

Fiscal Year 2022 Operational Energy Budget Certification Report



**Assistant Secretary of Defense for
Sustainment**

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The estimated cost of this report or study for the Department of Defense is approximately \$58,000 in Fiscal Years 2020 - 2021. This includes \$23,000 in expenses and \$35,000 in DoD labor.

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Executive Summary

The Fiscal Year (FY) 2022 Operational Energy Budget Certification Report satisfies the reporting requirement in section 2926(e)(4) of title 10, United States Code, and the separate energy and fuel budget justification requested in House Report 112-479, page 121, accompanying H.R. 4310, the National Defense Authorization Act for FY 2013. By statute, operational energy is defined as “energy required for training, moving, and sustaining military forces and weapons platforms for military operations,” and includes energy used by ships, aircraft, combat vehicles, tactical power systems, and generators.¹

Title 10, United States Code, section 2926(e)(4), requires the Secretary of Defense to submit a report on each military department’s and defense agency’s budget estimate submission for activities associated with implementing the *Operational Energy Strategy*², which were previously reviewed and certified by the Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)) as either adequate or inadequate for implementing the objectives of the Operational Energy Strategy. As has been done since 2015, rather than submit a report on the budget estimate submissions, which may change significantly in the process for developing the President’s Budget, USD(A&S) submits a report certifying that the Department of Defense portion of the FY 2022 President’s annual budget request to Congress is adequate for implementing the objectives of the *Operational Energy Strategy*. The focus of the report on the adequacy of the Department’s portion of the President’s Budget for implementation of the *Operational Energy Strategy* is also complimentary to the requested energy and fuel budget justification.

The FY 2022 President’s Budget aligns with direction from the President and the Secretary of Defense to ensure the forces and supply chains are resilient in the face of a wide range of challenges to include climate change, disruptions to energy supplies, and direct physical and cyber-attacks. The *Operational Energy Strategy* reinforces the role of assured delivery of energy to the warfighter in enabling worldwide missions, and establishes objectives for increasing future capabilities and reducing risks.

To carry out this review, the Department compared the proposed budgets of each Component against the three objectives in the *Operational Energy Strategy*: 1) Increase future warfighting capability; 2) Identify and reduce logistics and operational risks; and 3) Enhance mission effectiveness of the current force. Component support of the *Operational Energy Strategy* objectives was rated green as adequately funded, yellow as marginally funded, or red as inadequately funded. It is important to note that green ratings indicate objectives are funded to a level that allows adequate progress throughout the fiscal year, not that the objective is complete.

The President’s Budget for FY 2022 requested more than \$2.7 billion for the execution of operational energy initiatives. These investments procure new or upgrade existing vehicles and aircraft, increase the range and endurance of platforms, enhance energy resiliency at contingency bases, and plan and execute war-games to account for increasing risks to logistics and

¹ 10 U.S.C. 2924(4).

² 2016 *Operational Energy Strategy*. This strategy is accessible via:
http://www.acq.osd.mil/eie/Downloads/OE/2016percent20Oepercent20Strategy_WEBd.pdf

sustainment. As the Department prepares to operate in contested environments around the globe, these investments increase range, endurance, and lethality while decreasing risks to warfighters.

Relative to the President’s Budget for FY 2021, these operational energy enhancements include:

- Operational Capability Improvement Fund (OECIF): +\$74.3 million
- Operational Energy Prototyping Fund (OEPF) +\$23.2 million
- Alternative Fuels Certification: +\$2 million
- Air Force/Navy Operations and Planning Tools: +\$38.6 million
- Air Force Large Aircraft Drag Reduction: +\$14.1 million
- Navy Platform and Propulsion Upgrades +\$19.5 million
- Army Tactical Vehicle Electrification: +\$38.7 million.

Table 1 shows the overall funding of the Department’s operational energy program aligned against the objectives of the *Operational Energy Strategy*.

Table 1. DoD Operational Energy Investments by Strategy Objective, FY 2022 (\$ Millions)

Operational Energy Strategy Objectives	OSD	Air Force	Army	Navy	Marine Corps	Total
Enhance Mission Effectiveness of the Current Force	\$5	\$503	\$762	\$15	\$30	\$1,315
Increase Future Warfighting Capability	\$97	\$219	\$565	\$409	\$20	\$1,310
Identify and Reduce Logistics and Operational Risks	\$5		\$46	\$32		\$83
<i>Total</i>	\$107	\$722	\$1,373	\$456	\$50	\$2,708

Separate from these investments and overseen by the Office of the Under Secretary of Defense (Comptroller), the FY 2022 budget also includes the Defense Logistics Agency (DLA) estimate of fuel (Appendix D) provided as a reimbursable good to the Military Departments.

In FY 2021, the Department will complete the development of a new energy strategy to ensure advance resilient, cyber-secure, and efficient energy for Joint Forces and installations. The strategy will meet the requirements for an operational energy strategy, as prescribed in section 2926(d) of title 10, U.S Code, and will be used in the review of Department investments in future budget certification reports to Congress.

Office of the Secretary of Defense

As the senior energy advisor to the Under Secretary of Defense for Acquisition & Sustainment (USD(A&S)), the ASD(S) oversees and supports operational energy programs across the Department. Office of the Secretary of Defense (OSD) support to operational energy occurs through day-to-day operations of the Office of the Deputy Assistant Secretary of Defense for Environment & Energy Resilience (ODASD (EER)), and the Defense Logistics Agency (DLA).

OASD(S)

During FY 2020, the Department continued to refine its organization to meet current and future energy demands. Following the integration of operational and installation energy in FY 2018, the Office of the Deputy Assistant Secretary of Defense (ODASD) for Energy and the ODASD for Environment were consolidated into a single office, the ODASD for Environment and Energy Resilience, that will continue to oversee the Department's entire energy portfolio. OASD(Sustainment) will use Operation & Maintenance resources (**FY 2022, \$5M**) to oversee and integrate Department energy initiatives, to include development of an integrated energy strategy.

In FY 2022, OASD(S) will continue to develop policy and conduct oversight regarding the Department's use of operational energy. OASD(S) will be updating operational energy policy and governance, including Department of Defense Directive 4180.01, *DoD Energy Policy*, and Department of Defense Instruction 4140.25, *DoD Management Policy for Energy Commodities and Related Services*, with a focus on ensuring resilient and cyber secure energy for forces.

The Operational Energy Capability Improvement Fund (**OECIF; FY 2022, \$74M**) is an advanced technology development program that matures operational energy technologies from Technology Readiness Level (TRL) 3, characterized by analytical and laboratory studies, to TRL 6, characterized by a model or prototype system tested in a relevant environment. OECIF addresses joint requirements and capability gaps related to Powering the Force, Electrifying the Battlespace, and Commanding Energy. In line with Congressional direction, the Department also established the Operational Energy Prototyping Fund (**OEPF; FY 2022, \$23M**) to further enhance the transition of operational energy technologies to programs of record through prototyping. OEPF will demonstrate the most promising, innovative, cost-effective joint technologies, with the goal of minimizing the "valley of death" regarding transition to programs of record. Reflecting the direction in the FY 2021 National Defense Authorization Act (FY21 NDAA) section 324 (b)(1) to re-align OECIF to ASD(S), OASD(S) now oversees OECIF/OEPF, along with the Strategic Environmental Research Program (SERDP) and the Environmental Security Technology Certification Program (ESTCP), to advance common goals of the Department, promote organizational synergies, and avoid unnecessary duplication of effort.

The FY21 NDAA section 324 (c)(4) also directs the Secretary of Defense to develop and utilize a tool to track relevant investments in operational energy from applied research to transition to use to ensure user organizations have the full picture of technology maturation and

development. The FY2022 Budget requests funds for the creation of the OEPF 6.4 fund and for the tracking tool.

OASD(S) Rating: GREEN. Additional information on OASD(S) initiatives and responsibilities can be found in Appendices A, B, C, and E.

Defense Logistics Agency

The FY 2022 President's Budget includes **\$5M** in DLA investments to identify and reduce logistics and operational risks. These investments include \$2M in the Energy Readiness Program, which considers improvements in military acquisition specifications and analytical methods; renewable fuels and energy technologies; and DoD fuel storage, handling, and distribution systems to enhance the resilience of the Class III Bulk supply system. In addition, the Battery Network manufacturing technology Research and Development program will apply \$3M toward technical improvements that improve supply and performance, mitigate obsolescence, and reduce costs for batteries used in fielded weapons or soldier systems.

Additional information on DLA initiatives can be found in Appendix E.

Defense Logistics Agency Assessment Rating: GREEN. Progress was made on the energy storage standardization process, but additional efforts are needed to more closely align requirements with existing inventory to reduce overall battery variety across the Department. The OASD(S) assessed the proposed FY 2022 budget for DLA as adequate for the implementation of the *Operational Energy Strategy*.

Air & Space Forces

For FY 2022, the Air Force and Space Force budgeted a combined **\$722M** for investments that have an operational energy benefit, including \$503M to Enhance Mission Effectiveness of the Current Force and \$219M to Increase Future Warfighting Capability.

The primary Air Force investment to enhance the current force is the B-52 Commercial Engine Replacement Program (**CERP; FY 2022, \$484M**). Replacing the aging B-52s with a new commercial-based engine that will be 20% more efficient, enable upgrades to various mission systems, and yields substantial improvements in both maintainability and readiness. While these capability enhancements are significant, CERP evolved from expected sustainment challenges with the legacy B-52 engine, and not due to operational energy considerations. As such, B-52 CERP is considered a sustainment program with operational energy benefits, rather than a program prioritized based on operational energy risk and reward.

The Legacy Aircraft Drag Reduction Program (**FY 2022, \$15.5M**) will prototype, demonstrate, and eventually procure low-risk technologies that improve fuel efficiency for multiple aircraft, including C-17 microvanes, C-130 finlets, KC-135 vertical windshield wipers, and C-17 engine pylon fairings. Air Force investments in future warfighting capabilities also include operations and planning digital tools (**FY 2022, \$33M**) for optimizing Air & Space

Operations Center processes and planning. Other enhancements will focus on airlift and tanker operations by optimizing cargo loading, aircrew scheduling, and aircraft allocation.

For future warfighting capabilities, the FY 2022 PB includes Air Force investments in increased efficiency of engines, aircraft design, and operations and planning tools to enhance the range and capability of the force. The Adaptive Engine Transition Program and Next-Generation Adaptive Propulsion Program (**FY 2022 combined, \$124M**) will focus on development and maturation of engines for 5th- and 6th-generation fighter aircraft, respectively. Recent prototype engine tests validated that adaptive engines produce higher thrust response, increase efficiency during cruise, and significantly enhance power and thermal management capabilities when compared to current 5th-generation fighter engines.

Additional information on Air Force energy initiatives can be found in Appendix E.

Air & Space Forces Rating: YELLOW. While the Air Force made significant strides toward operational energy goals in the areas of mission planning and execution and legacy aircraft drag reduction, the OASD(S) is concerned that the Air Force continues to lack dedicated operational energy research and development programs to support development of future weapons systems. As the largest fuel consumer in the DoD, it is critical for the Air and Space Forces to identify and mitigate operational energy risks as early as possible in the capability development process and acquisition life cycle.

Army

In FY 2022, the Army budgeted **\$1,373M** for energy-related investments. In support of efforts to rebuild readiness, \$762M will Enhance Mission Effectiveness of the current force and \$46M for capabilities that Reduce Logistics Risks to Mission. In addition, the Army budgeted \$565M to Increase Future Warfighting Capabilities through modernization.

In support of enhancing mission effectiveness, the Army is investing in improvements to the Paladin self-propelled howitzer (**FY 2022, \$446M**). Enhancements to the Bradley engine, chassis, and suspension will provide greater mobility; a high-voltage generator and electric actuators will increase accuracy and lethality; and maintenance will be simplified. The Army also continues to replace the venerable HMMWV with the Joint Light Tactical Vehicle Program (**JLTV; FY 2022, \$99M**) that provides better ton-mile per gallon fuel efficiency with better protection, achieves a 30 percent reduction in fuel consumption at idle compared to legacy HMMWV, and can be outfitted with modular accessory packages to provide power to carried shelters, extend silent watch capabilities, or export power at need.

Army investments in future warfighting capabilities are focused on enhancing electrification, power generation, and improved engine performance. The Armored Multi-Purpose Vehicle Program (**AMPV; FY2022, \$104M**) provides improved power generation and mobility over legacy M113. The Platform Electrification and Mobility Project (**FY2022, \$38.7M**) focuses on hybrid-electric powertrains and enhanced vehicle electronics, with the goal of increasing mobility and improving acceleration, thereby extending mission duration and effectiveness. The Army is also investing in the Improved Engine Turbine Program (**FY2022,**

\$275M) to improve turbine engine performance, by increasing the altitude, lowering the fuel and maintenance requirements, and improving the overall reliability.

In support of assured fuel distribution and reduced logistical risks, the Army is investing in the Entry Fluid Distribution System (**E2FDS; FY 2022, \$13.9M**) to complement the Inland Petroleum Distribution System (IPDS) pipeline. The E2FDS can move 850,000 gallons per operational day through flexible conduit and automated pump stations and can be emplaced at a rate of 25 miles per day. The Army also is investing in the Bulk Fuel Distribution Systems (**BFDS; FY2022, \$19M**) to further mitigate risks to fuel distribution.

Additional information on Army energy initiatives can be found in Appendix E.

Army Rating: GREEN. The OASD(S) assesses the Army's proposed FY 2022 budget as adequate for the implementation of the *Operational Energy Strategy*.

Department of the Navy

Including the Navy and the Marine Corps, the Department of the Navy (DON) continues to enhance the lethality and effectiveness of forces through increased energy resilience, operational reach, and time-on-station of forward deployed naval forces. The operational energy focus in the FY 2022 budget supports the development, integration, and deployment of (1) advanced weapons systems and sensors, (2) alternative electric power sources, and (3) advanced batteries and energy storage.

Navy

In FY 2022, the Navy budgeted **\$456M** for operational energy investments, including \$409M to Increase Future Warfighting Capability, \$32M to Identify and Reduce Logistics and Operational Risk, and \$15M to Enhance Mission Effectiveness of the current force.

To increase future warfighting capability, Navy investments include the development of the MQ-25A (**FY2022, \$222M**), a CVN-based unmanned refueling aircraft that will enhance the range, capacity, and versatility for the Joint Forces Commander through rapid development, delivery, and integration of an effective, affordable, sustainable and adaptable unmanned air system into the Carrier Air Wing. In addition, the Integrated Power and Energy Systems Program, (**FY2022, \$69M**) will support development of Next Generation Integrated Power and Energy System (NGIPES) technology aboard Navy Ships to enable current and future weapons and sensor systems.

To enhance mission effectiveness and reduce logistics and operational risk, in FY 2022, the Navy is continuing its investment in the Platform and Propulsion Upgrades Program (**FY2022, \$20M**) that will fund improvements to DDG-51, LPD-17, LCS, and TAO-205 class oilers. The Alternative Fuels Qualification Program (**FY2022, \$2M**) will support testing and qualification of the available commercial pathways not approved for DoD use.

Additional information on Navy energy initiatives can be found in Appendix E.

Navy Rating: GREEN. Due to continued investment and focus on power, advanced batteries, and fuel distribution, OASD(S) assesses the Navy's proposed FY 2022 budget as adequate for the implementation of the *Operational Energy Strategy*.

Marine Corps

In FY 2022, the Marine Corps budgeted **\$50M** for operational energy investments, including \$20M to Increase Future Warfighting Capability and \$30M to Enhance Mission Effectiveness of the Current Force.

To increase future warfighting capability, Marine Corps investments include the Fuel Efficient Medium Tactical Vehicle Replacement Program (**FE MTRV; FY2022, \$7M**) to develop, optimize, integrate, and demonstrate at least 15 percent fuel efficiency improvement across a set of driving cycles representative of likely operational conditions, while maintaining MTRV affordability, current mobility, transportability, and survivability capabilities. Additionally, the Marine Corps invested in Expeditionary Energy Office (**E2O; FY2022, \$4M**) to further define future energy needs and investments required to mitigate emerging capability gaps. E2O continues to focus on Operational Reach looking at systems required to build a resilient energy network and increase the lethality of future forces through more effective use of energy innovation.

Marine Corps investments to enhance mission effectiveness of the current force include the Advance Mobile Medium Power Sources Program (**FY2022, \$30M**) to continuously procure, update, and replenish approximately 19,000 pieces of Mobile Tactical Power Generation and Distribution Equipment. This equipment is procured and fielded to provide electricity on the battlefield. Combat, combat support, and combat service support units all require tactical power to operate weapons systems, C4I systems, medical and messing facilities, environmental control equipment, and water purification systems.

Additional information on Marine Corps energy initiatives can be found in Appendix E.

Marine Corps Rating: YELLOW. Additional focus needs to be placed on critical capabilities associated not only with reducing risks, but also expanding capability, including systems like long-dwell and long duration unmanned systems.

Conclusion

The ASD(S) certifies that the FY 2022 President's Budget for the Department of Defense (DoD) is adequate for implementing the objectives of the *Operational Energy Strategy*. The current objectives of improving long-term capability, identifying and decreasing operational risk, and enhancing mission effectiveness of the current force align with and enhance the goals of the Department.

Looking ahead, the Department will implement a comprehensive energy strategy that aligns to *National Defense Strategy* priorities by focusing on energy resilience for both forces

and facilities. The unified Department energy strategy will provide the basis for meeting the budget reporting requirement in section 2926(e)(4) of title 10, United States Code. Given the need for resilient and agile logistics, the Department will continue to invest in energy initiatives that increase joint capability at best cost and provide combat capable forces and facilities to deter war and protect our nation's security.

Appendix A. Operational Energy in Requirements and Planning

In accordance to title 10 U.S. Code § 2926(e)(6), this appendix to the FY 2022 DoD Budget Certification report describes actions taken by the Joint Requirements Oversight Council (JROC) to complete implementation of the Energy Key Performance Parameter (title 10 U.S. Code § 2911) and details how operational energy is being addressed in defense planning scenarios, support to strategic analysis, and policy to improve combat capability. In addition to providing the Chairman's assessment of Joint Staff actions completed in FY 2020, the appendix includes information to account for the greater role of the Services in requirements and planning.

Joint Staff

The Joint Requirements Oversight Council completed implementation of the Energy Key Performance Parameter (energy KPP) for all programs in 2017, and streamlined the Joint Capabilities Integration and Development System (JCIDS) process in 2018.

As detailed in the FY 2021 Operational Energy Budget Certification Report, the JROC delegated oversight for the energy KPP to the military Service sponsors, but also reserved the authority to oversee the energy KPP for large programs that may significantly affect the operational energy burden of joint forces. This approach has proven effective, for example in FY 2020 energy KPP analysis by the Service sponsors was sufficient and Joint Staff intervention was not required.

The established JROC energy KPP waiver process relieves the military Service sponsors from completing energy supportability analyses and establishing energy KPPs for new capabilities that will not be net energy intensive. Programs eligible for the energy KPP waiver include software-only capabilities; contiguous United States-only, non-deployable, or training capabilities; capabilities with self-contained or nuclear energy sources that are not "energy providers," such as expendable munitions and satellites; and permanent component replacement in accordance with system engineering plans for existing platforms. This defined waiver procedure streamlined the JCIDS process, reduced non-value added work, and enabled better oversight of critical capability requirements that will significantly affect energy demand.

Operational energy principles are integrated into relevant defense planning scenarios, support to strategic analysis, and resulting policy during routine revisions. The *Operational Energy Strategy* directs the management of energy related risks in deliberate planning. Combatant Commander Campaign and Posture Plans now incorporate operational energy and energy security considerations which affect access, agreements, logistics sufficiency, and integrated priorities. Logistics assessments for fuel or energy sufficiency are completed for all Operational Plans and Contingency Plans, and the fuel and energy assessments are reflected in the Chairman's Risk Assessment and in the more detailed Joint Logistics Estimate and Global Logistic Readiness Dashboard. Operational Energy is now factored into modeling, war-games, and large exercises.

Army

As a complement to JCIDS, the Army Capabilities Integrated Development System (ACIDS) provides capability developers with guidance and templates through “writing guides” published by Army Futures Command that proscribe the creation of a capability document with the identical format and content submitted under JCIDS for all Acquisition Categories.

In FY 2019, the Army developed the Abbreviated Capability Development Document (A-CDD) to support rapid prototyping and rapid fielding under Middle Tier Acquisition Authorities. In FY 2020, the Army updated policy and guidance on drafting A-CDDs to further accelerate the process of writing and approving an A-CDD. The A-CDD is used to establish an Army position on development of an Army materiel capability. While an A-CDD will not support a Materiel Development Decision or an Acquisition Milestone, the A-CDD contains, and must address, all 13 paragraphs of a standard Capability Development Document, although not to the same level of detail. Successful rapid experimentation and prototyping from an A-CDD directly informs the documentation of a standard CDD for an acquisition decision. The A-CDD supports the Army objective to rapidly acquire prototypes and get them into Soldier’s hands for evaluation well before an acquisition decision is made.

During FY 2020, the Army approved 17 JCIDS documents for new capabilities that addressed the energy KPP. Twelve of the 17 systems were exempt due to various rationale, but primarily because the systems do not require energy resupply. A single Capabilities Production Document was approved which did not require an energy KPP. Finally, the four approved CDDs which were not exempt did include energy KPP language. Additionally, one of the two A-CDDs validated in FY 2020 included energy KPP language. Although not mandated to do so, the Cross-functional Team responsible felt that energy effectiveness was important enough to the capability that they specifically addressed that desire in their A-CDD.

Table 2. Army Acquisition Programs

<u>Weapons System/Program</u>	<u>Acquisition Document</u>	<u>Energy KPP Status</u>	<u>Rationale</u>
Threat Emulation (TE) (DCO child doc)	Reciprocal Defense Procurement (RDP)	Exempt	TE consists of software components to which hardware energy efficiency does not apply. The solution will reside on or be accessed from information systems operating from an associated facility.
High Accuracy Detection and Exploitation System	Abbreviated Capability Development Document (A-CDD)	N/A	
Mounted Assured Positioning, Navigation and Timing System (PNT CFT MS B effort)	Capability Development Document (CDD)	Yes	MAPS shall operate within the allocated energy budget (e.g., gallons of fuel or batteries) of the platform on which it resides for mission duration indicated in the OMS/MP. (T=O)
Medical Equipment Sets Holistic Health (MES H2F) and Fitness Increment 1	CDD-U	Exempt	MES H2F components shall be designed to current Energy Star or industry compliance standards for energy efficiency [T = O].
Medium Equipment Trailer	Capability Development Document (CDD)	Exempt	The sponsor has determined this KPP is not applicable. Propulsion of the trailer is provided by the truck tractor.

Enhanced Robotic Payloads - Render Safe (ERP-RS)	Capability Development Document (CDD)	Yes	ERP-RS Inc I consists of payloads that may or may not contain inherent power. Payloads are designed to optimally pull power from robotic chassis. The sponsor took this KPP into consideration and determined ERP will have minimal impact on current systems currently in use.
Enhanced Robotic Payloads - Unmanned Ground Systems	Capability Development Document (CDD)	Yes	The sponsor took this KPP into consideration and determined ERP will have minimal impact on current systems currently in use. ERP-UGS Inc I consists of payloads that may or may not contain inherent power. Payloads are designed to optimally pull power from robotic chassis.
Command Post Integrated Infrastructure (CP12) (Network CFT interest)	Capability Development Document (CDD) (draft)	Exempt	The CPI2 program will integrate governmental and commercial components/systems from other PORs into the MCP and CPSV.
Dengue Virus Tetravalent Vaccine (DVTV)	CDD-U	Exempt	An Energy Efficiency KPP is not appropriate for this capability. The DVTV does not require energy or fuel.
Aerial Weapons Scoring System (AWSS) Revision 1	Operational Requirements Document (ORD)	Exempt	Justification: AWSS is a training system, and exempt from the Energy KPP.
Soldier Protection System - Integrated Head Protection (IHPS) System Revision 2	Capability Production Document (CPD)	Exempt	The energy efficiency KPP is not applicable. IHPS does not consume fuel (hydrocarbon). Therefore, the energy efficiency KPP is not required.
30mm Multi-Function Munition (MFM)(Airburst)	CDD (draft)	Exempt	30mm MFM does not consume operational energy such as fuel (hydrocarbon) or require external sources of electricity. Therefore, the energy KPP is not required.
7.62mm Advanced Armor Piercing (ADVAP)/Tracer Cartridges	Capability Production Document (CPD)	Exempt	Justification: 7.62mm ADVAP ammunition does not consume energy and is not applicable in this case.
Joint General Purpose Decontaminant for Hardened Military Equipment (JGPD-HME)	Capability Production Document (CPD)	Exempt	The JGPD-HME is not mission critical. The Force Protection KPP does not apply per JCIDS Manual Enclosure D, Appendix B. This capability is unmanned and will be used to provide operational and thorough decontamination capabilities for tactical vehicles, surfaces afloat, crew-served weapons and individual weapons handle intelligence data. The current HETS rated at 70 ton payload capacity was able to attain a 300 mile range with both fuel tanks filled. The M1300 which will be rated for an 82 ton payload capacity is expected to also be able to attain a 300 mile range with both tanks filled.
Enhanced Heavy Equipment Transport System (HETS) Increment 3	Capability Development Document (CDD)	Yes	Energy efficiency is not applicable to this capability since the provision of energy for the proposed system does not impact the operational reach, or require protection of energy infrastructure or energy resources in the logistics supply chain.
Next Generation Biometric Collection Capability	Capability Development Document (CDD)	Exempt	Selectively applied KPPs (System Training and Energy Efficiency) not appropriate for MP
Joint Tactical Radio System - Manpack	Capability Production Document (CPD)	Exempt	

Revision 1 (aka Mounted and Dismounted Manpack CPD Revision 1)

capability. It was determined through analysis System Training and Energy Efficiency should not be KPPs.

Air and Space Forces

For the Air Force, the energy KPP supports the mitigation of appropriate acquisition program risk and reduces vulnerabilities in future operations. As intended, the energy KPP accounts for liquid fuel use, as well as platform power and thermal management.

Effectively managing campaign fuel demands remains a key component to assuring future air superiority. As the consumer of roughly two billion gallons of jet fuel annually, reducing Air Force liquid fuel demand by optimizing fuel use is critical to mission success. During peace time, this primarily ensures efficient use of tax-payer dollars in maintaining the readiness of personnel and aircraft. During wartime, which is expected to be a fuel-limited environment, optimized fuel use can be the difference between launching one more sortie, or not. The Air Force views the energy KPP as an opportunity to achieve progress toward fuel-optimized operations.

In addition to the criticality of assured fuel, the energy KPP addresses power and thermal management requirements. Rapid advancements in electrically-powered onboard systems, such as avionics and sensors, have presented challenges for the Department in modernizing legacy systems. Due to the nature of the acquisition program documents, an immediate consequence of the energy KPP includes updated systems engineering plans with enhanced platform power and thermal management requirements. These changes include consideration of potential “headroom” required for meeting the power needs of future upgrade programs. Moving forward, Air Force acquisition planning will include, at a minimum, consideration for power and thermal margin to enable future system upgrades. If not considered early in the lifecycle, overcoming upgrade limitations could be cost- and/or schedule-prohibitive, rendering weapons systems less capable than required to overcome ever-increasing threats and meet dynamic mission requirements.

In FY 2020, there were 12 Air Force acquisition program documents coordinated at the headquarters level (Table 3). The energy KPP was considered “not applicable” for six programs, three programs were assessed as “exempt,” and three programs have thus far adequately addressed and applied the energy KPP.

Table 3. Air Force Acquisition Programs

<u>Weapons System/Program</u>	<u>Acquisition Document</u>	<u>Energy KPP Status</u>	<u>Rationale</u>
F-16 Radar Modernization	Capability Development Document	Exempt	Existing F-16 power & thermal (P&T) limitations will drive new radar system P&T requirements
30-mm Multi-Functional Munitions	Capability Development Document	N/A	This munition is not a significant P&T or fuel consumer of itself

F-15EX	Rapid Fielding Requirements Document	Exempt	Program intended to be 1-for-1 replacement of legacy weapons systems (F-15C/E)
Advanced Aerial Refueling (AAR)	Initial Capabilities Document (ICD)	No KPPs addressed in ICD; energy comments submitted	AAR concept still under development; AF OE actively working with capability developers to ensure ESA & subsequent energy KPP(s) are incorporated early in the system(s) design phase
Space Maneuver and Servicing	Initial Capabilities Document	N/A	No direct energy component to the program
Agile Communications Enterprise Approach	DOTmLPP-P Change Recommendation	N/A	No direct energy component to the program
B-52 Commercial Engine Replacement Program	Capability Development Document	Exempt; fuel efficiency considered Key System Attribute (KSA)	Program intended to be 1-for-1 replacement of legacy engines (TF-33); primarily a sustainment initiative (TF-33 considered unsustainable); new engine expected to be >20% more fuel efficient, increased P&T margin
Advanced Radar Threat System – Variant 1	Capability Development Document	N/A	System used for training purposes only
F-35 Modernization Block 4	Capability Development Document	Fuel required to meet combat radius (energy KPP) will not increase; ongoing ESA	No change to energy KPP
GPS III F Space Vehicles	Capability Development Document Update	N/A	Energy requirements defined, fixed, and finite
Next-Gen Sensors	Capability Development Document (CDD)	Power & thermal management requirements to be defined and coordinated across MWSs	Energy KPP initially submitted as “N/A”; final CDD incorporates energy KPP to reduce future program risk by ensuring next-gen sensor P&T requirements are defined by the system with the greatest P&T limitations
Internet Broadcast Service Information Systems	Capability Development Document	N/A	IT system

Department of Navy

Following the 2018 update to the JCIDS Operating Manual the Secretary of the Navy revised the DON acquisition instruction and introduced a Two Pass-Seven Gate governance process for Navy and Marine Corps programs that requires assessments of “energy impacts and energy demand supportability” early in program acquisition reviews. Specifically, reviews of the Energy KPP start with Gate 2 of the process – the Analysis of Alternatives (AoA).

The Navy continues to align strategy and force architecture to enable distributed operating concepts introduced in the 2018 National Defense Strategy. That alignment includes energy supportability of the future Integrated Naval Force. In FY20 the Chief of Naval Operations (CNO) released operational energy objectives for aligning the Navy energy network to support Navy and Marine Corps operating concepts. The objectives prioritize resupply capabilities, weapons systems’ operational reach, and energy command and control, and specifically direct an update to Navy Energy KPP guidance. In FY21 the Navy will be revising Energy KPP guidance to ensure future power and energy requirements are considered in new acquisition programs.

Table 4 summarizes Energy KPP status from Navy acquisition reviews in FY20.

Table 4. Navy Acquisition Programs

<u>Weapons System/Program</u>	<u>Acquisition Document</u>	<u>Energy KPP Status</u>	<u>Rationale</u>
Auxiliary Floating Dry Dock Medium Replacement (AFDM(X))	CDD	Addressed: a maximum of 8 standard Navy shore power connections will be required. Energy-efficient components and equipment will be installed where practicable	Addressing shore demand requirements.
Yard Repair, Berthing and Messing Barge - Replacement (YRBM(X))	CDD	Addressed: a maximum of five standard Navy shore power connections will be required. Steam will not be required to operate any systems on the YRBM. Energy-efficient components and equipment will be installed where practical.	Addressing shore demand requirements.
Strategic Sealift	ICD	No KPPs addressed in ICD	Energy KPP and OESA will be addressed directly starting in AoA (Gate 2).
Knifefish Surface Mine Countermeasures Unmanned Undersea Vehicle (SMCM UUV)	CDD	N/A	Knifefish does not place a unique demand on the fleet energy logistics chain, aside from storage of batteries. Navy is considering batteries commonality and supply chain for future energy supportability
Naval Construction Force (NCF)	ICD	No KPPs addressed in ICD	Energy KPPs and OESA will be addressed directly starting in AoA (Gate 2).
Next Generation Jammer (NGJ)	CDD Update	N/A	All energy to operate NGJ comes from host aircraft. Navy is considering batteries commonality and supply chain for future energy supportability
Submarine Torpedo Defense System	CDD	N/A	Based on the system CONOPS, the overall energy consumption will not be sufficient to impact operational reach and will not be relevant to sustained performance over scenario timelines.

Appendix B. Operational Energy in the Procurement Process

Pursuant to section 2926(e)(4) of title 10, United States Code, this appendix to the FY 2022 Operational Energy Budget Certification Report certifies and describes how the acquisition system is addressing operational energy in the procurement process, including long-term sustainment considerations, and how programs are extending combat capability as a result of these considerations.

The Department addresses operational energy throughout its procurement process with particular attention given to planning and concept development in an effort to shape preliminary weapons system design. Although program oversight has been shifted back to the Military Departments, the requirement to address operational energy remains. To that end, each Military Department has provided a statement for this Appendix. In addition, Services consider operational energy in their title 10 war-games and in other war-games where applicable. Finally, the Department looks to the science and technology community for advancements in energy storage, energy consumption, and other areas that impact energy usage, such as lighter weight materials.

As part of its planning efforts, the Department ensures that operational energy plays a role in war-games executed by the Services and other agencies. These war-games are very helpful in identifying energy issues in the operating concepts of the Services, the operational plans of the Combatant Commands, and the various weapons and support platforms. War-game schedules have been significantly impacted by the pandemic; some have been canceled, some have been scaled back, and others conducted virtually.

The Department continues to invest in several ongoing science and technology programs with the potential to increase the energy performance and capability of several major systems. These efforts translate directly to improved operational capabilities through increased range, payload, endurance, and time on station. With regard to operational energy, the Department is particularly interested in directed energy platforms, improved energy storage capabilities, and improved engine technologies.

Energy is a fundamental enabler of military capability and the ability of the United States to project and sustain the power necessary for defense depends on the assured delivery of this energy. The Department remains committed to identifying, capturing, assessing, and mitigating risks to energy in the combat environment. Our focus is on increasing warfighter effectiveness through energy consideration of future platforms while enhancing the effectiveness of today's force by ensuring sufficient and timely delivery. Our primary methodology is through the use of war-games and energy supportability analysis. Analysis of energy supportability is now being required for all new weapons systems.

Appendix C. Estimated Expenditure and Requested Appropriations for OASD(S)

Pursuant to section 2926(e)(6) of title 10, United States Code, this appendix describes estimated expenditures and requested appropriations for FY22 for the activities of the Assistant Secretary of Defense for Sustainment (ASD(S)) in carrying out the duties of the ASD(S). The FY 2022 President’s Budget provides \$102.4 million in Operation and Maintenance funding to support energy activities in OASD(S). Reflecting the establishment of ODASD(EER), a single program element now supports the policy and governance for both operational and installation energy. In addition, OASD(S) is requesting funding for OECIF and OEPPF, noted below.

The information in this table also is included in Appendix E.

Organization	Program Title	Operational Energy Strategy Objectives	Treasury Code	BA Code	Program Element	FY 2022 \$K
OASD(S)/ ODASD (EER)	Operational Energy	Identify and Reduce Logistics and Operational Risks	100	04	0901388D8Z	4,931
OASD(S)/ ODASD (EER)	OECIF	Increase Warfighter Capability	400	03	0604055D8Z	74,300
OASD(S)/ ODASD (EER)	OEPPF	Increase Warfighter Capability	400	04	0604555D8Z	23,200
Total						102,431

Appendix D. Fiscal Year 2022 Budget Fuel Estimates

As requested in House Report 112-479, page 121, accompanying H.R. 4310, the National Defense Authorization Act for FY 2013 (Public Law 112-239), this appendix to the FY 2022 Budget Certification Report certifies and describes how fuel expenditures for the Department are developed, stabilized, and, when necessary, adjusted due to market volatility.

The table below provides the Fuel Summary (\$ in Millions) for the Department’s Revolving Funds.

	FY 2020 ¹	Price Change ²	Program Change ³	FY 2021 Estimate ⁴	Price Change	Program Change	FY 2022 Estimate ⁴
Fuel	\$9,146.58	\$-1,417.80	\$513.43	\$8,242.21	\$208.66	\$-46.34	\$9,207.10

1 The FY 2020 Actual column represents the cost to DoD customers at the executed standard price.

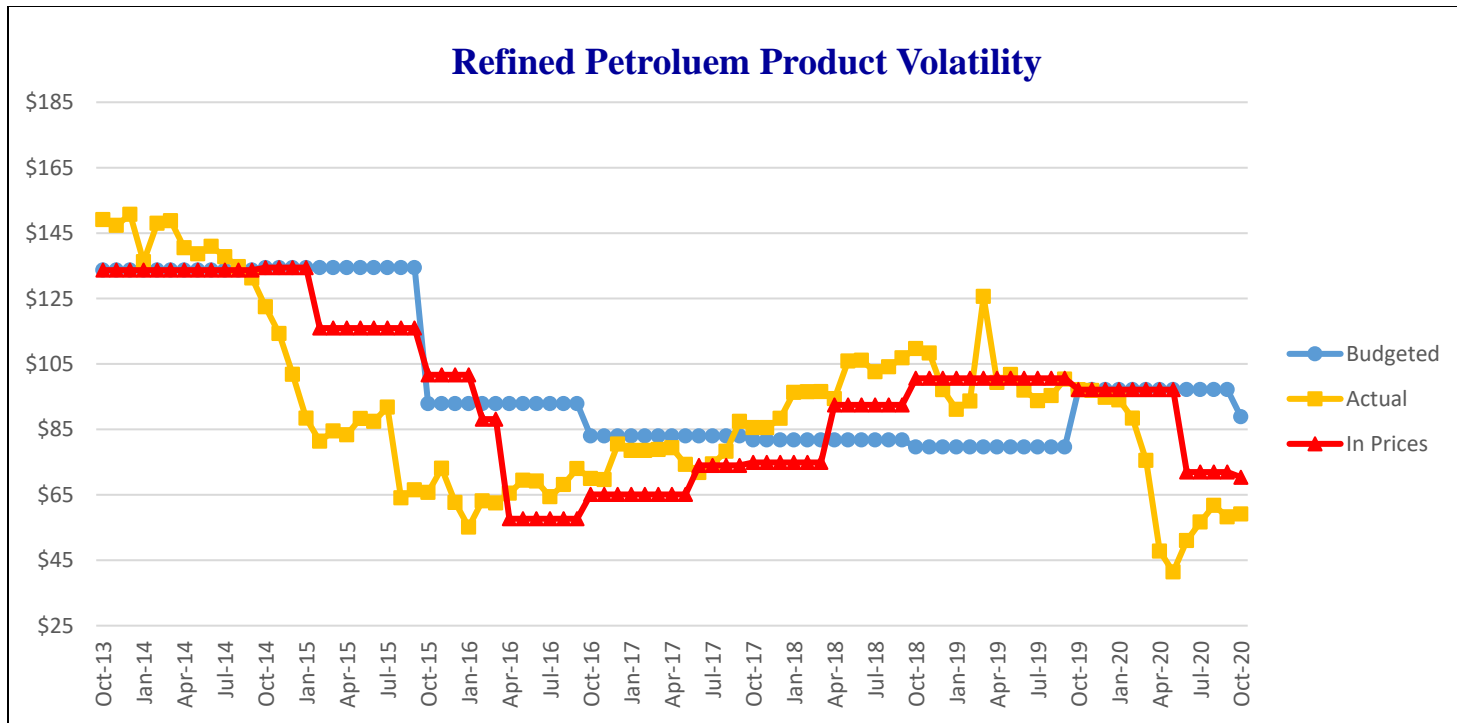
2 Price change calculated based on estimated sales at the budgeted price.

3 Program change calculated based on estimated sales at the budgeted price.

4 FY 2021 and FY 2022 estimates are based on Defense Logistics Agency sales projections for both base and contingency operations.

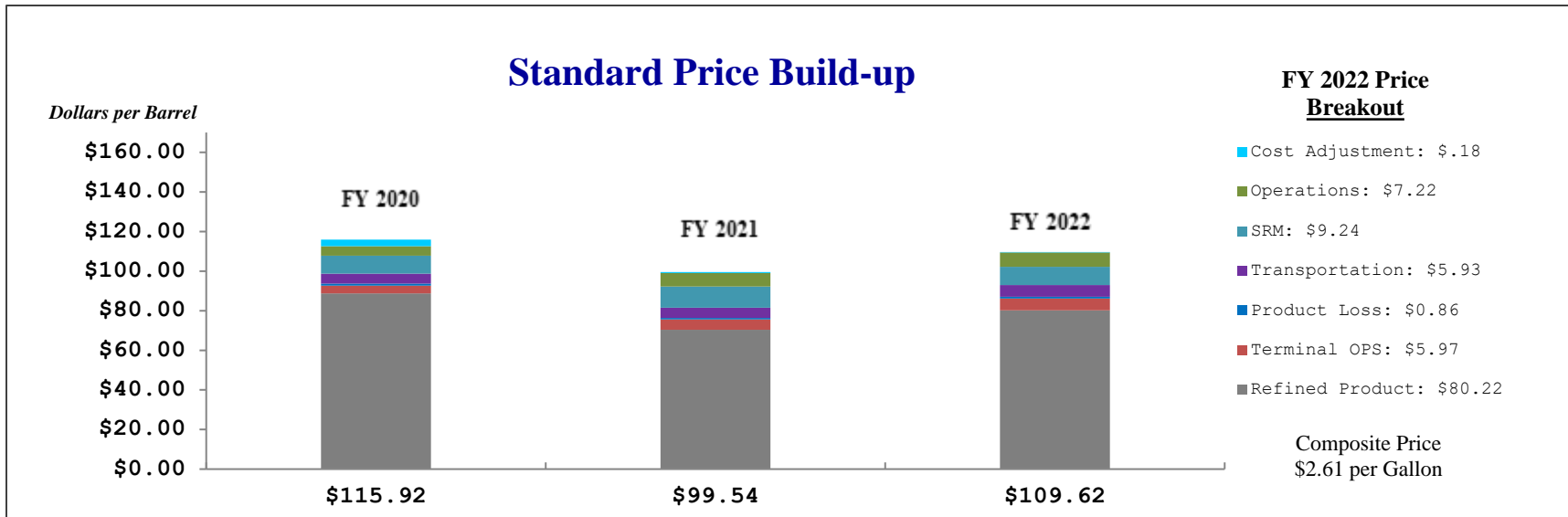
DLA is the sole-source fuel supplier for the Department of Defense. It is important to note that the Department purchases only refined products. The cost of refined fuel products constitutes nearly 80 percent of the price DLA charges customers, so accuracy of the Office of Management and Budget’s forecasted petroleum market prices is key to maintaining stabilized rates in the budget year.

The Working Capital Fund’s (WCF) primary goal is to protect customer programs from fuel market volatility. Customers are charged standardized rates that assume fuel will remain relatively stable throughout the year of execution. Fuel price volatility can require funding reallocations that disrupt investment programs or threaten readiness, especially when budgets are declining in real terms and funds are increasingly limited. The following chart illustrates the difficulty of setting prices that are sustainable for a full year, a year in advance of execution. The WCF loses cash whenever the cost of refined product (yellow line) exceeds the refined product in prices (red line). Conversely the WCF gains cash whenever the cost of refined product does not meet the refined product in prices.



The Defense-Wide WCF cash balance is the Department’s tool to stabilize DoD customer rates despite refined product market volatility. Cash balances must be sufficient in the Defense-Wide account to absorb the impact of market changes in the year of execution. When the market volatility exceeds the capacity of the Defense-Wide account to absorb or causes a large cash increase, the Department will seek additional funds through reprogramming or by instituting a year of execution price change. The price change can be either an upward or downward adjustment based on market projections. A downward adjustment will provide additional buying power to customers while an upward adjustment creates an execution year bill for customers.

Recognizing the volatility in the fuel market, the Department makes every effort to accurately project fuel prices and is seeking opportunities to stabilize the year of execution price. The Department reviews various options that range from modifying the formula used to develop the standard price to changing the benchmark source.



The Department sets the price of fuel, typically 18 months in advance, to break even in the budget year by recouping the cost of refined products and the non-product costs of terminal operations, storage, transportation, facilities maintenance, and operations. The Department sets the standard fuel price based on the Administration’s economic assumptions for refined petroleum products plus the non-product price of DLA’s projected operating costs. The “Standard Price Build-up” table below displays the components actual standard price for FY 2020, the composite price for FY 2021, and the President’s Budget FY 2022 request.

The refined petroleum market’s most volatile calendar years were 2008, 2009 and 2012. The goal of the Department is to maintain the Standard Fuel Price (SFP) at or below the budgeted rates throughout the fiscal year. In FY 2014, the Department experienced higher than expected fuel costs and the WCF lost \$9.81 per barrel (bbl); however, the Department’s Defense-Wide WCF cash account was able to absorb the loss without a year of execution price change. Conversely, market volatility in FY 2015 and FY 2016 led to reduced fuel product costs, resulting in a cash surplus and the Department was subsequently able to reprogram \$1,205.7 million and \$2,001 million out of the Defense-Wide Working Capital Fund (DWWCF) to other Department accounts to support emerging requirements. Additionally, in FY 2016, Congress rescinded \$1,038 million due to the build-up in the DWWCF cash balance. As fuel cost continued to decline in FY 2017, Congress imposed a reduction to the Services’ FY 2017 budget of \$1 billion. In order to offset the Congressional reduction, the Department adjusted the rates on October 1, 2016 and again on July 1, 2017, to react to the

reduction to the Services' budget and help maintain readiness operations. Starting in FY 2018, fuel cost reversed direction and started to increase, which led to a change in the fuel price from the budgeted price of \$104.48/bbl to \$115.92/bbl. Overall, the average fuel price for FY 2018 was \$103.11/bbl, which was \$1.47 below the budgeted fuel price of \$104.58/bbl. The average SFP charged to the Services in FY 2018 returned an estimated \$110.8 million in reductions taken from the Services' Operation and Maintenance (O&M) appropriations in the 2018 Presidents' Budget; however, the lower SFP resulted in a decrease to the DWWCF cash balance as fuel cost outpaced the fuel price charged to the Services. This led to Congress approving the transfer of \$691 million into the Department's WCF cash balance for Energy.

On October 1, 2018, the Department raised the FY 2019 SFP to \$125.16/bbl, which was \$21 higher than the FY 2019 Presidents Budget fuel price of \$104.16/bbl, to match the true cost of fuel expected in FY 2019. Also, in the FY 2019 Presidents' Budget, Congress added \$750 million to the Services O&M budget to mitigate higher than anticipated fuel costs.

On October 1, 2019, the FY 2020 SFP was set at the budgeted rate at \$124.32/bbl, but was later decreased to \$99.12/bbl due to lower fuel costs being experience throughout the fiscal year. The lower fuel costs resulted in an increase to the DWWCF cash balance, of which the Department realigned \$759 million to the DLA Supply activity and reprogrammed \$241 million to other WCF departments who were experiencing cash losses resulting from reduced sales in FY 2020 and increased disbursement related to prior year readiness investments.

On October 1, 2020, the FY 2021 SFP was set at \$99.54/bbl, lower than the budgeted rate of \$118.02/bbl due to reduced fuel cost experienced in FY 2020. Additionally, Congress imposed a reduction to the Services' FY 2021 O&M budget of \$1.7 billion. Ultimately with fuel market volatility and uncertainty, fuel costs have steadily increased in FY 2021 beyond the SFP (\$99.54/bbl established at the beginning of the fiscal year. So far, the DWWCF cash balance has been sufficient to protect the customer from an increase in the SFP.

The FY 2022 budgeted SFP is \$109.62/bbl.

Appendix E. Fiscal Year 2022 Operational Energy Initiatives

Due to rounding, investment amounts may differ in the report.

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Air Force ³	B-52H Re-Engine	B-52 Commercial Engine Replacement Program (CERP)	This sustainment program will replace the current unsustainable TF33 engine with engines of similar size, weight, and thrust characteristics. The development, production, and installation of new engines and related subsystems will replace legacy equipment on 76 B-52H a/c.	Enhance Mission Effectiveness	Propulsion Upgrades_Air	3600	07	0101113F	484,068
Air Force	Aerospace Propulsion	Adaptive Engine Transition Program (AETP)	Matures adaptive engine technologies through a maturation/risk reduction effort to design, fabricate, and test the first-ever complete, flight-weight adaptive engines in preparation for next-gen propulsion system development for multiple combat aircraft. Drives revolutionary progress necessary to guarantee future U.S. air superiority achieving +25% fuel efficiency, +10% thrust, significantly increased thermal capacity, and maintains full-life durability. **Many of the key component technologies, flow paths, and design parameters are either ITAR controlled or classified.	Increase Warfighter Capability	Propulsion Upgrades_Air	3600	04	0604004F	13,536
Air Force	Aerospace Propulsion	Next Generation Adaptive Propulsion (NGAP)	Like AETP, NGAP matures and demonstrates the scalability of adaptive engine technologies through a maturation/risk reduction effort to design, fabricate, and test flight-weight prototype engines targeted for Next-Generation Air Dominance applications. **Many of the key component technologies, flow paths and design parameters are either ITAR controlled or classified.	Increase Warfighter Capability	Propulsion Upgrades_Air	3600	04	0604004F	110,200
Air Force	Aerospace Propulsion and Power Technology	Megawatt Aircraft Power and Thermal	Integrating new developments in Power and Thermal components to demonstrate advanced architectures to enable high powered mission systems for future Air Superiority platforms while maintaining energy efficiency. Technology maturation in advanced power and thermal architecture, modeling and simulation, and integration. Developing flexible and adaptive Power and Thermal components that allow for synergetic architectures that leverage advanced engine capabilities and energy storage.	Increase Warfighter Capability	Platform Thermal Management	3600	03	0603216F	19,575
Air Force	Aerospace Vehicle Technologies	Low Cost Attributable Aircraft	Develop, prototype and flight-demonstrate a series of low cost attributable aircraft that can be rapidly manufactured, in large or small numbers and on-demand, as-needed, for a base platform	Increase Warfighter Capability	Platform Upgrades_Air	3600	02	0602201F	5053

³After reviewing previous year's Budget Certification Reports, for FY 2022 the Air Force Operational Energy office reported only those investments with either a primary purpose of optimizing operational energy usage, or those with a significant operational energy impact; investments with either marginal or difficult-to-define impact were excluded. Although this resulted in a significant reduction in the number of programs reported, the Air Force Operational Energy Office believes the FY 2022 report reflects a more accurate representation of the Service's prioritization of and investment in operational energy.

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
			cost NTE \$3M, plus the cost of the mission system/payload. The capability will enable the Air Force to be able to levy a cost-imposing strategy on potential adversaries, near-peer or otherwise, with a focus on the A2AD threat. The capability will be able to operate as needed with fractionated capabilities, limited training, minimal maintenance, certified analytically, and economically produced at very low production quantities.						
Air Force	Aerospace Vehicle Technologies	Low Cost Attributable Aircraft Platform Sharing (LCAAPS)	Develop two variants of a long range attributable UAS for \$3M AUFC. Define aircraft open architecture concept.	Increase Warfighter Capability	Platform Upgrades_Air	3600	03	0603211F	37,995
Air Force	Materials Development	Low-Cost Attributable Structures	This program will provide manufacturing support to the Low Cost Attributable Aircraft Technology (LCAAT) Initiative by investigating and validating low cost manufacturing materials and processes that can be introduced to reduce aerospace vehicle costs and minimize vehicle manufacturing time.	Increase Warfighter Capability	Materials and Design	3600	03	0603680F	2521
Air Force	Tech Transition Program	Legacy Aircraft Drag Reduction - Prototyping and Demonstration	The Legacy Aircraft Drag Reduction Prototyping and Demonstration program will enable procurement of low-risk technologies that improve fuel efficiency for multiple aircraft by reducing aerodynamic drag. Examples of aircraft drag reduction technologies include: Microvanes, Finlets, vertical windshield wipers, engine pylon fairings, and flight control surface fine-tuning.	Enhance Mission Effectiveness	Platform Upgrades_Air	3600	04	0604858F	15,500
Air Force	Software and Digital Technology Pilot Programs	Air & Space Operations Center (AOC) - Software Pilot Program	This program aims to optimize AOC processes and planning through agile software solutions. One example is KRADOS, the Kessel Run All Domain Operations Suite, a system of applications that address workflows within the Air Operations Center (AOC). Kessel Run has several applications in use at the 609th AOC, including the tanker planning application Jigsaw, and the Master Air Attack Plan (MAAP) application Slapshot. The integrated system allows for accurate and timely data sharing in an adaptable and complete system. KRADOS calculates solutions, offers a network of data delivery options, and provides real-time plans to inform decision-makers. A second example is Pythagoras, which builds on the existing tanker planning tool, Jigsaw, by adding an auto-planning feature to match refueling requests with tankers to optimize tanker utilization. Added capability aims to increase scheduling efficiency through optimization algorithms implemented by Kessel Run. Goal is to provide capability within Jigsaw for planners to quickly develop a feasible, optimized aerial refueling schedule, accounting for a host of constraints and planner judgement.	Increase Warfighter Capability	Current Operations Tools	3600	08	0608410F	12,000
Air Force	Tech Transition Program	Mobility Asset Optimization	This program will enhance the efficiency of Mobility Air Fleet (MAF) operations through tools that optimize processes such as cargo loading, aircrew scheduling, and aircraft allocation. Optimized cargo load plans yield more efficient flight operations, and the possibility to decrease fuel use by	Increase Warfighter Capability	Current Operations Tools	3600	04	0604858F	18,000

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
			maximizing loads and utilizing fewer aircraft. Improved load planning also requires a reassessment of under-loaded long distance flights. Loading techniques range from bi-level aircraft loading system, to dynamic re-planning software, to dual-rail swap and aggregation. For aircrew scheduling, Puckboard is a data-informed software application that plans aircrew flight qualification and ground training events. The tool, developed by and for Airmen, allows schedulers to rapidly match aircraft commanders, pilots, and loadmasters with available flights that complete currency requirements. Digital interface enables planners to visualize flight schedules and generate schedules for aircrew while considering required qualifications, crew rest, and conflicts. Overall increases in operational efficiency are expected. For aircraft allocation, Magellan is Air Mobility Commands' readiness-driven allocation process software program to synchronize aircraft and crew data, coordinate allocation cycles, enable real-time changes. These tools allow the force to fly more missions with the same amount of aircraft.						
Air Force	AF Energy Program	Mission Execution Incentivization Program (MEIP)	The MEIP program aims to incentivize operational units toward fuel-efficient operations such as: precision fuel planning, engine start technique, cruise altitude selection, descent profile, and reduced engine taxi. Based on historical data analysis, AF planners and operators require incentives to use fuel more efficiently and become an energy-optimized force. SAF/IEN, the AF Operational Energy Office, created a Mission Execution Incentive Strategy to re-align incentives and remove barriers. This strategy includes a competitive, voluntary program to incentivize Airmen to operate with fuel-use optimization in mind. Financial incentives will aim to create future savings and reinvestment in fuel-efficient education, training, and programs.	Enhance Mission Effectiveness	Policy and Oversight	3400	04	0905015F	3,000
Air Force	AF Energy Program	F108 Engine Detergent Wash (KC-135)	Jet engines ingest debris and contaminants during operations that reduces their time-on-wing and decreases engine efficiency and power. This causes increased fuel burn and exhaust gas temperature, leading to higher maintenance costs and decreased aircraft availability. Detergent engine washes reach deep into the engine core and apply full coverage to engine parts, removing buildup of contaminants. Detergent washing is expected to improve performance, reduce engine temperatures, and decrease fuel burn. This program focuses on the F108 engine, which is the engine used on the KC-135.	Enhance Mission Effectiveness	Propulsion Upgrades_Air	3400	04	0905015F	600
								Air & Space Forces Total	\$722,048

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Army	Defense Research Sciences	Vehicle Propulsion Power Research - 128	Investigate concepts and theories to provide enhanced tools, methods, and innovative concepts to enable improvements in propulsion power density, energy efficiency, reliability, and lifecycle costs for increased performance and capabilities in future Army systems.	Increase Warfighter Capability	Propulsion Upgrades_Land	2040	01	0601102A	1,394
Army	Defense Research Sciences	Intelligent Systems - 48	Research in autonomous systems that supports and unburdens Soldiers in a flexible, robust, survivable and comprehensive manner. This work addresses the cognitive requirements of humans and (non-human) agents, both hardware and software based, operating individually or in collaboration, on the battlefield.	Increase Warfighter Capability	Platform Upgrades_Land	2040	01	0601102A	6,164
Army	Defense Research Sciences	Reconfigurable Platform Mechanics Propulsion - 146	Reconfigurable platform mechanics and propulsion science investigating technologies to enable subsystem configuration concepts for efficient hover and high-speed/range Vertical Take-Off and Landing (VTOL) aircraft.	Increase Warfighter Capability	Propulsion Upgrades_Air	2040	01	0601102A	981
Army	Defense Research Sciences	Unmanned Air System (UAS) Vehicle Research - 93	Basic research focused on topics that contribute to the body of knowledge required to create future intelligent, unmanned air systems that can effectively team with manned and unmanned aircraft, ground platforms, and human teammates.	Increase Warfighter Capability	Propulsion Upgrades_Air	2040	01	0601102A	3,018
Army	Defense Research Sciences	Autonomous Vehicle Research - 120	Basic research focused on enabling robust autonomous mobility for small and human-scale robotic systems, including autonomous teaming behavior with hybrid human-robotic teams. Enablers for robust autonomous mobility include planning, behaviors, energy efficient maneuver, and the interface of manipulation technologies to support manned-unmanned teaming constructs.	Increase Warfighter Capability	Platform Upgrades_Land	2040	01	0601102A	1,637
Army	Defense Research Sciences	Sol Struct Mech - AMRDEC-AV - 101	Create robust experimental and computational approaches for understanding, modeling, and predicting the complex fluid flow and aerodynamics of next generation rotorcraft concepts.	Increase Warfighter Capability	Propulsion Upgrades_Air	2040	01	0601102A	2,574
Army	Defense Research Sciences	Fundamentals for Alternative Energy Applied Physics Research - 143	Explore novel concepts in energy generation and capture in technologies for efficient conversion of ambient energy to electrical energy for use and storage. Design novel structures to include microscale power devices for multimodal harvesting and efficient distributed power conversion.	Increase Warfighter Capability	Platform Upgrades_Land	2040	01	0601102A	930
Army	Defense Research Sciences	Research In Vehicle Mobility - 151	Research in support of advanced military mobility technologies with emphasis on Terramechanics (vehicle-terrain interaction), and complex vehicle dynamics and simulation.	Increase Warfighter Capability	Platform Upgrades_Land	2040	01	0601102A	741
Army	Defense Research Sciences	Novel multi-fuel tolerant small vehicle power - 92	Basic research to enable highly efficient, multi-fuel conversion in small engines with reduced sensitivity to fuel property variation and extreme ambient conditions.	Increase Warfighter Capability	Platform Upgrades_Land	2040	01	0601102A	3,354
Army	Defense Research Sciences	Chemical Synthesis and Power - 66	Basic research to achieve advanced energy control. Research efforts will lead to light-weight, reliable, and compact power sources.	Increase Warfighter Capability	Propulsion Upgrades_Land	2040	01	0601102A	5,491
Army	Defense Research Sciences	Propulsion Energetics Flight - 97	Basic research for improved understanding of propulsion and combustion for improved efficiency and fuel flexibility and fluid dynamics for rotorcraft.	Increase Warfighter Capability	Propulsion Upgrades_Air	2040	01	0601102A	2,809

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Army	Soldier Lethality Technology	Tactical Power for Soldier Lethality - 938	Designs, and develops innovative power generation and energy storage technologies that support next generation Soldier systems to decrease Soldier load and power burden, and increase power capabilities by providing more energy to prolong mission run-time.	Increase Warfighter Capability	Individual/Warfighter Power	2040	02	0602143A	3,557
Army	Soldier Lethality Technology	Efficient Compact Portable Power - 959	Develop more efficient power and thermal management for small systems and alternative energy technologies to substantially reduce the number of batteries required to accomplish dismounted Soldier/Squad mission objectives.	Increase Warfighter Capability	Individual/Warfighter Power	2040	02	0602143A	910
Army	Ground Technology	Advanced Distributed Power for Autonomous Systems	Research power distribution concepts and architectures for autonomous systems.	Increase Warfighter Capability	Platform Upgrades_Land	2040	02	0602144A	1,423
Army	Ground Technology	Beyond Lithium-Ion Energy Storage 16	Research Lithium-Ion and other battery technologies to increase energy storage density.	Increase Warfighter Capability	Platform Upgrades_Land	2040	02	0602145A	1,121
Army	Ground Technology	Diesel Electric Power Generator 15	Research Diesel Electric Power Generator to enable hybrid powertrains for combat vehicles and silent mobility and watch.	Increase Warfighter Capability	Platform Upgrades_Land	2040	02	0602145A	2,143
Army	Ground Technology	Electric Drive Motors/Power Controllers/Conv 18	Research Electric Drive Motors, Power Controllers, and Converters to enable hybrid powertrains with electric drive for silent mobility and watch and to improve fuel efficiency of manned and unmanned combat vehicles.	Increase Warfighter Capability	Propulsion Upgrades_Land	2040	02	0602145A	2,874
Army	Ground Technology	High Voltage Modular Li-Ion Battery 17	Research High Voltage Modular Li-Ion Battery technologies to increase energy storage density and enable electrification of manned and unmanned combat vehicles.	Increase Warfighter Capability	Platform Upgrades_Land	2040	02	0602145A	2,115
Army	Ground Technology	RCV Silent Watch and Mobility Range Extension	Researches JP8 reformer based silent watch and mobility extension subsystem.	Increase Warfighter Capability	Platform Upgrades_Land	2040	02	0602145A	2,044
Army	Ground Technology	Power Electronic Components and Materials	Research Power Electronic Components and Materials to enable high power electrification of manned and unmanned combat vehicles and other Army systems.	Increase Warfighter Capability	Platform Upgrades_Land	2040	02	0602144A	1,258
Army	Ground Technology	Scalable Electrification & Control Architecture 19	Research Scalable Electrification & Control Architectures to enable electrified and energy efficient manned and unmanned combat vehicles.	Increase Warfighter Capability	Platform Upgrades_Land	2040	02	0602145A	1,430
Army	Ground Technology	Segmented Composite Track and Strut Suspension 12	Research Segmented Composite Track and Strut Suspension systems to improve combat vehicle mobility.	Increase Warfighter Capability	Platform Upgrades_Land	2040	02	0602145A	924
Army	Network C3I Technology	Energy Efficient Devices Technology 84	Develop supply and demand electronics for energy-constrained platforms that will extend mission duration (dismounted Soldier), reduce frequency of battery replacement (unattended Sensors) and increase endurance (Unmanned Aerial Vehicles (UAVs)).	Increase Warfighter Capability	Individual/Warfighter Power	2040	02	0602146A	5,710
Army	Future Vertical Lift Technology	Future UAS Engine Technology 01	Research to enable intelligent and robust propulsion performance and noise signature reduction via multi-fuel and optimized hybrid electric capability for small engines (20-150kW) powering future aerial and ground systems.	Increase Warfighter Capability	Propulsion Upgrades_Air	2040	02	0602148A	3,153

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Army	Future Vertical Lift Technology	High Reduction-Ratio Transmission (HRT) 63	Project develops FVL advanced drive train technologies that increase performance and double current drivetrain life cycles while improving their reliability and maintainability	Increase Warfighter Capability	Propulsion Upgrades_Air	2040	02	0602148A	4,153
Army	Future Vertical Lift Technology	Power & Thermal Management for FVL Tech	Project effort will develop and demonstrate integrated power and thermal management technologies to provide significantly higher electrical power capability for FVL aircraft	Increase Warfighter Capability	Propulsion Upgrades_Air	2040	02	0602148A	7,175
Army	Soldier Lethality Advanced Technology	Dismounted Soldier Power and Energy	Matures, integrates, and demonstrates advanced Soldier Power and Energy (P&E) technologies to power the dismounted Soldier and small unit's command and control, communications, computers, and sensor devices during tactical operations.	Increase Warfighter Capability	Individual/Warfighter Power	2040	03	0603118A	3,184
Army	Ground Advanced Technology	Advanced Tribology Research 58	Mature tribology techniques to evaluate fluids and fuels.	Increase Warfighter Capability	Platform Upgrades_Land	2040	03	0603119A	460
Army	Ground Advanced Technology	Enhanced Jet Fuel for Ground System Durability 56	Evaluate Enhanced Jet Fuel to determine its impact to Ground System Durability.	Increase Warfighter Capability	Platform Upgrades_Land	2040	03	0603119A	522
Army	Ground Advanced Technology	Fuel Contamination Limits for Ground Systems 54	Evaluate Fuel Contamination Limits to establish standards for military Ground Systems based on emerging commercial fluids and standards.	Increase Warfighter Capability	Platform Upgrades_Land	2040	03	0603119A	292
Army	Next Generation Combat Vehicle Advanced Technology	Advanced Mobility Experimental Prototype - 728	Develops advanced powertrain, track and running gear, and unmanned robotic technologies for integration into a ground combat vehicle.	Increase Warfighter Capability	Propulsion Upgrades_Land	2040	03	0603462A	2,819
Army	Next Generation Combat Vehicle Advanced Technology	AVPTA - Electrification Technology 11	Develop Electrification Technology in collaboration with the Department of Energy through the Advanced Vehicle Power Technology Alliance.	Increase Warfighter Capability	Propulsion Upgrades_Land	2040	03	0603462A	2,000
Army	Next Generation Combat Vehicle Advanced Technology	Diesel Electric Power Generator 09	Develop Diesel Electric Power Generator to enable hybrid powertrains for combat vehicles and silent mobility and watch.	Increase Warfighter Capability	Propulsion Upgrades_Land	2040	03	0603462A	1,855
Army	Next Generation Combat Vehicle Advanced Technology	Electric Drive Motors/Power Controllers/Conv 07	Develop Electric Drive Motors, Power Controllers and Converters to enable hybrid powertrains for combat vehicles and silent mobility and watch.	Increase Warfighter Capability	Propulsion Upgrades_Land	2040	03	0603462A	711
Army	Next Generation Combat Vehicle Advanced Technology	High Voltage Modular Li-Ion Battery 10	Develop High Voltage Modular Li-Ion Battery technologies to increase energy storage density and enable electrification of manned and unmanned combat vehicles.	Increase Warfighter Capability	Propulsion Upgrades_Land	2040	03	0603462A	1,072
Army	Next Generation Combat Vehicle Advanced Technology	Highly Electrified and Autonomous Platforms - GVSC/AAL 15	Develop electrification components to enable high power electrification of manned and unmanned combat vehicles.	Increase Warfighter Capability	Platform Upgrades_Land	2040	03	0603462A	3,420
Army	Next Generation Combat Vehicle	Highly Electrified and Autonomous Platforms - GVSC/AAL 16	Demonstrate Highly Electrified Autonomous Platform components and architectures.	Increase Warfighter Capability	Platform Upgrades_Land	2040	03	0603462A	3,965

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
	Advanced Technology								
Army	Next Generation Combat Vehicle Advanced Technology	RCV Silent Watch and Mobility Range Extension Advanced Technology	Matures and integrates JP8 reformer components and sub-systems in order to demonstrate extended silent watch and mobility as part of a modular electrification architecture supporting robotic combat vehicles.	Increase Warfighter Capability	Propulsion Upgrades_Land	2040	03	0603462A	1,462
Army	Next Generation Combat Vehicle Advanced Technology	Scalable Electrification and Control Architecture - 856	Validates component-level performance and integrates the power distribution and control components to implement a common, scalable, electrified vehicle power architecture on combat platforms from 15 to 50 tons.	Increase Warfighter Capability	Propulsion Upgrades_Land	2040	03	0603462A	1,950
Army	Next Generation Combat Vehicle Advanced Technology	Platform Electrification E-Vectronics	Demonstrate Tactical Vehicle Electronics Architecture	Increase Warfighter Capability	Platform Upgrades_Land	2040	03	0603462A	5,215
Army	Future Vertical Lift Advanced Technology	Alternative Concept Engine Advanced Technology 07	Project develops FVL engine technologies that could significantly improve platform performance (range, speed, payload), durability, and operational capability.	Increase Warfighter Capability	Propulsion Upgrades_Air	2040	03	0603465A	3,828
Army	Future Vertical Lift Advanced Technology	Next Generation Aviation Transmission Adv Tech	Project develops FVL advanced drive train technologies that increase performance and double current drivetrain life cycles while improving their reliability and maintainability.	Increase Warfighter Capability	Propulsion Upgrades_Air	2040	03	0603465A	1,404
Army	Future Vertical Lift Advanced Technology	Power & Thermal Management Tech Demo	Project effort will develop and demonstrate integrated power and thermal management technologies to provide significantly higher electrical power capability for FVL aircraft.	Increase Warfighter Capability	Propulsion Upgrades_Air	2040	03	0603465A	3,402
Army	Generators and Associated Equipment	Power Distribution Illumination Systems Electrical (PDISE) Expansion	Power Distribution Illumination Systems Electrical (PDISE) Expansion	Increase Warfighter Capability	Contingency Basing	2035	03	0216300A	4,338
Army	Generators and Associated Equipment	Small Tactical Electric Power (STEP)	Small Tactical Electric Power (STEP)	Increase Warfighter Capability	Contingency Basing	2035	03	0216300A	1,554
Army	Mobile Soldier Power	Platoon Power Generator (PPG)	Platoon Power Generator (PPG)	Increase Warfighter Capability	Contingency Basing	2035	03	0211700A	5,625
Army	Abrams Upgrade Program	Improved Abrams	Power Initiative for Abrams M1A2SEPV3 (Power ECP) vehicle	Increase Warfighter Capability	Platform Upgrades_Land	2033	01	0211702A	12,633
Army	Abrams Upgrade Program	Improved Abrams	Advance Reliability & Cost Savings (ARCS) for the AGT-1500 Turbine Engine	Enhance Mission Effectiveness	Propulsion Upgrades_Land	2033	01	0211702A	3,200
Army	Armored Multi-Purpose Vehicle (AMPV)	Armored Multi-Purpose Vehicle (AMPV)	N/A	Increase Warfighter Capability	Propulsion Upgrades_Land	2033	01	0211702A	104,727
Army	Improved Turbine Engine	Aviation - Improved Turbine Engine Program (ITEP)	Aviation - Improved Turbine Engine Program (ITEP)	Increase Warfighter Capability	Propulsion Upgrades_Air	2040	07	0607139A	275,024

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Army	Aviation Ground Support Equipment	Next Generation Aviation Ground Power Unit (NGAGPU)	Next Generation Aviation Ground Power Unit (NGAGPU)	Increase Warfighter Capability	Contingency Basing	2040	05	0605830A	1,201
Army	Integrated Soldier Power Data System - Core	Small Unit Tactical Power (ISPDS-C)	Small Unit Tactical Power (ISPDS-C)	Increase Warfighter Capability	Individual/Warfighter Power	2040	05	0604827A	4,322
Army	Universal Battery Charger	Small Unit Tactical Power (ISPDS-C)	Small Unit Tactical Power (ISPDS-C) UBC	Enhance Mission Effectiveness	Individual/Warfighter Power	2040	05	0604827A	987
Army	Mobile Soldier Power	Integrated Soldier Power Data System - Core (ISPDS-C)	ISPDS-C	Enhance Mission Effectiveness	Individual/Warfighter Power	2035	03	0211700A	5,947
Army	Mobile Soldier Power	Universal Battery Charger	UBC	Enhance Mission Effectiveness	Individual/Warfighter Power	2035	03	0211700A	6,243
Army	Ground Soldier System	Small Unit Tactical Power (Net Warrior)	Small Unit Tactical Power (Net Warrior)	Enhance Mission Effectiveness	Individual/Warfighter Power	2035	03	0211700A	50,052
Army	Engine-Driven Generators Engineering Development	Large Tactical Power (LTP)	Large Tactical Power (LTP)	Increase Warfighter Capability	Contingency Basing	2040	05	0604804A	4,529
Army	Engine-Driven Generators Engineering Development	Small Tactical Electric Power (STEP)	Small Tactical Electric Power (STEP)	Increase Warfighter Capability	Contingency Basing	2040	05	0604804A	12,688
Army	Combat Vehicle Improvement	Stryker Non-Primary Power Capability Enhancement	Stryker Non-Primary Power Capability Enhancement	Enhance Mission Effectiveness	Metering and Monitoring	2040	07	0203735A	4,250
Army	Water and Petroleum Distribution - ED	Early Entry Fluid Distribution System (E2FDS)	Early Entry Fluid Distribution System (E2FDS)	Reduce Logistics Risks to Mission	Fuel Infrastructure	2040	05	0604804A	150
Army	Distribution Systems, Petroleum & Water	Early Entry Fluid Distribution System (E2FDS)	Early Entry Fluid Distribution System (E2FDS)	Reduce Logistics Risks to Mission	Fuel Infrastructure	2035	03	0216300A	13,763
Army	Water and Petroleum Distribution - ED	Bulk Fuel Distribution System (BFDS)	BFDS - Bulk Fuel Distribution System	Reduce Logistics Risks to Mission	Fuel Infrastructure	2040	05	0604804A	1,075
Army	Distribution Systems, Petroleum & Water	Bulk Fuel Distribution System (BFDS)	BFDS - Bulk Fuel Distribution System	Reduce Logistics Risks to Mission	Fuel Infrastructure	2035	03	0216300A	17,985

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Army	Bradley Program (MOD)	Improved Bradley	Increases mobility with extended life track, and improved shocks, road arms and torsion bars.	Enhance Mission Effectiveness	Platform Upgrades_Land	2033	01	0211702A	75,258
Army	Bradley Program (MOD)	Improved Bradley	More efficient Bradley - The Bradley improved engine and transmission generate an overall fuel reduction of 3%.	Increase Warfighter Capability	Propulsion Upgrades_Land	2033	01	0211702A	30,694
Army	Paladin PIM MOD In Service	M109 Family of Vehicles (FOV) Paladin Integrated Management (PIM)	Powertrain and electrical system upgrades	Enhance Mission Effectiveness	Propulsion Upgrades_Land	2033	01	0210609A	446,430
Army	Stryker Upgrade	Improved Stryker	More efficient Stryker, increased horsepower, electrical output, upgraded suspension, and in-vehicle network.	Enhance Mission Effectiveness	Propulsion Upgrades_Land	2033	01	0202123A	1,885
Army	UH-60 Black Hawk M Models	Black Hawk Aircrew Simulators	Black Hawk Aircrew Simulators	Enhance Mission Effectiveness	Simulators Air	2031	01	0210101A	9,900
Army	UH-60 Black Hawk A and L Models	Black Hawk Aircrew Simulators	Black Hawk Aircrew Simulators	Enhance Mission Effectiveness	Simulators Air	2031	01	0210101A	22,681
Army	Generators and Associated Equipment	Advanced Medium Mobile Power Source	Advanced Medium Mobile Power Sources (AMMPS) Skids	Increase Warfighter Capability	Contingency Basing	2035	03	0216300A	631
Army	Inland Petroleum Distribution System	Fuel Infrastructure	IPDS Fuel Unit COSIS	Reduce Logistics Risks to Mission	Fuel Infrastructure	2020	02	0208031A	12,681
Army	Joint Light Tactical Vehicle	Electrical System Energy Related Improvements - Engine Upgrade	Electrical System Energy Related Improvements - Engine Upgrade	Enhance Mission Effectiveness	Propulsion Upgrades_Land	2035	01	0216300A	90,539
Army	Joint Light Tactical Vehicle	Electrical System Energy Related Improvements - Alternator and Li Battery	Electrical System Energy Related Improvements - Alternator and Li Battery	Enhance Mission Effectiveness	Platform Upgrades_Land	2035	01	0216300A	8,899
Army	Combat Service Support Equipment	Force Provider	Force Provider	Enhance Mission Effectiveness	Contingency Basing	2035	03	0216300A	28,860
Army	Combat Service Support Equipment	Heaters' and ECU's	Improved Environmental Control Units (IECU)	Enhance Mission Effectiveness	Contingency Basing	2035	03	0216300A	7,116
								Total Army	1,372,511

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
DLA	Battery Network (BATTNET)	BATTNET	Battery Network (BATTNET) is one element of DLA's Improving Industrial Base Manufacturing Processes' strategic focus area and will improve the supply and reduce the cost of procured batteries used in fielded weapon systems, such as communication radios and armored vehicles. Batteries exhibit dynamic challenges for military logistics. BATTNET relies on a community of battery supply chain members, engineering support activities, researchers, and users to conduct research and development on sustainment issues or risks, and bridge technical solutions for specific groups of batteries.	Reduce Logistics Risks to Mission	Alternative Power Sources	0400	03	0603680S	2,620
DLA	Energy Readiness Program	ERP	Energy Readiness Program (ERP) addresses current and future issues connected to areas encompassing the Class III Bulk (Petroleum, Oils and Lubrication) fuel supply system in order to maintain and improve current warfighter product requirements.	Reduce Logistics Risks to Mission	Alternative Fuels Certification and Testing	0400	03	0603712S	2,169
OSD	Office Under Secretary of Defense	Operational Energy	OSD Senior Officials for Operational Energy. Tasked to analyze, develop and direct OE's energy strategy.	Enhance Mission Effectiveness	Policy and Oversight	0100	04	0901388D8Z	4,931
OSD	Office Under Secretary of Defense	Operational Energy Capability Improvement	Advance technologies in operational energy across warfighting platforms and domains.	Increase Warfighter Capability	Storage, Power Controls and Distribution	0400	03	060455D8Z	74,300
OSD	Office Under Secretary of Defense	Operational Energy Prototyping	Operational energy prototype and demonstration.	Increase Warfighter Capability	Storage, Power Controls and Distribution	0400	04	0604555D8Z	23,200
								Total DLA and OSD	107,220

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Navy	Unmanned Undersea Vehicle (UUV) Core Technologies	Li-Ion Battery: Propagation Resistant Architecture	Project is focused on the development of a propagation resistant battery architecture including integration and demonstration in a medium sized UUV. Effort also includes modeling and simulation capabilities geared toward predicting the propagation resistance of a battery architecture.	Increase Warfighter Capability	Propulsion Upgrades_Sea	1319	04	0604029N	8,296
Navy	Unmanned Undersea Vehicle (UUV) Core Technologies	Warehousing: Robotic Cell Screening	Development of a robust screening process geared toward discarding battery cell outliers that show signs of internal shorting early in the battery assembly process. The discarded outliers will have the effect of increasing both system reliability and safety by eliminating poorer performing cells and cells with signs of internal shorts. This will also have the effect of reducing the probability of a future latent cell defect and catastrophic battery system failures for UUVs. Program will establish a Quality Assurance protocol and procedure for quality control oversight and documentation of battery assembly and configuration control.	Increase Warfighter Capability	Propulsion Upgrades_Sea	1319	04	0604029N	6,550
Navy	Battery Development and Safety Enterprise	Battery Safety Certification	This project area will accomplish improvements in the battery safety certification process increasing the rapid safe deployment of advanced battery systems to the DoN. Allowing more battery based systems to be deployed more quickly will provide gains in fielding greener energy sources and increasing combat capabilities.	Increase Warfighter Capability	Storage, Power Controls and Distribution	1319	04	0603724N	1,500
Navy	Battery Development and Safety Enterprise	Battery Commonality	This project area will accomplish development of battery commonality efforts. Battery commonality will save DoN money and time when fielding advanced weapon systems.	Enhance Mission Effectiveness	Storage, Power Controls and Distribution	1319	04	0603724N	700
Navy	Battery Development and Safety Enterprise	Battery Hazard Reduction	This project area will reduce the hazard of fielded batteries. Allowing more battery based systems to be deployed more quickly will provide gains in fielding more greener energy sources and increasing combat capabilities.	Enhance Mission Effectiveness	Storage, Power Controls and Distribution	1319	04	0603724N	2,000
Navy	Battery Development and Safety Enterprise	Battery/Fuel Cell Standards	This project area will develop clear battery, battery system, and containment oriented standards and requirements. Allowing more battery/fuel cell based systems to be deployed more quickly will provide gains in fielding greener energy sources and increasing combat capabilities.	Increase Warfighter Capability	Storage, Power Controls and Distribution	1319	04	0603724N	500
Navy	Battery Development and Safety Enterprise	Battery Technology Development	This project area will accomplish development, laboratory, and Fleet testing to determine overall mission and cost effectiveness of improved storage technologies allowing for the transition to more greener energy and power sources.	Increase Warfighter Capability	Storage, Power Controls and Distribution	1319	04	0603724N	1,213

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Navy	Aircraft Energy	High Efficiency Generator	Evaluate and demonstrate alternative aircraft power generation/conversion technologies to provide more efficient power generation to meet legacy platform power deficiencies.	Increase Warfighter Capability	Individual/Warfighter Power	1319	04	0603724N	1,500
Navy	Aircraft Energy	Advanced Fuel Cells for UAS Applications	Design, build, and test a drop-in ready hydrogen fuel cell power and propulsion (P&P) system for the VTOL Stalker to demonstrate improved operational performance.	Increase Warfighter Capability	Platform Upgrades_Air	1319	04	0603724N	300
Navy	Aircraft Energy	Operational Modeling, Simulation and metrics	Leverage modeling, simulation and data sources to develop assessments and tools to support operational capability assessments.	Increase Warfighter Capability	M&S, Studies, and War-games	1319	04	0603724N	200
Navy	Aircraft Energy	Variable Vapor Cycle Systems	Design, build and demonstrate variable vapor cycle system that provides continuous cold liquid flow and heat rejection at a higher temperatures for greater thermal control on future aircraft applications.	Increase Warfighter Capability	Platform Thermal Management	1319	04	0603724N	100
Navy	Aircraft Energy	On-Board Thermal Management	Demonstrate deoxygenation technology to increase fuel heat sink capability in order to maximize aircraft thermal management and increase engine efficiency.	Increase Warfighter Capability	Platform Thermal Management	1319	04	0603724N	50
Navy	Aircraft Energy	Splittered Rotor Compressor	Development and validation of advance compressor design to increase efficiency and reduce weight.	Increase Warfighter Capability	Propulsion Upgrades_Air	1319	04	0603724N	30
Navy	Aircraft Energy	Opportunity Studies	Provide seed funding to investigate potential aircraft Operational Energy solutions (Power and Thermal) and identify potential candidates to select for detailed projects.	Increase Warfighter Capability	Platform Upgrades_Air	1319	04	0603724N	18
Navy	Mobility Fuels	Deployed Sensor Development and Validation	Develop and validate technology to reduce time and resources necessary to provide fuel quality surveillance in forward deployed environments.	Reduce Logistics Risks to Mission	Metering and Monitoring	1319	04	0603724N	1,017

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Navy	Mobility Fuels	Interoperability with Commercial and Allied forces	Conduct RDTE necessary to assure that Naval tactical forces (air, sea and ground) can operate seamlessly using allied and/or commercially procured fuels.	Enhance Mission Effectiveness	Conventional Fuels Testing	1319	04	0603724N	800
Navy	Mobility Fuels	Rapid fuel analysis and impact assessment	Develop test methods, fuel-hardware interaction correlations and analytic tools to reduce operational impacts from field identified deficiencies.	Reduce Logistics Risks to Mission	Conventional Fuels Testing	1319	04	0603724N	3,100
Navy	Mobility Fuels	Fuel Hardware Impact analysis	Conduct RDTE necessary to allow operational and/or technical decision makers the ability to assess risk of fuel properties/chemistry on current and emerging operational or platform requirements.	Enhance Mission Effectiveness	Conventional Fuels Testing	1319	04	0603724N	2,315
Navy	OPLOG IPT Development	Sea-based Petroleum Distribution System (SPDS)	Development of an offshore bulk fuel cache storage and over the shore transfer system. Replaces and improves on legacy OPDS systems.	Reduce Logistics Risks to Mission	Fuel Infrastructure	1319	04	0603564N	9,600
Navy	OPLOG IPT Development	Joint Offshore Fuel Farm (JOFF)	Development of an open ocean bulk fuel cache storage and transfer system to refuel oilers and combatants at sea.	Reduce Logistics Risks to Mission	Fuel Infrastructure	1319	04	0603564N	169
Navy	Energy Conservation	Power Generation and Storage	This project area will accomplish development, laboratory and Fleet testing to determine overall mission and cost effectiveness of improved power generation and storage technologies.	Increase Warfighter Capability	Platform Upgrades_Sea	1319	04	0603724N	2,440
Navy	Energy Conservation	Hull Husbandry	This project will be utilized to identify and evaluate new underwater hull coating systems and underwater hull cleaning and maintenance techniques to reduce hydrodynamic drag on the hull and thereby increase fuel efficiency.	Increase Warfighter Capability	Platform Upgrades_Sea	1319	04	0603724N	1,024
Navy	Energy Conservation	Hull Hydrodynamics	This project area will accomplish development, modeling, laboratory and Fleet testing of ship modifications to propellers such as fouling release coatings and/or hull appendages to determine overall mission and cost effectiveness of these improvements.	Increase Warfighter Capability	Platform Upgrades_Sea	1319	04	0603724N	827

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Navy	Energy Conservation	HVAC	This project will be utilized to accomplish prototype development, land and shipboard testing to determine cost effectiveness of improvements aimed at more efficient climate control of shipboard spaces.	Increase Warfighter Capability	Platform Upgrades_Sea	1319	04	0603724N	737
Navy	Energy Conservation	Thermal Management	This project will be utilized to identify and evaluate potential uses for Thermal Management techniques designed to reduce or dissipate overall shipboard heat generation and reduce the shipboard electrical demand on HVAC systems.	Increase Warfighter Capability	Platform Upgrades_Sea	1319	04	0603724N	567
Navy	Energy Conservation	Propulsion Systems	This project will be utilized to identify requirements and perform land based and shipboard testing of ship propulsion system improvements on Gas Turbine, Steam, and Diesel Engine systems to reduce overall fuel consumption and lower maintenance costs.	Increase Warfighter Capability	Propulsion Upgrades_Sea	1319	04	0603724N	237
Navy	Energy Conservation	Electrical Systems	This project will be utilized to identify and perform land based and shipboard testing of ship electrical system improvements to reduce energy consumption.	Increase Warfighter Capability	Platform Upgrades_Sea	1319	04	0603724N	587
Navy	Energy Conservation	Auxiliary Systems	This project will be utilized to identify, test, and evaluate new technologies for shipboard auxiliary systems aimed at reducing fuel consumption.	Increase Warfighter Capability	Platform Upgrades_Sea	1319	04	0603724N	237
Navy	Energy Conservation	Energy Monitoring & Assessment	This project area will focus on methods of capturing and displaying energy related data to shipboard personnel as actionable information for ships force to employ energy conservation measures underway and in port as mission requirements permit.	Increase Warfighter Capability	Metering and Monitoring	1319	04	0603724N	3,108
Navy	MQ-25	MQ-25 Development	Development of first CVN-based organic mission and recovery tanker. MQ-25 will extend the range and increase lethality of the CSG's CVW, and will contribute to F/A-18EF shortfall by relieving tanker duties and returning a/c to the strike fighter role. MQ-25 will also have a secondary ISR capability. IOC 4QFY24.	Increase Warfighter Capability	Mobile Fuel Assets	1319	05	0605414N	222,373
Navy	Defense Research Sciences	NRL - Energy	Long term Basic and Applied research into phenomena and mechanisms allowing for more efficient conversion of power; generation of power from solar illumination; from hydrogen conversion in fuel cells; storage of energy in improved battery technologies; augmentation of liquid fuels for greater energy density and exploitation of biological mechanisms for long-duration energy sources.	Increase Warfighter Capability	Alternative Fuels Production	1319	01	0601153N	3,921

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Navy	Defense Research Sciences	NRL - Energy	Long term Basic and Applied research into phenomena and mechanisms allowing for more efficient conversion of power; generation of power from solar illumination; from hydrogen conversion in fuel cells; storage of energy in improved battery technologies; augmentation of liquid fuels for greater energy density and exploitation of biological mechanisms for long-duration energy sources.	Increase Warfighter Capability	Alternative Power Sources	1319	01	0601153N	2,423
Navy	Defense Research Sciences	NRL - Energy	Long term Basic and Applied research into phenomena and mechanisms allowing for more efficient conversion of power; generation of power from solar illumination; from hydrogen conversion in fuel cells; storage of energy in improved battery technologies; augmentation of liquid fuels for greater energy density and exploitation of biological mechanisms for long-duration energy sources.	Increase Warfighter Capability	Storage, Power Controls and Distribution	1319	01	0601153N	862
Navy	Defense Research Sciences	Sea Based Aviation Propulsion Basic Research	This Program provides long-term basic research that discovers new phenomena related power propulsion and thermal management, with the intent that they mature to provide transition opportunities for the associated applied research program. This Program also supports university research in these areas and the associated graduate student support to help build the number and quality of Scientists and Engineers with relevant skills to help further develop power and propulsion systems for future Sea Based Aviation platforms and weapon systems.	Increase Warfighter Capability	Propulsion Upgrades_Air	1319	01	0601153N	2,761
Navy	Defense Research Sciences	Energy Materials Research	Energy storage and power generation materials basic research.	Increase Warfighter Capability	Materials and Design	1319	01	0601153N	8,880
Navy	Defense Research Sciences	Power, Energy, and Propulsion Research	Advancing power and energy science through fundamental research in the areas of conductor and permanent magnet materials, energy conversion, combustion, and cyber physical system modeling. Advancing thermal science and technology through fundamental studies of multi-phase heat transfer, fluid dynamics, and nanostructured materials to efficiently acquire, transport, and reject heat and enable higher power density electronic systems. Fulfill the power and energy needs of the Navy's next-generation weapons and platforms by improving (1) Education, (2) Reliability of power electronic devices, (3) Power density of power systems, and (4) Power Electronics Manufacturing costs.	Increase Warfighter Capability	Platform Upgrades_Sea	1319	01	0601153N	7,900
Navy	Defense Research Sciences	Naval Biosciences - Microbial Fuel Cells	Microbial fuel cells (MFC) provide electricity harvested from specialized natural bacteria that use non-hazardous organic compounds as fuel, and then provide electrical current to an electrode. Can be used to sustainably power seafloor sensors/systems in place of batteries. Program focuses on	Increase Warfighter Capability	Alternative Power Sources	1319	01	0601153N	657

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
			study of fundamental mechanisms used for extracellular electron transport.						
Navy	Defense Research Sciences	Bioengineering and Life Sciences (Energy)	Basic research exploring bio fabrication for generation of inorganic energy harvesting/conversion materials; bacterial-inorganic hybrid materials for fuel cells; nano-biomaterials for generating high intensity light sources; silk composites for energy harvesting and energy sources; and novel humidity responsive materials for harnessing energy for natural evaporation.	Increase Warfighter Capability	Materials and Design	1319	01	0601153N	606
Navy	Defense Research Sciences	Bioengineering and Life Sciences (Energy)	Basic research exploring the fundamental mechanism of bacterial spores' water-responsive behaviors in order to develop practical applications using the evaporation energy harvesting technique, and next generation actuators.	Increase Warfighter Capability	Alternative Power Sources	1319	01	0601153N	144
Navy	Defense Research Sciences	ONRG International Research	Basic research with international principle investigators doing collaborative and cooperative research with the Naval research enterprise.	Increase Warfighter Capability	Alternative Power Sources	1319	01	0601153N	199
Navy	Power Projection Applied Research	NRL - Energy	Long term Basic and Applied research into phenomena and mechanisms allowing for more efficient conversion of power; generation of power from solar illumination; from hydrogen conversion in fuel cells; storage of energy in improved battery technologies; augmentation of liquid fuels for greater energy density and exploitation of biological mechanisms for long-duration energy sources.	Increase Warfighter Capability	Storage, Power Controls and Distribution	1319	02	0602123N	2,374
Navy	Power Projection Applied Research	Propulsion Task Force Energy (TFE)	This Program, in partnership with the Variable Cycle Advance Technology (VCAT) program, has the objective to develop variable geometry and adaptive cycle gas turbine engine technology for next generation air dominance aircraft. The benefits of these technologies are anticipated to be reduced fuel consumption and hence greater operational range and reduced logistics tail, mostly by reducing the demand for deployed fuel and tanker aircraft support.	Increase Warfighter Capability	Propulsion Upgrades_Air	1319	02	0602123N	8,833
Navy	Power Projection Applied Research	Sea Based Aviation Propulsion Applied Research	This Program provides medium-term, applied research to demonstrate advanced engine technologies applicable to engine components for naval aviation platforms in propulsion-related technology areas. The specific areas addressed in this program are: (1) Propulsion Cycles, Subsystems, and Engine-Airframe Integration (2) High Stage-Loading, Variable-Geometry, and Enhanced Durability Turbomachinery (3) Jet Noise Reduction for tactical aircraft (4) Hot Section Materials and Coatings, (5) Higher Power Density and Stability Combustion Systems, and (6) Small Propulsion Engine Technology for Autonomous Air Vehicles.	Increase Warfighter Capability	Propulsion Upgrades_Air	1319	02	0602123N	3,676

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Navy	Power Projection Applied Research	Power, Energy, and Propulsion Research	Technology programs focused on providing technologically superior warfighting capabilities at reduced total ownership costs for surface and subsurface platforms through investments in applied research of programs such as the Electric Ship Research and Development Consortium (ESRDC). ESRDC is composed of eight leading universities and is focused on afloat power systems, and leads efforts to address a national shortage of electric power engineers, and ensure U.S. superiority in electric systems; activities linked with newly established Combat Power and Energy Systems (CPES); and activities in support of digital twin, heat transfer/thermal management, distribution/control of power and energy storage and power management.	Increase Warfighter Capability	Platform Upgrades_Sea	1319	02	0602123N	28,930
Navy	Warfighter Sustainment Applied Research	Biocentric Technology (Energy)	Program focuses on microbes that produce electricity from organic matter found in sediment or wastewater, and is targeting two distinct naval applications: (1) Powering of undersea devices and sensors for environmental monitoring, and (2) shipboard/submarine wastewater degradation.	Reduce Logistics Risks to Mission	Alternative Power Sources	1319	02	0602236N	685
Navy	Warfighter Sustainment Applied Research	ONRG International Research	Early applied research with international principle investigators doing collaborative and cooperative research with the Naval research enterprise.	Increase Warfighter Capability	Alternative Power Sources	1319	02	0602236N	150
Navy	Ocean Warfighting Environment Applied Research	Integrated Climate Weather and Ocean Decision Support	Applied research for multi-objective planning and asset routing to adjust planned logistics routes to account for factors like hazardous and extreme weather and ocean conditions to increase operational logistics effectiveness, fuel efficiency, and reduce platform lifecycle costs from damage and fatigue.	Reduce Logistics Risks to Mission	Storage, Power Controls and Distribution	1319	02	0602435N	3,643
Navy	Undersea Warfare Applied Research	NRL - Energy	Long term Basic and Applied research into phenomena and mechanisms allowing for more efficient conversion of power; generation of power from solar illumination; from hydrogen conversion in fuel cells; storage of energy in improved battery technologies; augmentation of liquid fuels for greater energy density and exploitation of biological mechanisms for long-duration energy sources.	Increase Warfighter Capability	Alternative Power Sources	1319	02	0602747N	733
Navy	Undersea Warfare Applied Research	Undersea Weaponry (USW) - Power & Energy	Applied research to develop component, subsystem and system technologies that are the critical building blocks for advanced high-energy-density and power-density propulsion systems, enabling increased endurance (days/weeks/months) and reliability in an air-independent environment. Approaches include modeling and simulation, fuel cells, engines, novel fuels/oxidizers and reactant storage/delivery systems.	Increase Warfighter Capability	Propulsion Upgrades_Sea	1319	02	0602747N	1,197

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Navy	Future Naval Capabilities Applied Research	SW-FY21-02 Robust Combat Power Control (RCPC)	Develop Combat Power and Energy Control System to anticipate, align and configure shipboard resources based on system state and mission context.	Increase Warfighter Capability	Storage, Power Controls and Distribution	1319	03	0603673N	7,735
Navy	Aircraft Energy	Common Affordable Safe Energy Storage	Optimize aircraft battery performance, safety and cost through development of a common, scalable Li ion battery.	Increase Warfighter Capability	Individual/Warfighter Power	1319	04	0603724N	1,400
Navy	Aircraft Energy	Aircraft Turbine Engine Recuperator	Demonstrate using M250 engine utilizing an advanced recuperator design enabling 25% reduced specific fuel consumption (SFC). Reduced SFC would provide extended time on station improvement of 25 - 35%, critical to ISR mission.	Increase Warfighter Capability	Propulsion Upgrades_Air	1319	04	0603724N	1,500
Navy	Aircraft Energy	Integrated Thermal and Power Management Modelling	Development and validation of Integrated Power and thermal management models to develop integrated solutions in legacy and emerging platforms.	Increase Warfighter Capability	Platform Thermal Management	1319	04	0603724N	1,900
Navy	Advance Surface Machinery Sys	Integrated Power & Energy Systems	Development of Next Generation Integrated Power and Energy System (NGIPES) technology aboard Navy Ships to enable current and future weapons and sensor systems.	Increase Warfighter Capability	Storage, Power Controls and Distribution	1319	04	0603573N	69,324
Navy	ICAS/eRM	Condition Assessment System	Supports Installation and Procurement of ICAS (Integrated Condition Assessment System) and eRM (Enterprise Remote Monitoring). These systems enables remote monitoring and real time health assessments of shipboard equipment.	Enhance Mission Effectiveness	Platform Upgrades_Sea	1810	01	0204228N	827
Navy	MUSE Program	Mobile Utility Support Equipment	The Mobile Utility Support Equipment (MUSE) Program is recapitalizing end-of-life electrical generation assets providing efficient electrical power generation, reduced air pollutants via air permitting requirements, and reduced carbon emissions offsetting the effects of climate change.	Enhance Mission Effectiveness	Contingency Basing	1810	05	0708012N	8728
Navy	LCS In-Service Modernization	LCS Stern Flap	Complete engineering for stern flap installations on LCS.	Increase Warfighter Capability	Platform Upgrades_Sea	1810	01	0204230N	850

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
Navy	TAO Fleet Oiler	T-AO 205 Efficient Replacement Engines	SCN supporting energy efficient engines for T-AO Class ships.	Reduce Logistics Risks to Mission	Propulsion Upgrades_Sea	1611	05	0204441N	11,470
Navy	Mobility Fuels	Tri-Service Harmonized Synthetic Fuel Qualification	Conduct analytic assessment of the synthetic fuel processes currently approved by the commercial specification to provide assessment and recommendations to Service Air Worthiness authorities for approval or not. Identify testing required to obtain approval for those process not recommended for approval.	Reduce Logistics Risks to Mission	Alternative Fuels Certification and Testing	1319	04	0603724N	2,000
								Total Navy	456,403

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
USMC	Mobile Power Equipment	Advance Mobile Medium Power Sources	The Family of Mobile Power Equipment is a family-of-systems to continuously procure, update, and replenish approximately 19,000 items of Mobile Tactical Power Generation & Distribution Equipment to include the AMMPS system, and 22 different TAMCNs. The Family of Mobile Electric Power Equipment consists of skid & trailer mounted tactical generators ranging from 2 to 200 kilowatts, Mobile Electric Power Distribution Systems, Floodlight Sets, Load Banks & Electricians Tool Kits. This equipment is procured & fielded to provide electricity on the battlefield. Combat, combat support & combat service support units all require tactical power to operate weapons systems, C4I systems, medical & messing facilities, environmental control equipment, & water purification systems.	Enhance Mission Effectiveness	Contingency Basing	1106	01	0206624M	857
USMC	Mobile Power Equipment	Advance Mobile Medium Power Sources	The Family of Mobile Power Equipment is a family-of-systems to continuously procure, update, and replenish approximately 19,000 items of Mobile Tactical Power Generation & Distribution Equipment to include the AMMPS system, and 22 different TAMCNs. The Family of Mobile Electric Power Equipment consists of skid & trailer mounted tactical generators ranging from 2 to 200 kilowatts, Mobile Electric Power Distribution Systems, Floodlight Sets, Load Banks & Electricians Tool Kits. This equipment is procured & fielded to provide electricity on the battlefield. Combat, combat support & combat service support units all require	Enhance Mission Effectiveness	Contingency Basing	1109	06	0206211M	21,467

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
			tactical power to operate weapons systems, C4I systems, medical & messing facilities, environmental control equipment, & water purification systems.						
USMC	Mobile Power Equipment	Advance Mobile Medium Power Sources	The Family of Mobile Power Equipment is a family-of-systems to continuously procure, update, and replenish approximately 19,000 items of Mobile Tactical Power Generation & Distribution Equipment to include the AMMPS system, and 22 different TAMCNs. The Family of Mobile Electric Power Equipment consists of skid & trailer mounted tactical generators ranging from 2 to 200 kilowatts, Mobile Electric Power Distribution Systems, Floodlight Sets, Load Banks & Electricians Tool Kits. This equipment is procured & fielded to provide electricity on the battlefield. Combat, combat support & combat service support units all require tactical power to operate weapons systems, C4I systems, medical & messing facilities, environmental control equipment, & water purification systems.	Enhance Mission Effectiveness	Contingency Basing	1109	06	0502511M	1,895
USMC	Mobile Power Equipment	Advance Mobile Medium Power Sources	The Family of Mobile Power Equipment is a family-of-systems to continuously procure, update, and replenish approximately 19,000 items of Mobile Tactical Power Generation & Distribution Equipment to include the AMMPS system, and 22 different TAMCNs. The Family of Mobile Electric Power Equipment consists of skid & trailer mounted tactical generators ranging from 2 to 200 kilowatts, Mobile Electric Power Distribution Systems, Floodlight Sets, Load Banks & Electricians Tool Kits. This equipment is procured & fielded to provide electricity on the battlefield. Combat, combat support & combat service support units all require tactical power to operate weapons systems, C4I systems, medical & messing facilities, environmental control equipment, & water purification systems.	Enhance Mission Effectiveness	Contingency Basing	1109	06	0502514M	2,885
USMC	Mobile Power Equipment	Advance Mobile Medium Power Sources	The Family of Mobile Power Equipment is a family-of-systems to continuously procure, update, and replenish approximately 19,000 items of Mobile Tactical Power Generation & Distribution Equipment to include the AMMPS system, and 22 different TAMCNs. The Family of Mobile Electric Power Equipment consists of skid & trailer mounted tactical generators ranging from 2 to 200 kilowatts, Mobile Electric Power Distribution Systems, Floodlight Sets, Load Banks & Electricians Tool Kits. This equipment is procured & fielded to provide electricity on the battlefield. Combat, combat support & combat service support units all require tactical power to operate weapons systems, C4I systems, medical & messing facilities, environmental control equipment, & water purification systems.	Enhance Mission Effectiveness	Contingency Basing	1319	07	0206624M	3,109

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Strategy Objectives	OE Activity Classification	Treasury Code	BA Code	Program Element	FY2022 (\$K)
USMC	Family of Shelters and Shelter Equipment	Shelters, Shelter Liners, Lighting upgrades	R&D for future shelter systems and USMC lighting solution of the future.	Increase Warfighter Capability	Contingency Basing	1319	07	0206623M	174
USMC	Medium Tactical Vehicle Replacement (MTVR)	Fuel Efficient MTVR FNC Transition	Through analysis, modeling and simulation, hardware development, integration, test, and evaluation, the Fuel Efficient Medium Tactical Vehicle Replacement (MTVR) FNC program will select, bench test, and integrate a suite of affordable fuel efficiency enablers.	Increase Warfighter Capability	Platform Upgrades_Land	1106	01	0702808M	189
USMC	Medium Tactical Vehicle Replacement (MTVR)	Fuel Efficient MTVR FNC Transition	Through analysis, modeling and simulation, hardware development, integration, test, and evaluation, the Fuel Efficient Medium Tactical Vehicle Replacement (MTVR) FNC program will select, bench test, and integrate a suite of affordable fuel efficiency enablers.	Increase Warfighter Capability	Platform Upgrades_Land	1109	05	0206315M	6,935
USMC	Expeditionary Energy Office	Expeditionary Energy Concepts (E2C, formally ExFOB)	Annual process to evaluate and deploy technologies to support Marine Corps Expeditionary Energy Strategy goals of increased combat effectiveness and reduced dependence on liquid logistics on the battlefield.	Increase Warfighter Capability	Individual/Warfighter Power	1106	04	0903798M	3,032
USMC	Expeditionary Energy Office	Expeditionary Energy Concepts (E2C, formally ExFOB)	Annual process to evaluate and deploy technologies to support Marine Corps Expeditionary Energy Strategy goals of increased combat effectiveness and reduced dependence on liquid logistics on the battlefield.	Increase Warfighter Capability	Individual/Warfighter Power	1319	07	0206313M	1,290
USMC	MCWL/Futures Directorate	Hybrid Electric ITV Trailer (HEIT)	Combining proven technologies in a novel way, program seeks to provide an ITV-towable, V-22/CH-53/C130 transportable, Mobile Hybrid Power source that can use multiple fuel types to provide quiet sustained power.	Increase Warfighter Capability	Contingency Basing	1319	03	0603640M	713
USMC	Applied Research	Marine Corps Operational Energy: Energy Efficiency and Demand Reduction	Applied Research to increase energy efficiency in weapons systems, platforms, vehicles and equipment and extend tactical range/operational reach. Develop, optimize, integrate, and demonstrate at least 15% fuel efficiency improvement over the existing MTVR.	Increase Warfighter Capability	Individual/Warfighter Power	1319	02	0602131M	1,960
USMC	Advanced Technology Demo	Marine Corps Operational Energy: Energy Optimization and Logistic Burden Reduction	Advanced Technology Demonstration research to optimize energy usage and/or meet operational energy demand with renewable energy sources and reduce excess capacity or reduce logistic footprint/burden energy sources. Develop, optimize, integrate, and demonstrate at least 15% fuel efficiency improvement over the existing MTVR.	Increase Warfighter Capability	Individual/Warfighter Power	1319	03	0603640M	5,323
USMC	Medium Tactical Vehicle Replacement (MTVR)	Fuel Efficient MTVR FNC Transition	Through analysis, modeling and simulation, hardware development, integration, test, and evaluation, the Fuel Efficient Medium Tactical Vehicle Replacement (MTVR) FNC program will select, bench test, and integrate a suite of affordable fuel efficiency enablers.	Increase Warfighter Capability	Platform Upgrades_Land	1319	07	0206624M	35
								USMC Total	49,864