focusing on more than just electrification; investments include disruptive technologies in energy scavenging at the tactical edge, alternative fuels, and energy-efficient small-scale efforts to support the sustainment and logistics of Sailors and Marines deployed in austere environments.

The $34.5 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. This funding focuses on common efficiency opportunities for electrification of tactical vehicles and ensures learning and partnership across the services while driving down duplication of efforts.
### Measurement or modeling of climate impacts (R08) ($6.3 million)

**Description:** Research to improve preparedness with advanced sensing and monitoring of climate data to help reduce negative consequences.

**Funding Details:** The $0.4 million for Air Force supports the development of modern weather sensor 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 $4.0 million in RDT&E, Defense-wide funding will improve DoD preparedness to operate in a world impacted by climate change, reducing the likelihood of climatic “surprise” and preserving enduring advantage under all future conditions. These funds will support advancement of capabilities to measure, model, and monitor complex climate interactions at the range of geographic and time scales necessary to enable the Department to operate under changing climate conditions, thus preserving operational capability and enhancing and protecting the natural and man-made systems essential to the Department’s success. Measuring, modeling, and monitoring are key to climate-informed decision-making. Climate data sources must be continuously

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monitored and updated, with consideration of the operational impact, to account for the rapid rate of climate change and its impacts.

The $1.9 million for Pacific Disaster Centers use applied science and information and technology to reduce worldwide disaster risks and impacts on life, property, and economies.

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- **Climate change-related modeling, simulation, wargames, exercises (R09) ($16.0 million)**

  *Description*: Advanced demonstrations to collect climate-related data using modeling, simulation, wargames and exercises to identify and understand DoD’s highest priority environmental requirements.

  *Funding Details*: The $16.0 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.

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- Adaptation to climate change (R10) ($65.6 million)

  *Description:* Innovation to develop and demonstrate innovative, cost-effective, and sustainable solutions to increase DoD’s ability to meet environmental challenges and adapt to climate change. In addition to monitoring and mitigation measures for 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 $1.8 million for Army funds medical technologies that mitigate climate change-related risks to Soldiers. In addition to monitoring and mitigation measures for 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.

  The $3.7 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, resiliency, and mitigation.

  The $0.9 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 $43.8 million for Defense Advanced Research Projects Agency (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, and Food and Feedstocks on Demand programs:

    - The $14.0 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. Currently, DoD relies on purification of existing water sources or distribution of bottled or treated water to provide the warfighter with sufficient daily hydration. State-of-the-art water-from-air generation systems are not suitable for military applications because the systems do not operate in a range of atmospheric conditions needed by our service members, from arid conditions to extremely humid, and are too energy-intensive. AWE will deliver systems with extraordinarily low size, weight, and power characteristics to provide potable water to individual warfighters, and expeditionary units. Technologies developed under this program will provide strategic and tactical advantages aligned with the DoD’s vision of future combat operations carried out by distributed and self-sustaining forces. The AWE program offers an adaptation approach - as climate change leads to greater drought and scarcity of water resources, the program can provide a means to provide potable water to water-stressed populations that become more prevalent as a result of climate change.
MEETING THE CLIMATE CHALLENGE

- The $12.0 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 primary benefit of such structures is to attenuate wave height during storm events for both established and under construction coastal facilities.

- The $17.9 million request for the Food and Feedstocks on Demand program advances the development of biological technologies to support the DoD need to strengthen local resource security for the warfighter. Currently, operators in the field are burdened with transport and disposal of single-use materials. This program is using these burdensome materials as inputs to re-form the molecules for nutrition or other strategic applications. 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 program is developing technologies that process, deconstruct, and repurpose plastics and other waste products into other useful materials reducing the burden of plastic waste.

The remaining $15.2 million in RDTE, DW funding is directed toward enhanced knowledge of climate adaptation that will enable the Department to operate under changing climate conditions. Targeted applied science and technology is critical to accelerating climate adaptation across the Department. The Strategic Environmental Research and Development Program and the ESTCP harness the latest science and technology to develop and demonstrate innovative, cost-effective, and sustainable solutions to meet DoD’s environmental challenges. These technologies will find direct application by planners and managers to more efficiently prepare installations to avoid disruptions to operations resulting from climate change.
### MEETING THE CLIMATE CHALLENGE

<table>
<thead>
<tr>
<th>Climate Effort Title</th>
<th>Climate Category</th>
<th>Account Title</th>
<th>Budget Activity Title</th>
<th>Line Item Title</th>
<th>Program Element</th>
<th>FY 2023 $ in thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science and Technology</td>
<td>R10</td>
<td>Research, Development, Test &amp; Eval,</td>
<td>Advanced Technology Development</td>
<td>Medical Advanced Technology</td>
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<td>Ocean Warfighting Environment Applied Research</td>
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<td></td>
<td>Research, Development, Test &amp; Eval,</td>
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<td>Weather Service</td>
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<td>Operational Systems Development</td>
<td>Materials and Biological Technology</td>
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<td>Research, Development, Test &amp; Eval,</td>
<td>Applied Research</td>
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<td></td>
<td></td>
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<td>65,557</td>
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</table>
IV. CONTINGENCY PREPAREDNESS

Contingency Preparedness ($27.6 million) includes investments to incorporate climate risks into wargames, exercises, and other planning tools to ensure the Department understands climate impacts on missions and is prepared to respond. This includes black-start exercises to identify vulnerabilities and remediate risks to installation power systems. As climate-induced extreme weather is increasing demand for DoD support, Contingency Preparedness investments include support for Humanitarian Assistance and Disaster Relief (HADR) and Defense Support to Civil Authorities (DSCA) activities. Details by climate funding category follow:

- **Modeling, simulation, wargames, exercises (e.g. black start exercises) (O08) ($21.6 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 international program for defense-related environmental and operational energy engagement activities.

  **Funding Details:** The $7.7 million for Navy funds critical infrastructure protection. The program supports all-hazards threat and vulnerabilities assessments across the Shore enterprise.

  The $0.4 million for the Marine Corps is for the Marine Corps Prepositioning Program – Norway that supports the withdrawal of equipment and supplies for ashore prepositioning sites in support of contingency preparedness for cold weather related exercises.

  The $2.5 million for Air Force supports efforts for black-start exercises to assess that our installations are ready and capable of withstanding utility disruptions caused by extreme weather or malevolent acts. These exercises highlight needed utility improvements to support mission assurance, energy resilience, and climate-response

  $3.0 million in O&M, DW funds the Defense International Environmental Program (DEIC) to work with international partners on defense-related environmental and operational energy engagement activities. DEIC also supports international engagement in pursuit of the strategic end states identified in the Secretary of Defense’s Guidance for the Employment of the Force as well as the Combatant Command’s Theater Campaign Plans.

  The $8.0 million for the Joint Training Exercise and Evaluation Program (JTEEP), formerly Combatant Commander Exercise Engagement and Training Transformation (CE2T2), funds Joint Exercises at Combatant Commands and incorporates joint context into Service training programs. The FY 2023 funding request for JTEEP builds on FY 2022 investments for climate change to support climate and severe weather-related exercises. In FY 2023, funding will be applied to SOUTHCOM and NORTHCOM exercises. The SOUTHCOM exercises, CENTAM GUARDIAN and RESOLUTE SENTINEL, will improve combined responsiveness with partners to execute humanitarian assistance and disaster recovery due to changing climate conditions. Funding applied to NORTHCOM 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.

- **HADR and DCSA for extreme weather events (O10) ($6.0 million)**

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

  *Funding Details:* The $1.1 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 impacting military operations globally. Funding will also ensure proper sustainment of climate services at higher enclaves to Combatant Commands, the Intelligence Community, advanced acquisition programs, and planning communities. It also includes necessary cybersecurity oversight to protect defense information systems from cyber threats.

  The $4.9 million is for Pacific Disaster Centers that is 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 most demanding 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.

<table>
<thead>
<tr>
<th>Climate Effort Title</th>
<th>Climate Category</th>
<th>Account Title</th>
<th>Budget Activity Title</th>
<th>Line Item Title</th>
<th>Program Element</th>
<th>FY 2023 $ in thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contingency Preparedness</td>
<td>O10</td>
<td>Operation &amp; Maintenance, Air Force</td>
<td>Operating Forces Administration and Service-Wide Activities</td>
<td>Global C3I and Early Warning</td>
<td>0305111F</td>
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<td>Operation and Maintenance, Defense-Wide</td>
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<td>Defense Logistics Agency</td>
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### TABLE 4. Climate Funding by Appropriation

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<tr>
<th>Appropriation</th>
<th>FY 2023 $ in thousands</th>
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<tbody>
<tr>
<td>Operation &amp; Maintenance, Army</td>
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<tr>
<td>Operation &amp; Maintenance, Navy</td>
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<td>Operation &amp; Maintenance, Marine Corps</td>
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<td>Operation &amp; Maintenance, Air Force</td>
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<td>Operation and Maintenance, Defense-Wide</td>
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<td>Operation &amp; Maintenance, Army Res</td>
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<td>Operation &amp; Maintenance, Navy Res</td>
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<td>Operation &amp; Maintenance, ARNG</td>
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<td>Other Procurement, Army</td>
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<tr>
<td>Other Procurement, Navy</td>
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<td>Procurement, Marine Corps</td>
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<td>Aircraft Procurement, Air Force</td>
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<td>Military Construction, Defense-Wide</td>
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<td><strong>Grand Total</strong></td>
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## MEETING THE CLIMATE CHALLENGE

### TABLE 5. Climate Funding by Line of Effort and Category

<table>
<thead>
<tr>
<th>Climate Lines of Effort</th>
<th>Climate Categories</th>
<th>Climate Category Code</th>
<th>FY 2023 $ in Thousands</th>
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<tbody>
<tr>
<td><strong>Installation Resiliency and Adaptation</strong></td>
<td>Renewable energy, Storage, Microgrids, Efficiency Gains, Pwr Distr Systems</td>
<td>M01</td>
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<td></td>
<td>Increase installation resilience for impacts of climate change</td>
<td>M02</td>
<td>7,000</td>
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<td></td>
<td>Infrastructure ISO the deployment of non-tactical electric vehicles</td>
<td>M03</td>
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<td></td>
<td>ESPC or UESC</td>
<td>O01</td>
<td>476,020</td>
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<tr>
<td></td>
<td>Renewable Energy Power Purchases</td>
<td>O02</td>
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<td></td>
<td>Deploy renewable energy, storage, energy/water efficiency gains</td>
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<td></td>
<td>Resilience improvements impacting climate change</td>
<td>O05</td>
<td>322,057</td>
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<tr>
<td></td>
<td>Deployment of non-tactical electric vehicles</td>
<td>O06</td>
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<td></td>
<td>Climate impact planning; installation master plans / energy plans</td>
<td>O07</td>
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<td></td>
<td>Personnel ISO climate change mitigation or adaptation</td>
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<tr>
<td></td>
<td>Renewable energy or energy storage systems</td>
<td>E03</td>
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<tr>
<td></td>
<td>Energy management or measurement software and systems</td>
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<td><strong>Installation Resiliency and Adaptation total</strong></td>
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<td><strong>Operational Energy and Buying Power</strong></td>
<td>Energy efficiency gains, existing platform (vehicles, ships and airplanes)</td>
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<td></td>
<td>Electric / hybrid propulsion systems (vehicles, ships, airplanes)</td>
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<td></td>
<td>Carbon sequestration.</td>
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<td></td>
<td><strong>Operational Energy and Buying Power total</strong></td>
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<td><strong>Science and Technology</strong></td>
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<tr>
<td></td>
<td>Energy storage</td>
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<td>Fuel cells</td>
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<td></td>
<td>Low carbon fuels, including hydrogen</td>
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<td>7,277</td>
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<tr>
<td></td>
<td>Improving energy efficiency of platforms, operations or installations</td>
<td>R05</td>
<td>317,000</td>
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<tr>
<td></td>
<td>Energy efficient new platforms</td>
<td>R06</td>
<td>177,945</td>
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<tr>
<td></td>
<td>Electrification of vehicles, ships, and airplanes</td>
<td>R07</td>
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<td></td>
<td>Measurement or modeling of climate impacts</td>
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<td>Climate change-related modeling, simulation, wargames, exercises</td>
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<td>Adaptation to climate change</td>
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<td><strong>Science and Technology total</strong></td>
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<td><strong>Contingency Preparedness</strong></td>
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<td><strong>Contingency Preparedness total</strong></td>
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<td><strong>Grand Total</strong></td>
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