

Fiscal Year 2016 Operational Energy Budget Certification Report



**Assistant Secretary of Defense for
Energy, Installations, and Environment**

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EXECUTIVE SUMMARY

Following an extensive review, the FY 2016 President’s Budget for the Department of Defense (DoD) is adequate for implementing the objectives of the *Operational Energy (OE) Strategy*. Conducted pursuant to title 10, United States Code, section 2926(c), this review requires that the Assistant Secretary of Defense for Energy, Installations, and Environment (ASD(EI&E)) annually review the President’s Budget to certify that the level of funding for OE initiatives is adequate for carrying out the Department’s 2011 *Operational Energy Strategy*.

For the FY 2016 budget certification assessment, the Office of the ASD(EI&E) compared the proposed budgets of the Military Departments, Defense Logistics Agency (DLA), and Office of the Secretary of Defense (OSD) against the strategy objectives, including reducing demand for energy in military operations, diversifying the supply of energy, and adapting the future force.

DoD OE Funding by Strategy Objective (\$ Millions)	FY 2016	FY 2016 %	FYDP	FYDP %
Reduce Demand	\$ 1,632.6	90.5%	\$ 10,473.3	92.8%
Diversify Supply	\$ 160.7	8.9%	\$ 768.1	6.8%
Adapt Future Forces and Technology	\$ 10.8	0.6%	\$ 50.0	0.4%
<i>Total</i>	\$ 1,804.1	100%	\$ 11,291.4	100%

The Department is investing over \$1.8 billion in FY 2016 and \$11.2 billion over the FY 2016-2020 Future Years Defense Program (FYDP) in operational energy initiatives. In addition, nearly 90 percent of Department investments in FY 2016 are focused on reducing demand, matching the emphasis in the 2011 *Operational Energy Strategy*. Balancing these demand reduction investments are efforts in tactical solar, improved batteries, and alternative fuels certification. Finally, the Military Departments are adapting requirements and analytical processes to fundamentally adjust the energy needs of our future forces.

Given the role of propulsion in influencing joint energy needs—and accompanying capabilities and risks—the Department funded innovations related to current and future engines, including the Adaptive Engine Technology Development program for tactical aircraft, KC-135 engine upgrades, Improved Turbine Engine Program for helicopters, improved power pack for Stryker, and Hybrid Electric Drive for ships. Going forward, Department decision-making should consider the significant improvements in warfighting capability and risk reduction capability that result from these propulsion initiatives.

The Department also invests in reducing energy use at contingency bases. The Army and Marine Corps investments in Advanced Mobile Medium Power Sources generator sets; the contingency base infrastructure initiative to standardize planning, construction, and operation of base camps; and other expeditionary applications will reduce energy needs at outposts and base camps. As a Department, we must institutionalize these lessons learned for ground component operations in desert conditions and seek the same improvements at contingency bases supporting air, sea, and land operations in different environmental conditions.

Over the long term, the Department is making appropriate investments in science and technology (S&T). Programs like the Army's investments in dual-use ground vehicles; the Navy's electric ship research and development (R&D) consortium; the Air Force initiatives in composite materials and aircraft design; and the Marine Corps initiatives in energy efficient processors, sensors, and fuel cells each contribute to improvements in the use of energy across air, land, and sea. To ensure that operational energy capabilities reach the field, the Military Departments, in particular, need to support and appropriately transition technologies funded through the Operational Energy Capabilities Improvement Fund.

Finally, Military Department initiatives to include operational energy in wargames are improving, but these strategic-level investments require complementary funding for modeling and simulation. As energy supportability analyses are essential to the formulation of the Energy Key Performance Parameter, the Military Departments should support scenario-based modeling and simulation with realistic assumptions about our own logistics capacity and the adversaries we are likely to face.

In line with the 2011 *Operational Energy Strategy*, the Department's FY 2016 President's Budget demonstrates the full range of innovations now underway in how we generate, use, and plan to use energy. Department operators, planners, and logisticians are treating energy as a constrained and vulnerable commodity that may not always be available in a combat environment. As energy continues to affect operations, plans, and materiel development programs, the Department is making energy a permanent and lasting component of our decision-making.

APPROACH TO BUDGET CERTIFICATION

For the FY 2016 budget certification assessment, the proposed budgets of the Military Departments, DLA, and OSD were compared against the objectives of the 2011 *Operational Energy Strategy*. Reducing demand, diversifying supply, and adapting the future force will mean a military that uses energy more effectively, has more secure energy sources, and can better assure that deployed forces will have the energy needed to carry out missions around the globe.

Reduce Demand. Today's military missions require large and growing amounts of energy with supply lines that can be costly, vulnerable to disruption, and burdensome on Warfighters. As a result, the Department is adapting technology, training, and education to reduce the demand for operational energy and improve military energy use. The resulting force will be more capable and face fewer risks. These investments reduce the overall demand for energy in specific systems or enable equipment to provide more capability per unit of energy consumed.

Diversify Supply. Most military operations depend on a single energy source: petroleum-based liquid fuels. This has economic, strategic, and environmental drawbacks. In addition, the security of the energy supply infrastructure is not always robust or within the Department's full control. Consequently, the Department needs to further diversify its energy sources and supply chains and protect access to energy supplies in order to have a more reliable and assured supply of energy for military missions. Investments to diversify supply include alternatives that supplement military specification petroleum, displace liquid fuels, or minimize the other risks associated with petroleum use.

Adapt the Future Force. The Department's decision-making and processes for developing future forces need to better consider the risks and costs of escalating energy demand. To account for these risks, the Department must continue to integrate operational energy considerations into the full range of planning and force development activities, including wargames, the Joint Capabilities Integration Development System (JCIDS), and supporting modeling and simulation. Investments to adapt the future force are not necessarily as capital intensive as those to reduce demand or diversify supply. Beyond specific investments in wargames and modeling and simulation (M&S), many of these initiatives include changes to existing processes that support the planning, programming, budgeting, and execution system.

In addition to the relationship to the 2011 strategy objectives, the Department also categorizes initiatives into three areas: *Direct investments* are intended specifically to reduce demand, diversify supply, or adapt the future force, as articulated in the 2011 *Operational Energy Strategy*. *Indirect investments* are not specifically made under the umbrella of operational energy, but they help the Department achieve operational energy goals. Finally, *research investments* include broader research, development, test, and evaluation (RDT&E) programs intended to generally advance our future technological edge, and they fall across budget activities one, two, and three.

To evaluate the adequacy of investments, the OASD(EI&E) assessed initiatives and validated each operational energy initiative in the President's Budget. As much as possible, the OASD(EI&E) used the existing review process within the Department, but it also received

specific briefings from the Military Departments and DLA and participated in Program Budget Review issue teams.

The ASD(EI&E) also formed a Certification Advisory Working Group (CAWG) with representatives from the Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, Department of Defense; the Office of the Director, Cost Analysis and Program Evaluation; the Joint Staff; the Military Departments; and DLA. The CAWG reviewed the Military Departments responses to ASD(EI&E) questions and provided recommendations on the adequacy of resourcing 2011 *Operational Energy Strategy* objectives.

Component support of 2011 *Operational Energy Strategy* objectives then were rated green as adequately funded, amber 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 remainder of the report includes detailed reviews of Service and OSD investments across the three objectives of the 2011 *Operational Energy Strategy*, data tables, and required appendices on changes in the requirements and procurement processes. It also includes resource information for OASD(EI&E), a table with all FY 2016 operational energy initiatives, and an estimate of the FY 2016 fuel budget.

ARMY

The Department of the Army budgeted \$946.5 million in FY 2016 and approximately \$6.3 billion across the FYDP for OE initiatives. Approximately 92 percent of the Army's funding (\$5.8 billion) across the FYDP is budgeted for demand reduction initiatives, while the remaining eight percent (\$478.2 million) is aligned to diversify supply and adapting the future force.

Reduce Demand

The Army budgeted \$852.2 million in FY 2016 and \$5.8 billion across the FYDP to *reduce demand*. Key efforts are summarized below:

- **Improved Stryker** (\$263.1 million FY 2016; \$2.2 billion FYDP). This Engineering Change Proposal is an *indirect initiative* focused on increasing mobility and electrical power of the Stryker wheeled combat vehicle, and it includes a 4000w AC/DC power generator, alternator, engine, and smart power management system. The FY 2016 President's Budget increases the funding as a result of the Stryker integration efforts and currently is in Phase II RDT&E. Specifically, this new power supply increases the platform's electrical power margin and enables the sustained operation of all on-board systems, a capability lacking in the current Stryker. The current schedule calls for a production decision in 2017 followed by actual production beginning in 2018. Current requirement is for 1,128 Strykers, with approximately one Brigade (~320) completed annually.
- **Advanced Mobile Medium Power Source (AMMPS) Generator Sets** (\$115.8 million FY 2016; \$491.4 million FYDP). A *direct investment* in operational energy, AMMPS are technologically advanced, tactical, diesel-fueled, lightweight, portable, reliable, rugged medium power sources that replace the second-generation Tactical Quiet Generators. Together, AMMPS is DoD's newest family of standardized military generators in the medium size range (5-60 kilowatts (kW)), and it provides greater reliability, reduced noise, and lighter weight. Most significantly, the AMMPS provides a fleet-wide average of 21 percent improved fuel efficiency, which reduces the amount of fuel transported through contested environments and reduces the risks to personnel and equipment moving fuel. This funding supports the Army component of the program, which totals approximately 70,000 AMMPS generator sets.
- **Improved Turbine Engine Program (ITEP)** (\$49.2 million FY 2016; \$640.8 million FYDP). As an *indirect investment* in operational energy, this new engine for UH-60 and AH-64 helicopters significantly reduces fuel consumption and maintenance costs while also increasing performance at high altitude and in high temperatures. This initiative has the potential to deliver significant increased operational capability to the Army's rotary wing fleet and become a consideration for other H-60 models serving in the Navy and the Air Force.
- **National Automotive Center (NAC) Dual Use Technologies** (\$11.5 million FY 2016; \$55.1 million FYDP). As the largest Army *research initiative* in support of reducing

demand, the NAC addresses technology gaps for tracked and wheeled combat vehicles and reaches out to industry, academia, and other Government agencies to build collaborative relationships based on mutual technical interests. The Advanced Vehicle Power Technology Alliance (AVPTA) is a joint partnership between the Department of the Army and the Department of Energy (DoE) welcoming concept papers and proposals in energy efficient vehicle technology. Similarly, the High-Efficiency Truck Users Forum brings original equipment manufacturers, suppliers, fleets, and other industry stakeholders together to ensure commercial product offerings are capable of meeting high-efficiency military requirements.

Diversify Supply

The Army budgeted \$92.8 million in FY 2016 and \$473.7 million across the FYDP to *diversify supply*. Key efforts are summarized below:

- **Soldier Power** (\$51.3 million FY2016; \$247.9 million FYDP). This *direct investment* in operational energy is designed to diversifying the energy used to power dismounted Soldier systems and, ultimately, reducing Soldier load. To reduce the load, the Army assesses technologies to improve battery output, reduce battery weight, and expand options for recharging batteries from alternative energy sources. The United States Army Natick Soldier Research, Development, and Engineering Center (NSRDEC—known as NATICK Labs) has developed and is evaluating small, lightweight, efficient, on-the-move, portable energy-harvesting and distribution systems that eliminate the need to carry extra batteries. These systems work by capturing small amounts of energy that would otherwise be lost as heat, light, sound, vibration, or movement, and they use that energy to recharge batteries and provide power for Soldier communication equipment, sensors, or battlefield situational displays. For instance, the Lightning Pack's Rucksack Harvester relies on the weight of the backpack to produce kinetic energy when the backpack oscillates vertically in response to the Soldier's walking or running stride, and it is capable of producing 16 to 22 watts while walking and 22 to 40 watts while running. The Bionic Power's Knee Harvester collects kinetic energy by recovering the power generated when walking. In addition, NATICK is testing conformal solar panels fitted to backpacks and helmets that, under bright sunlight conditions, are capable of delivering up to 17 watts of electrical power.
- **Modular Fuel System (MFS)** (\$16.3 million FY 2016; \$63.2 million FYDP). This *direct initiative* in support of diversifying supply will dramatically alter the way the Army distributes bulk fuel around the battlefield. The MFS consists of two 600-gallon-per-minute pump racks and fourteen 2,500-gallon tank racks for a total capacity of 35,000 gallons, all of which are included on a C-130 transportable Heavy Expanded Mobility Tactical Truck. The standard equipment setup includes 3,300 feet of hose and a full complement of nozzles needed to support multiple retail, bulk, and aviation distribution points. The system can support two refuel-on-the-move configurations for a total of 16 distribution points, and it is compatible with all military fuel mixtures.

Adapt the Future Force.

The Army budgeted \$1.5 million in FY 2016 and \$4.5 million across the FYDP for *adapt the future force*, including:

- **Modeling and Simulation** (\$1.5 million FY 2016; \$4.5 million FYDP). This *direct investment* in OE supports the development of analytic processes and M&S tools to examine operational energy, logistics, and force protection requirements in an integrated fashion for given scenarios; estimate energy, water, and waste (solid, hazardous, and medical) requirements; and provide improved logistical and fuel planning tools. These efforts will enable leadership to better understand logistics risks related to energy in a contested battle space and the operational consequences associated with attrition and force protection demands. The Director of the United States Army Training and Doctrine Command Analysis Center also established an operational energy task force, which includes the Army analytic community and OSD representatives. The ASD(EI&E) commends the Army for their commitment and encourages the other Military Departments to establish similar efforts.

Army Assessment Rating: **GREEN**

The ASD(EI&E) assessed the Army's proposed FY 2016 budget as adequate for the implementation of the 2011 *Operational Energy Strategy*.

NAVY

The U.S. Navy budgeted \$323.8 million in FY 2016 and approximately \$1.8 billion across the FYDP for OE initiatives. The Navy budgeted approximately 91 percent of the funding (\$1.4 billion) across the FYDP for demand reduction initiatives, while the remaining nine percent (\$138.1 million) is aligned to diversifying supply and adapting the future force.

Reduce Demand

The Navy budgeted \$295.7 million in FY 2016 and \$1.4 billion across the FYDP for *demand reduction*. Key efforts are summarized below:

- **Electric Ship Research and Development Consortium** (\$10.1 million FY 2016; \$54.6 million FYDP). The Electric Ship Research and Development Consortium is a *research initiative* focusing on developing advanced power distribution system architecture for a future 100MW electric ship with enough energy density to fit into a 10,000 ton ship. The system would enable integration of a smart ship system design tool to improve power distribution, address segmented design, and incorporate a flexible control system needed to support distribution architecture to support a future 100MW electric ship. To date, the Electric Ship Research and Development Consortium is using the DDG-51 as the basis to for developing a roadmap on the technical challenges associated with supporting future power loads. A more open approach to ship design and electrical architecture allows greater flexibility in accommodating new weapons and sensor platforms by building in the capability to meet higher load requirements as new systems are developed and deployed. The improvements over current density efficiency include smart ship system design tools, common energy storage, flexible control systems, advanced motors, and modular power converters.
- **Hybrid Electric Drive (HED) Implementation** (\$37.1 million FY 2016; \$211.6 million FYDP). As a *direct investment* in operational energy, the HED uses an electric motor attached to the main reduction gear of DDG-51-class destroyers to improve fuel economy and increase time on station by up to 2.5 days per ship when used 50 percent of the time between refuelings. The Navy's budget for HED development and implementation supports two installations beginning in FY 2016, with an additional four installations scheduled per year in FY 2017 through FY 2019.
- **Simulator Upgrades** (\$79.3 million FY 2016; \$400.5 million FYDP). These *indirect investments* will enable fleet squadrons to accomplish a greater degree of training and readiness in the simulator, potentially resulting in a reduction of the flying hour program's requirements.

Diversify Supply

The Navy budgeted \$25.9 million in FY 2016 and \$128.4 million across the FYDP to *diversify supply*, including:

- **Alternative Fuels Test and Qualification Program** (\$12.5 million FY 2016; \$62.6 million FYDP). This *research initiative* evaluates the effects of changes in fuel chemistry and properties on the performance and reliability of ship, aircraft, and fuel distribution systems. Specifically, the program develops the operational requirements necessary to acquire, approve, and test alternative fuel types for use in Navy ships and aircraft as well as non-tactical base support vehicles and support equipment. Through collaboration with energy partners from the armed forces, Federal agencies, academia, and the energy industry, the Navy is able to effectively evaluate the potential benefits of renewable fuel sources. Past demonstrations of alternative fuel use include the F/A-18 “Green Hornet” flying on fuel derived from the camelina plant and/or alcohol-to-jet, and testing fuel derived from algae and other feedstocks on surface ships.

Adapt the Future Force.

The Navy budgeted \$2.1 million in FY 2016 and \$9.7 million across the FYDP to *adapt the future force*. Key efforts are summarized below:

- **Auditing, Modeling and Savings Analysis** (\$1.5 million FY 2016; \$6.9 million FYDP). This *research initiative* combines Operational Logistics R&D with Military Sealift Command (MSC) research to manage and conduct energy audits onboard ships; facilitates and optimizes energy reduction methods; and evaluates alternatives to reduce energy costs. Once calibrated through audit data input, a model for each ship class will generate baseline energy usage profiles for various missions, load-outs, areas of operations, and operating conditions. The program is projected to save approximately 18,000 barrels of fuel from FY 2010-2020.
- **Policy Guidance and Development and Training and Incentive Program** (\$.5 million FY 2016; \$2.7 million FYDP). This *direct investment* in operational energy implements class- or fleet-wide policy that results in more efficient ship operations. It also integrates energy efficiency training into existing Civilian Mariner Engineering Officer Training program and adds an incentive program to incentivize efficient ship operation and the generation of energy conservation initiatives. The program is projected to save approximately 10,000 barrels of fuel from FYs 2010-2020.

Navy Assessment Rating: GREEN

The ASD(EI&E) assessed the Navy’s proposed FY 2016 budget as adequate for the implementation of the 2011 *Operational Energy Strategy*.

MARINE CORPS

The Marine Corps budgeted \$41.7 million in FY 2016 and approximately \$292.9 million across the FYDP for OE initiatives. Approximately 65 percent of the funding (\$189.1 million) across the FYDP is budgeted for demand reduction initiatives, while the remaining 35 percent (\$103.8 million) is aligned to diversifying supply and adapting the future force.

Reduce Demand

The Marine Corps budgeted \$20 million in FY 2016 and \$189 million across the FYDP to *reduce demand*. Key efforts are summarized below:

- **Portable Electric Energy and Water Purification** (\$7.9 million FY 2016; \$47.9 million FYDP). This *research initiative* supports research into concepts for flexible photovoltaics for integrated and deployable systems and UV-LED water purification-energy efficient small unit water purification technologies (filtration, desalination, sanitation). This will enable reduced fuel use at forward locations, reducing the need for logistics resupply through contested access.
- **Medium Tactical Vehicle Replacement (MTVR)** (\$6.1 million in FY 2016; \$34.1 million FYDP). This Office of Naval Research-sponsored *direct initiative* includes developing and demonstrating a 15 percent improvement in fuel efficiency over the existing MTVR while maintaining affordability, mobility, and survivability.
- **Improved Environmental Control Units (ECU)** (\$0.4 million FY 2016; \$11.9 million FYDP). This *indirect initiative* standardizes ECUs while increasing efficiency by approximately 17 percent across the portfolio of systems. The improved ECUs also are both quieter and more rugged, and they contain a more environmentally acceptable refrigerant.

Diversify Supply

The Marine Corps budgeted \$16 million in FY 2016 and \$75 million across the FYDP to *diversify supply*, including:

- **Advanced Power Sources** (\$15.5 million FY 2016; \$74.1 million FYDP). As a *direct investment* in operational energy, the Advanced Power Sources portfolio of alternative power capabilities supports communications equipment, computers, and other electronic equipment in expeditionary environments. This family includes energy harvesting systems as well as power converters (AC to DC), power inverters (DC to AC), variable output power supplies, and radio power adapters. This equipment drives efficient energy production and distribution to support Marine units and individuals, and it increases the operational reach of the force by reducing the requirement for fuel and batteries. Specifically, these investments include Solar Portable Alternative Communications Energy Systems (SPACES) and Ground Renewable Expeditionary Energy System (GREENS).

Adapt the Future Force

The Marine Corps budgeted \$5.7 million in FY 2016 and \$28.8 million across the FYDP to *adapt the future force*, including:

- **Expeditionary Energy Office (E2O)** (\$5.7 million FY 2016; \$28.9 million FYDP). The E2O annually hosts Expeditionary Energy Concepts (E2C), formally known as Experimental Forward Operating Base (ExFOB). As a directive, E2C brings together stakeholders from across Marine Corps requirements, acquisition, and technology development communities to quickly evaluate technologies that address the capability gaps identified in the Energy Water and Waste Capabilities Base Assessment, Initial Capability Document. The ExFOB guides the development of new requirements documents and informs Marine Corps investment decisions, accelerating new capabilities from concept to combat.

To facilitate the incorporation of energy security considerations into force development, the Marine Corps has pursued extensive M&S to support the requirements and acquisition processes. The Marine Corps has developed a portfolio of modeling tools, including the Marine Air-Ground Task Force Power and Energy Model to provide demand-side quantitative modeling of energy. The Marine Corps also developed the Marine Corps Power and Energy Investment Model with Sandia National Labs to assess supply-side requirements and risks.

The Marine Corps has proposed incorporating the amphibious force into the Synthetic Theater Operations Research Model (STORM) M&S tool in order to incorporate OE into force structure and force allocation decisions. When the M&S tool is complete, the Marine Corps will be able to inform energy tradeoffs in requirements development and acquisition program performance criteria. Such analysis supports the evaluation of major defense acquisition programs and the setting of threshold and objective levels of energy demand.

Marine Corps Assessment Rating: GREEN

The ASD(EI&E) assessed the Marine Corps' proposed FY 2016 budget as adequate for the implementation of the 2011 *Operational Energy Strategy*.

AIR FORCE

The Department of the Air Force budgeted \$445.3 million in FY 2016 and approximately \$2.9 billion across the FYDP for OE initiatives. Within the Air Force's budget, approximately 97 percent of the funding (\$2.8 billion) across the FYDP is budgeted for demand reduction initiatives, while three percent (\$78 million) is aligned to diversify supply and adapt to future force initiatives.

Reduce Demand

The Air Force budgeted \$421.6 million in FY 2016 and \$2.8 billion across the FYDP for *demand reduction*. Key efforts are summarized below:

- **Adaptive Engine Technology** (\$243.7 million FY 2016; \$2 billion FYDP). This *research initiative* leverages prior insights gained through Adaptive Versatile Engine Technology (ADVENT), a next-generation turbine engine technology program that sought to optimize combat aircraft engine fuel efficiency and performance across all flight conditions. Adaptive engine technology seeks to mature engine design and aircraft integration to reduce development costs, accelerate the acquisition process, and optimize fuel usage. If successful, adaptive engines will increase range and endurance of fighter aircraft and decrease the requirement for tanker aircraft to support by achieving 25 percent greater fuel efficiency.
- **KC-135 Engine Upgrade** (\$24.8 million FY 2016; \$50.4 million FYDP). This *research initiative* is a fourth-generation engine upgrade for high pressure components. The CFM-Propulsion Upgrade Program inserts modern technology into the F-108 engine, including changes/upgrades to the high-pressure turbine nozzle, turbine shroud assembly, turbine blades, and compressor blades/vanes. The goal is to reduce fuel consumption, improve reliability and durability, and achieve lifetime fuel and maintenance savings of more than \$1.3 billion.
- **Next Generation Mobility** (\$12.7 million FY 2016; \$99.9 million FYDP). This *research initiative* evaluates structures, controls, and aerodynamics for use in future aerospace vehicles. Advanced structures concepts are explored and developed to exploit new materials, fabrication processes, and design techniques. The purpose of this project is to determine configurations with high strength to weight ratios and improve fuel efficiencies.

Diversify Supply

The Air Force budgeted \$22.3 million in FY 2016 and \$71.3 million across the FYDP to *diversify supply*, including:

- **Bioenergy and Biofuels Research** (\$0.7 million FY 2016; \$4 million FYDP). This *research initiative* develops new methods to split and store hydrogen, turn carbon dioxide into fuels using solar energy, and produce hydrogen with photosynthetic molecules.

Adapt the Future Force

The Air Force budgeted \$1.5 million in FY 2016 and \$6.9 million across the FYDP to *adapt the future force*, including:

- **Air Force Energy Office (SAF/IEN)** (\$1.5 million FY 2016; \$6.9 million FYDP). This *direct initiative* develops OE policy across the Air Force and supports the integration of energy in Air Force title 10 wargames.

Air Force Assessment: GREEN

The ASD(EI&E) assessed the Air Force's proposed FY 2016 budget as adequate for the implementation of the 2011 *Operational Energy Strategy*.

OFFICE OF THE SECRETARY OF DEFENSE

Of specific relevance to operational energy are OSD investments by the OASD(EI&E) and the DLA. Overall, OSD and DLA budgeted \$48.8 million in FY 2016 and approximately \$254.6 million across the FYDP for OE initiatives. Approximately 89 percent of this funding (\$227.6 million) across the FYDP is budgeted for reducing demand, while the remaining eleven percent (\$27 million) is focused on diversifying supply.

Office of the ASD for Energy, Installations and Environment

As the senior OE advisor to the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), the ASD(EI&E) oversees and supports OE programs with participation and sponsorship across the Department.

Reduce Demand

Overseen by the OASD(EI&E), the Operational Energy Capability Improvement Fund (OECIF) (\$37 million FY 2016; \$200 million FYDP) is a series of targeted research initiatives to improve operational effectiveness. Specifically, the OECIF incentivizes long-term alignment of Military Department S&T portfolios with the 2011 *Operational Energy Strategy* and facilitates OE investments by the Military Components.

Each year, OECIF funds new programs and sustains funding to programs already underway. Since its inception in FY 2012, the OASD(EI&E) has included a specific theme in its annual call for OECIF proposals.

Consortia Programs (FY 2013 Starts). These consortia programs aim to incorporate a wide range of stakeholders and developers, including small businesses and non-traditional defense suppliers, into standing forums for addressing persistent operational energy challenges. Key efforts are summarized below:

- **Tactical Microgrids Standards Consortium.** This *research initiative* is developing standards for interconnections, communications, and safety for tactical microgrids using a consortium approach, which will improve the interoperability and adoption of tactical microgrids. The military benefits from tactical microgrids include a reduction in fuel consumption for electrical generation at contingency bases and the ability to prioritize and utilize power resources according to mission needs.
- **Energy Efficient Outpost Modeling Consortium (EEOMC).** As a *research initiative*, the EEOMC will provide mission planners tools to optimize the mix of energy technologies to significantly improve energy efficiency of contingency bases. These tools will also provide mission commanders with the knowledge and ability to operate these bases more efficiently. EEOMC has established initial optimization models for the Energy Resource Planning Tool and identified key parameters for a baseline commander base energy dashboard.

- **Soldier and Small Unit Power.** This program will provide DoD with a comprehensive system engineering framework for managing the power and energy needs of dismounted Soldiers and small units along with the organizational structure and new technology. So far, this program has formulated the next-generation Soldier Power and Energy architecture and started work on several approaches that could reduce the battery load carried by dismounted warriors, including intelligent power management, low power demand Soldier electronics, improved power generation and energy storage, and non-materiel recommendations.
- **Engineering Surfaces and Coatings for Drag Reduction.** As aircraft are among the largest users of energy in the Department, this program seeks to reduce aircraft fuel consumption by reducing drag through engineered surfaces and materials. Not only may this reduce the cost of energy, but it also may enhance military capabilities and operations and improve range and payload capacity. This program has identified legacy fleet drag reduction technologies—including non-structural Outer Mold Line “add-ons” with potential to reduce drag penalties of pylon and winglet integration on C-17 aircraft, the Air Force’s largest fuel consumer.

Analytical Methods (FY 2014 Starts). The six programs started in FY 2014 focused on analytical methods for incorporating OE considerations level into Department planning and management processes. Key efforts are summarized below:

- **STORM-E.** The Marines are developing a module to the STORM to explicitly incorporate energy issues for an expeditionary force at the campaign level. The STORM-E program is currently transitioning the STORM database to the Pacific Theater and identifying data requirements and analytical focus for campaign-level OE assessments to inform the STORM-E roadmap.
- **Operational Energy Analysis Task Force (OEATF).** This program is strengthening and deepening the work of the Army’s OEATF program, supporting work in scenarios and M&S tools. The program is developing the scenarios, data, and simulation capability to assess OE across a range of operational environments.
- **Joint Deployment Energy Planning and Logistics Optimization Initiative (J-DEPLOI).** This program is investigating and implementing ways to fold OE considerations into the Joint Operational Planning Process at U.S. Pacific Command. The program is currently assessing over two dozen existing defense information technology tools to determine the best architecture and database candidates for an operational energy insertion method.
- **Comprehensive Operational Energy (COE) Toolkit.** This program will develop tools to examine the mission level effects of attacks on energy supplies at and en route to air bases.
- **Energy Integration and Interoperability (Energy I&I).** This program is folding energy considerations into a kill chain analysis technique for the Navy. The team is

planning to incorporate this in Valiant Shield 2016 and to actively employ the Energy I&I analytical methodology within the Navy's I&I activity methodology.

- **Capability Assessment and Modeling for Energy Logistics (CAMEL).** Led by the Air Force Research Lab, CAMEL is developing and/or leveraging modeling, simulation, and analysis solutions for planners and decision makers to close airlift and air refueling OE mission gaps.

Legacy Tactical Ground Vehicle Efficiency (FY 2015 Starts). In FY 2015, OECIF will begin a shift away from emphasizing contingency bases and toward a greater emphasis on the mobile platforms that consume much of our fuel; this will start with ground vehicles. Initiatives include:

- **Advanced Vehicle Power Technology Alliance.** The FY 2015 program will significantly expand ongoing collaboration with DoE under the Advanced Vehicle Power Technology Alliance, with a focus on improving the energy performance and range and of DoD's legacy tactical ground vehicles. The specific possible development areas include more autonomy, greater vehicle electrification, engine thermal barrier coatings, and improved system analysis of fuel economy.
- **Energy Harvesting.** Additionally, OECIF is funding a Marine Corps and Army program to demonstrate energy harvesting technology at the company level and improve understanding of the duty cycles of dismounted troop equipment. This effort complements the Soldier Power consortia program begun in FY 2013.

Air and/or Sea Platforms (FY 2016 Starts). The FY 2016 program will continue a shift within OECIF toward energy use in mobile platforms. Given OECIF's on-going work on improving the energy performance of ground vehicles, improving the energy performance of sea and air platforms will be of primary interest for FY 2016 new program starts. This focus will be particularly relevant to the rebalance to the Asia-Pacific region. FY 2016 starts may also reflect input from the Energy and Power, Ground and Sea Platforms, and Air Platforms Communities of Interest; the Military Departments; and their respective energy office.

DEFENSE LOGISTICS AGENCY

The DLA conducts limited investments in OE-related research and development.

Diversify Supply

The DLA budgeted \$3.8 million in FY 2016 and approximately \$19.74 million across the FYDP to *diversify supply*. Key efforts are summarized below:

- **Innovative Products and Services for DLA Customers (Energy Readiness Program)** (\$1.8 million FY 2016, \$9.29 million FYDP). This *research initiative* supports the Energy Efficiency and Alternate Energy Technologies initiative and the Alternate Energy Development program to test and certify synthetic and alternative fuels for compatibility with mobility fuel specifications.

- **Battery Network** (\$2.0 million FY 2016, \$10.5 million FYDP). As a *direct initiative* this is a manufacturing technology program focused on improving the supply and reducing the costs of batteries used in fielded weapons systems.

OSD AND DEFENSE AGENCY ASSESSMENT: GREEN

The ASD(EI&E) assessed DLA's and OASD(EI&E)'s proposed FY 2016 budgets as adequate for the implementation of the 2011 *Operational Energy Strategy*.

SUPPORTING TABLES

The following figures and tables represent the initiatives broken out by component, strategy objective, investment category, and appropriation.

OE Investments by Component

DoD OE Funding by Service (\$ Millions)	FY 2016	FYDP	FY 2016 %	FYDP %
Army	\$ 946.5	\$ 6,326.4	52.5%	56.0%
Navy	\$ 323.8	\$ 1,572.8	17.9%	13.9%
Marine Corps	\$ 41.7	\$ 292.9	2.3%	2.6%
Air Force	\$ 445.3	\$ 2,851.9	24.7%	25.3%
Defense-Wide	\$ 46.8	\$ 247.4	2.6%	2.2%
<i>Total</i>	\$ 1,804.1	\$ 11,291.4	100%	100%

OE Investments by Strategy Objective

FY 2016 DoD OE Funding by Objectives (\$ Millions)	Army	Navy	Marines	Air Force	Defense-wide	Total
Reduce Demand	\$ 852.2	\$ 295.7	\$ 20.0	\$ 421.6	\$ 43.0	\$ 1,632.6
Diversify Supply	\$ 92.8	\$ 26.0	\$ 16.0	\$ 22.3	\$ 3.8	\$ 160.8
Adapt Future Forces and Technology	\$ 1.5	\$ 2.1	\$ 5.7	\$ 1.5	\$ -	\$ 10.8
<i>Total</i>	\$ 946.5	\$ 323.8	\$ 41.7	\$ 445.3	\$ 46.8	\$ 1,804.1

FYDP DoD OE Funding by Objective (\$ Millions)	Army	Navy	Marines	Air Force	Defense-wide	Total
Reduce Demand	\$ 5,848.3	\$ 1,434.6	\$ 189.1	\$ 2,773.7	\$ 227.7	\$ 10,473.3
Diversify Supply	\$ 473.7	\$ 128.4	\$ 74.9	\$ 71.3	\$ 19.7	\$ 768.1
Adapt Future Forces and Technology	\$ 4.5	\$ 9.7	\$ 28.9	\$ 7.0	\$ -	\$ 50.1
<i>Total</i>	\$ 6,326.5	\$ 1,572.8	\$ 292.9	\$ 2,851.9	\$ 247.4	\$ 11,291.4

OE Investments by Investment Category

FY 2016 DoD OE Funding by Investment (\$ Millions)	Army	Navy	Marines	Air Force	Defense-wide	Total
Direct	\$ 309.9	\$ 123.8	\$ 28.8	\$ 1.5	\$ 5.6	\$ 469.6
Indirect	\$ 487.3	\$ 90.0	\$ 1.9	\$ -	\$ -	\$ 579.2
Research	\$ 149.3	\$ 110.0	\$ 11.0	\$ 443.8	\$ 41.2	\$ 1,048.8
<i>Total</i>	\$ 946.5	\$ 323.8	\$ 41.7	\$ 445.3	\$ 46.8	\$ 1,804.1

FYDP DoD OE Funding by Investment (\$ Millions)	Army	Navy	Marines	Air Force	Defense-wide	Total
Direct	\$ 1,339.5	\$ 514.3	\$ 211.6	\$ 7.0	\$ 27.8	\$ 2,100.3
Indirect	\$ 4,158.4	\$ 446.4	\$ 19.4	\$ -	\$ -	\$ 4,624.2
Research	\$ 828.5	\$ 612.0	\$ 61.9	\$ 2,844.9	\$ 219.6	\$ 4,566.9
<i>Total</i>	\$ 6,326.5	\$ 1,572.8	\$ 292.9	\$ 2,851.9	\$ 247.4	\$ 11,291.4

OE Investments by Appropriation

FY 2016 DoD OE Funding by Appropriation (\$ Millions)	Army	Navy	Marines	Air Force	Defense-wide	Total
Procurement	\$ 622.6	\$ 137.6	\$ 16.6	\$ -	\$ -	\$ 776.9
RDT&E	\$ 323.9	\$ 162.1	\$ 17.9	\$ 419.0	\$ 41.2	\$ 964.1
O&M	\$ -	\$ 7.5	\$ 7.2	\$ 26.3	\$ 5.6	\$ 46.5
National Defense Sealift Fund	\$ -	\$ 16.6	\$ -	\$ -	\$ -	\$ 16.6
<i>Total</i>	\$ 946.5	\$ 323.8	\$ 41.7	\$ 445.3	\$ 46.8	\$ 1,804.1

FYDP DoD OE Funding by Appropriation (\$ Millions)	Army	Navy	Marines	Air Force	Defense-wide	Total
Procurement	\$ 4,488.3	\$ 755.2	\$ 170.1	\$ -	\$ -	\$ 5,413.6
RDT&E	\$ 1,838.2	\$ 723.7	\$ 89.3	\$ 2,794.4	\$ 219.6	\$ 5,665.1
O&M	\$ -	\$ 12.4	\$ 33.5	\$ 57.5	\$ 27.8	\$ 131.3
National Defense Sealift Fund	\$ -	\$ 81.5	\$ -	\$ -	\$ -	\$ 81.5
<i>Total</i>	\$ 6,326.5	\$ 1,572.8	\$ 292.9	\$ 2,851.9	\$ 247.4	\$ 11,291.5

APPENDIX A: OPERATIONAL ENERGY IN REQUIREMENTS AND PLANNING Chairman of the Joint Chiefs of Staff

In accordance with the Carl Levin and Howard P. Buck McKeon National Defense Authorization Act for FY 2015, section 2926(c)(5)(c), this appendix to the FY 2016 Budget Certification Report describes progress made by the Joint Requirements Oversight Council (JROC) in implementing the Energy Key Performance Parameter (KPP) and details how operational energy is being addressed in defense planning, scenarios, support to strategic analysis, and resulting policy to improve combat capability.

The JROC implements the Energy KPP through JCIDS by guiding the development of requirements for future acquisition systems by reflecting the needs of all Services through a focus of the requirements definition process on capabilities needed by the Combatant Commanders. JCIDS enforces application of the six mandatory KPPs of Force Protection: System Survivability, Sustainment, Net-Ready, Energy, and Training across nine Joint Capability Areas (JCAAs). The JCAAs are comprised of Force Support; Battlespace Awareness; Force Application; Logistics; Command, Control, Communications, and Computers (C4); Protection; Building Partnerships; Corporate Management; and Support. The JCAAs are overseen by the following six Functional Capability Boards (FCBs): C4/Cyber, Battlespace Awareness, Force Application, Logistics, Protection, and Force Support. Major progress has been made with the evolution of the Energy KPP from its origin in 2009 to its most recent refinement in the 2015 version of the JCIDS Manual by significantly expanding the content guide for the KPP. This provides clear context for the application of the KPP, better explanation of the process and methodology for development of the KPP, and it includes more detailed treatment of the Energy Supportability Analysis and energy performance attributes that are central to ensuring energy sufficiency for any acquisition system.

JROC implementation of the Energy KPP ensures combat capability of the force by balancing the energy performance of systems against the provisioning of energy necessary to sustain systems/forces required by the operational commander under applicable threat environments. The Energy KPP includes, but is not limited to, optimizing fuel and electric power demand in capability solutions in the context of the logistical supply of energy to the Warfighter as it directly affects the burden on the force to provide and protect critical energy supplies. The Energy KPP includes both fuel and electric power demand considerations in systems, including those for operating off-grid for extended periods when necessary. In cases where energy demand reduction is impractical or insufficient to align with projected energy supply, the Energy KPP forces closer scrutiny of associated doctrine, organization, training, materiel, leadership, personnel, facilities, and policy related to the energy supply chain necessary to accommodate the increased energy demands and satisfy the Energy KPP.

The JROC applies the Energy KPP to all systems where the balance of energy performance of the system and the provision of energy to that system, including both fuel and electric power, impacts operational reach, or requires protection of energy infrastructure or energy resources in the logistics supply chain. Through the Joint Capabilities Board and subordinate FCBs, the JROC has applied the Energy KPP most recently during the development of the capability development documents and/or capability production documents for the Navy's LHA(R) and LXR Amphibious Assault Ships; the Fleet Replenishment Oiler (TAO-X); next-generation Ford Class of naval aircraft carriers (CVN-21); the Ohio replacement submarine (SSBN-X); the Joint Light Tactical Vehicle; the Ship-to-Shore Connector replacement for the landing-craft/air-cushioned; the Marine Amphibious Combat Vehicle and CH-53K King Stallion; the Army's Maneuver Support Vessel-Light and Mobile Protected Firepower; as well as the KC-46A Pegasus tanker and the F-35 Lightning II multi-role fighter. By applying scenario-based energy supportability analysis and the Energy KPP against these programs, the JROC is better able to understand the energy demand and supply relationships of these systems within the context of their unit of maneuver in the future force, thereby informing design considerations, potential concepts of operations, related force structure changes, and/or the decision to assume risk with regard to energy supportability.

Operational energy is addressed throughout Joint planning, scenario development, requirements definition, design, acquisition, procurement, and sustainment processes. Combatant Commander Campaign Plans and Posture Plans now incorporate operational energy and energy security aspects which directly relate to access, agreements, logistics sufficiency, and integrated priorities. Logistics assessments for fuel and/or energy sufficiency are conducted for Operational Plans and Contingency Plans and are captured in the Chairman's Risk Assessment as well as in the more detailed Joint Logistics Estimate and Global Logistics Readiness Dashboard. Ongoing refinement and updating of challenge scenarios and security constructs has yielded opportunities to interrogate operational energy in discrete modeling analysis, wargames, and large exercises such as the Navy Logistics Wargame; Defense Logistics Agency Wargame and Air Force title 10 wargames, Unified Engagement 2014 and Futures Game 2015. Strategic analysis of fuel and energy security implications, constraints, and gaps were accomplished through these wargames as well as associated modeling and simulation tools assessing energy supportability analysis, including the Air Force's "4G" Wargaming Tool; the Marine Corps' Marine Air-Ground Task Force Power and Energy Model; and the Army's Operational Energy Analysis Task Force use of the Training and Doctrine Command Analysis Center modeling and simulation heuristic to assess the effects of constrained operational energy on mission accomplishment, logistics risk, and combat capability effectiveness.

The Joint Staff and Combatant Commands will continue to analyze, evaluate, and assess where increased energy demand necessary for improved combat capabilities intersects with operational energy and energy security constraints or vulnerabilities. This will further refine and

improve plans, strategy, procurement, force development, and policies that will maximize successful mission outcomes while minimizing mission risk.

Prepared By: Joint Chiefs of Staff Director for Logistics (JCS DJ4)

Reviewed By: Joint Chiefs of Staff Director for Force Structure, Resources and Assessment (JCS DJ8)

Approved By: Chairman of the Joint Chiefs of Staff (CJCS)

APPENDIX B: OPERATIONAL ENERGY IN THE PROCUREMENT PROCESS Under Secretary of Defense for AT&L

Pursuant to title 10, U.S.C. 2926(c)(5)(d), this appendix to the FY 2016 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. DoD efforts with regard to operational energy span multiple organizations and processes. Particular attention is given to early influence of the planning process and concept development in an effort to shape preliminary weapons system design.

The Military Departments, in collaboration with the ASD(EI&E) and the Joint Staff J-4, ensure that operational energy is addressed throughout the planning, requirements, design, development, and sustainment processes. In order to realistically explore risks and opportunities, the Components are incorporating operational energy into wargames. Most recently, the Defense Logistics Agency conducted a strategic-level wargame focusing on the movement of bulk fuel. The Air Force included energy considerations in both of their title 10 wargames, Unified Engagement 2014, and Futures Game 2015. These wargames were enhanced through the use of modeling and simulation tools that systematically track energy use during the game and inform energy supportability analyses (ESA). These wargaming tools include the Air Force's "4G" Wargaming Tool and the Marine Corps' Marine Air-Ground Task Force Power and Energy Model. The Army's Operational Energy Analysis Task Force also has a set of modeling and simulation tools that analyze the effects of energy on mission effectiveness, sustainment capabilities, and the Fully Burdened Cost of Energy.

DoD encourages the Military Departments to begin ESA early in the requirements process, well before the development of any capability documents. By conducting ESA early in the requirements process, DoD is better able to understand the energy demand and supply relationships of a system within the context of its unit of maneuver, thereby informing design considerations, potential concepts of operations, force structure changes, and decisions to assume risk with regard to energy supportability. The Military Departments are continuing to improve their processes for conducting ESAs, with multiple analyses planned or ongoing, such as the Navy's LHA(R) Amphibious Ship and TAO(X) Oiler, and the Air Force's KC-46A Tanker.

To further encourage early energy planning, DoD has recently updated the acquisition instruction for mandatory KPPs (including Energy) in DoD Instruction (DoDI) 5000.02, "Operation of the Defense Acquisition System," published in January 2015. This update mandates that the Military Departments fully consider possible tradeoffs among life-cycle cost, schedule, and the Energy KPP for each alternative considered during an Analysis of Alternative (AoA). This instruction necessitates the Military Departments develop the Energy KPP and its ESA earlier in the acquisition process. Additionally, the DoDI directs the Director for Cost

Assessment and Program Evaluation to assess the extent that the AoA considers the Fully Burdened Cost of Energy.

Finally, there are several ongoing S&T programs with the potential to increase the energy performance and capability of several major systems. The Air Force is currently exploring adaptive cycle engines with the goal of reducing fuel consumption by 25 percent and increasing range by 30 percent. The Army is transitioning the Advanced Affordable Turbine Engine S&T project into the Improved Turbine Engine Program with the goal of increasing lift and range in hotter conditions and at higher altitude, with reduced fuel consumption and maintenance. The Navy is investing in small, high-power electrical distribution components that increase electric system power density and enable integrated power systems to support future surface combatants.

DoD will continue to assess how the need for energy affects the battlespace using wargames and M&S tools. The Office of the ASD(EI&E) and Joint Staff J-4 will continue to collaborate with the Military Departments to conduct ESA as early as possible in the requirements and acquisition processes ensuring that future capabilities have the energy needed to perform their mission.

**APPENDIX C:
ESTIMATED EXPENDITURES AND REQUESTED
APPROPRIATIONS FOR OASD(EI&E)**

This appendix is provided in accordance with section 2926(c)(5)(e) of title 10, U.S.C. In order to carry out the duties of the Assistant Secretary related to operational energy, the FY 2016 President’s Budget includes nearly \$43 million in FY 2016 and \$227 million over the FYDP. These funds support the functioning of the office as well as the investments carried out through the Operational Energy Capabilities Improvement Fund.

ORG	OE Program Title	OE Initiative Title	OE Project Description	Treasury Code	BA Code	OE Investment	Program Element	FY2016 (S Thousands)	FYDP (S Thousands)
OSD	Operational Energy Capability Improvement Funding	Operational Energy Capability Improvement Funding (OECIF)	Improves the Department's OE effectiveness via targeted S&T investments	0400	03	Research	0604055D	37,420	199,833
OSD	Operational Energy Plans and Programs Office	Operational Energy Plans and Programs Office	OSD Senior Officials for Operational Energy, Plans and Programs. Tasked to Analyze, develop, and direct OE's energy strategy	0100	04	Direct	0901388D8Z	5,569	27,845
TOTAL								42,989	227,678

**APPENDIX D:
FISCAL YEAR 2016 OPERATIONAL ENERGY INITIATIVES**

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
ARMY	Contingency Base Infrastructure (CBI)	Contingency Base Infrastructure (CBI)	Optimize recommendations for materiel used to establish, maintain, and operate contingency basing	Diversify Supply	2040	05	Direct	0604804A	2,541	10,861
ARMY	Joint Operational Energy Initiative (JOEI)	Modeling and Simulation	Holistic approach to the evaluation of Operational Energy related impacts, systems, and improvements	Future Force	2040	04	Direct	0603804A	1,500	4,500
ARMY	Joint Light Tactical Vehicle	Joint Light Tactical Vehicle (JLTV)	More efficient light vehicle - ~30% improvement in stationary fuel consumption over the baseline HMMWV	Reduce Demand	2040	05	Indirect	0605812A	-	677
ARMY	Joint Light Tactical Vehicle	Joint Light Tactical Vehicle (JLTV)	More efficient light vehicle - ~30% improvement in stationary fuel consumption over the baseline HMMWV	Reduce Demand	2035	01	Indirect	0216300A	35,975	342,767
ARMY	Stryker	Improved Stryker	More efficient Stryker, increased horsepower, electrical output, upgraded suspension, and in-vehicle network	Reduce Demand	2040	07	Indirect	0203735A	90,800	199,900
ARMY	Stryker	Improved Stryker	More efficient Stryker, increased horsepower, electrical output, upgraded suspension, and in-vehicle network	Reduce Demand	2033	01	Indirect	0211702A	172,300	1,957,080
ARMY	Modular Fuel System (MFS)	Modular Fuel System (MFS)	More efficient fuel distribution in the battlespace	Diversify Supply	2035	03	Direct	0216300A	16,267	63,151
ARMY	Force Provider	Improved Energy Efficiency	Base Camp Integration Lab (BCIL), Fort Devens / Net Zero / Zero Footprint	Reduce Demand	2040	04	Direct	0603804A	3,788	16,635
ARMY	Force Provider	Improved Energy Efficiency	Base Camp Integration Lab (BCIL) Fort, Devens / Net Zero / Zero Footprint	Reduce Demand	2040	05	Direct	0604804A	1,575	13,878
ARMY	Force Provider	Improved Energy Efficiency	Modifications to In-Service Equipment, Force Provider MoD 7 - Purchase of liners, shades, doorways, micro-grids and Light Emitting Diodes (LED) lighting resulting in a 35% reduction in fuel demand	Reduce Demand	2035	03	Direct	0216300A	30,258	106,578
ARMY	Force Provider	Improved Energy Efficiency	Improved Force Provider - Purchase of liners, shades, Light Emitting Diode (LED) lighting, micro-grids and shower water re-use systems to reduce fuel usage by 50% and water by 75%	Reduce Demand	2035	03	Direct	0216300A	18,830	18,830
ARMY	Battlefield Kitchen	Improved Energy Efficiency	Energy efficient burners and appliances save 20% in fuel vs. legacy appliances	Reduce Demand	2040	04	Indirect	0603747A	280	760
ARMY	Battlefield Kitchen	Improved Energy Efficiency	Energy efficient burners and appliances save 20% in fuel vs. legacy appliances	Reduce Demand	2040	05	Indirect	0604713A	-	4,190
ARMY	Battlefield Kitchen	Improved Energy Efficiency	Energy efficient burners and appliances save 20% in fuel vs. legacy appliances	Reduce Demand	2035	03	Indirect	0216300A	-	4,955
ARMY	Combat Vehicle Improvement	Improved Bradley	More efficient Bradley - Research and Development effort to improve Bradley fuel efficiency by 3%	Reduce Demand	2040	07	Indirect	0203735A	500	700
ARMY	Combat Vehicle Improvement	Improved Bradley	More efficient Bradley - The Bradley improved transmission generate an overall fuel reduction of 3%	Reduce Demand	2033	01	Indirect	0211702A	26,300	501,600
ARMY	Combat Vehicle Improvement	Improved Abrams	More efficient Abrams - Research & Development effort to improve Abrams fuel efficiency by 24%	Reduce Demand	2040	07	Indirect	0203735A	269	504
ARMY	Combat Vehicle Improvement	Improved Abrams	More efficient Abrams - The Abrams Auxiliary Power Unit (APU) will generate an overall fuel savings of 24%	Reduce Demand	2033	01	Indirect	0211702A	2,800	18,100

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
ARMY	Early Entry Fluid Distribution System (E2FDS)	More efficient fuel/non-potable water distribution	More efficient fuel/non-potable water distribution in the battlespace	Diversify Supply	2040	04	Direct	0603804A	3,935	7,735
ARMY	Early Entry Fluid Distribution System (E2FDS)	More efficient fuel/non-potable water distribution	More efficient fuel/non-potable water distribution in the battlespace	Diversify Supply	2040	05	Direct	0604804A	2,713	7,413
ARMY	Advanced Medium Mobile Power Source (AMMPS)	Advanced Mobile Medium Power Sources (AMMPS) Generator Sets	Purchase of the improved medium generator sets using 21% less fuel	Reduce Demand	2035	03	Direct	0216300A	115,844	491,436
ARMY	HIPPO Water Distribution System	Improved Energy Efficiency	More efficient water distribution	Reduce Demand	2035	03	Direct	0216300A	14,429	39,266
ARMY	Improved Power Distribution Illumination Systems Electrical (IPDISE)	Improved Energy Efficiency	More efficient power distribution	Reduce Demand	2040	05	Direct	0604804A	2,040	3,894
ARMY	Improved Power Distribution Illumination Systems Electrical (IPDISE)	Improved Energy Efficiency	More efficient power distribution	Reduce Demand	2035	03	Direct	0216300A	2,500	62,091
ARMY	Small Tactical Electrical Power (STEP)	Improved Small Generator	Small Tactical Electrical Power (STEP)	Reduce Demand	2040	05	Direct	0604804A	7,822	19,103
ARMY	Small Tactical Electrical Power (STEP)	Improved Small Generator	Small Tactical Electric Power (STEP)	Reduce Demand	2035	03	Direct	0216300A	6,280	63,624
ARMY	Improved Environmental Control Unit (IECU)	Improved Energy Efficiency	Military air conditioners with supplemental heaters	Reduce Demand	2040	05	Direct	0604804A	976	10,478
ARMY	Improved Environmental Control Unit (IECU)	Improved Energy Efficiency	Heaters and Improved Environmental Control Unit (IECU) family	Reduce Demand	2035	03	Direct	0216300A	18,876	60,288
ARMY	Improved Aircraft Engine	Improved Aircraft Engine	More efficient helicopter engine - ITEP enters Milestone A in 1QFY14 - Army expects 13% to 22% fuel reduction from current Blackhawk/Apache engines. Flies at higher altitudes, in hotter temperatures and increased range 35% less maintenance cost	Reduce Demand	2040	07	Indirect	0203744A	49,247	640,796
ARMY	Aviation Simulator	Aviation Combined Arms Tactical Trainer (AVCATT)	Simulators for aviation asset collective training	Reduce Demand	2040	05	Indirect	0604780A	1,225	26,920
ARMY	Aviation Simulator	Simulator for the Apache helicopter	Simulator for the Apache Helicopter	Reduce Demand	2031	01	Indirect	0210100A	15,385	80,506
ARMY	Aviation Simulator	Aviation Combined Arms Tactical Trainer (AVCATT)	Simulators for aviation asset collective training	Reduce Demand	2035	03	Indirect	0219900A	31,274	145,123
ARMY	Aviation Simulator	Simulator for the Blackhawk Helicopter	The Blackhawk simulator saves fuel and enhances safety	Reduce Demand	2031	01	Indirect	0210101A	22,199	76,519
ARMY	Aviation Simulator	Simulator for the Chinook Helicopter	Chinook Transportable Flight Proficiency Simulator saves (TFPS)	Reduce Demand	2031	01	Indirect	0210104A	13,364	66,597
ARMY	Improved Large Generator	Improved Large Generator	Large Advanced Mobile Power Sources (LAMPS)	Reduce Demand	2035	03	Indirect	0216300A	25,380	90,736

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
ARMY	Expeditionary Water Packaging System (EWPS)	Reduced reliance on shipping water into theater	EWPS provides localized production of bottle water	Diversify Supply	2035	03	Direct	0216300A	3,025	15,847
ARMY	Early Entry Fluid Distribution System (E2FDS)	More efficient fuel/non-potable water distribution	More efficient fuel/non-potable water distribution in the battlespace	Diversify Supply	2035	03	Direct	0216300A	-	35,328
ARMY	Small Unit Power	Small Unit Power (SUP) Platoon Power Generation	Platoon Power Generation	Diversify Supply	2040	05	Direct	0604827A	5,411	40,690
ARMY	Small Unit Power	Soldier Power	Reduces Soldier Load, improved battery output, reduced weight, and ability to recharge them from alternative energy sources	Diversify Supply	2035	03	Direct	0211700A	51,334	247,898
ARMY	In-house Laboratory Independent Research	Advanced Mobility - ILIR - TARDEC 02	TARDEC in-house basic research for ground vehicles to support improved system mobility, reliability, and survivability	Reduce Demand	2040	01	Research	0601101A	1,452	6,570
ARMY	Defense Research Sciences	Vehicle Propulsion & Power Research 01	Basic research to increase the performance of small air-breathing engines and power-trains for air and/or ground vehicles; new materials to withstand the higher temperature regimen flow physics and the mechanical behavior tools	Reduce Demand	2040	01	Research	0601102A	2,431	12,544
ARMY	Defense Research Sciences	High Efficiency Propulsion Research 02	Basic research to develop improved tools and methods to enhance the reliability and fuel efficiency of small engines for air and ground vehicles and to enable the use of heavy fuels	Reduce Demand	2040	01	Research	0601102A	1,730	8,947
ARMY	Defense Research Sciences	Propulsion System Tech 01	Basic researching non-linear ground vehicle control algorithms, using off-road terrain characteristics; and unique mobility approaches, using advanced analytical and experimental procedures	Reduce Demand	2040	01	Research	0601102A	707	3,662
ARMY	Defense Research Sciences	Engineered Biotechnology 05	Basic research in multi-scale modeling approach to investigate biological systems to develop biologically-inspired sensors as well as bio-inspired power generation and storage techniques	Diversify Supply	2040	01	Research	0601102A	3,014	18,552
ARMY	Defense Research Sciences	Novel Materials for Compact Power 05	Basic research on electronic materials and structures as well as technologies in energy harvesting and energetic materials, batteries and fuel cells to enable higher performance and more efficient electronic systems	Reduce Demand	2040	01	Research	0601102A	2,696	13,368
ARMY	Defense Research Sciences	Electromagnetics & Solid State Electronics 21	Extramural basic research in Electromagnetics & Solid State Electronics	Reduce Demand	2040	01	Research	0601102A	2,646	13,684
ARMY	Defense Research Sciences	Propulsion, Energetics & Flight 27	Propulsion Energetics and Flight extramural basic research	Reduce Demand	2040	01	Research	0601102A	3,045	14,127
ARMY	Defense Research Sciences	Electrochemistry and Energy Conversion 52	Extramural basic research in electrochemistry and energy conversion, power generation, energy storage, and power management components and software	Reduce Demand	2040	01	Research	0601102A	5,700	29,472
ARMY	Aviation Technology	Advanced Concept Engine Components 58	Applied research in high efficiency engine component technology for manned and unmanned rotary wing aircraft	Reduce Demand	2040	02	Research	0602211A	1,100	14,614
ARMY	Aviation Technology	Rotorcraft Transmission 62	Applied research in rotorcraft advanced drive system component technologies to support multi-speed transmissions, lighter weight gearboxes, and reduced costs, while improving reliability and maintainability	Reduce Demand	2040	02	Research	0602211A	2,500	17,511

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (S Thousands)	FYDP (S Thousands)
ARMY	Aviation Technology	Air Vehicle Propulsion & Power Technology 23	Applied Research for rotary wing aircraft in high temperature materials, advanced models for flow physics, and improved methods for predicting propulsion system mechanical behavior to increase fuel efficiency and reduce propulsion system weight	Reduce Demand	2040	02	Research	0602211A	2,126	13,985
ARMY	Combat Vehicle and Automotive Technology	NAC Program - Power, Energy and Mobility 01C	Ground vehicle applied research in dual use power, energy, and mobility technologies focusing on: light weight composite materials, electrification of engine accessories, alternative fuels, hybrid vehicle architectures, and compact electrical power genera	Reduce Demand	2040	02	Research	0602601A	4,236	20,891
ARMY	Combat Vehicle and Automotive Technology	NAC Program - Power, Energy and Mobility STO 01CV	Ground vehicle applied research in dual use power, energy, and mobility technologies focusing on: lightweight composite materials, electrification of engine accessories, alternative fuels, hybrid vehicle architectures, and compact electrical power genera	Reduce Demand	2040	02	Research	0602601A	-	947
ARMY	Combat Vehicle and Automotive Technology	NAC Program - Dual Use Technologies 01E	Ground vehicle applied research in ground vehicle technologies with both military and commercial applications such as renewable energy technologies, electrical power management between vehicles and the grid, alternative fuels, and advanced vehicle network	Reduce Demand	2040	02	Research	0602601A	11,502	55,100
ARMY	Combat Vehicle and Automotive Technology	NAC Program - Dual Use Technologies STO 01EV	Ground vehicle applied research in ground vehicle technologies with both military and commercial applications such as renewable energy technologies, electrical power management between vehicles and the grid, alternative fuels, and advanced vehicle network	Reduce Demand	2040	02	Research	0602601A	-	3,919
ARMY	Combat Vehicle and Automotive Technology	Electrical Power Systems 86	Ground vehicle applied research in electrical power systems--high temperature and efficient power generation components using high operating temperature switching devices and advanced electrical generation components	Reduce Demand	2040	02	Research	0602601A	159	5,682
ARMY	Combat Vehicle and Automotive Technology	Electrical Power Systems 861	Ground vehicle applied research in electrical power systems--high temperature and efficient power generation components using high operating temperature switching devices and advanced electrical generation components	Reduce Demand	2040	02	Research	0602601A	1,378	5,516
ARMY	Combat Vehicle and Automotive Technology	Electrical Power Systems STO 86V	Ground vehicle applied research in electrical power systems--high temperature and efficient power generation components using high operating temperature switching devices and advanced electrical generation components	Reduce Demand	2040	02	Research	0602601A	1,046	2,074
ARMY	Combat Vehicle and Automotive Technology	Energy Storage Research 87	Ground vehicle applied research in energy storage devices such as advanced chemistry batteries and ultra-capacitors for starting, lighting, and ignition and silent watch reqs for powering vehicle electronics and communication systems with main engine off	Reduce Demand	2040	02	Research	0602601A	-	2,587
ARMY	Combat Vehicle and Automotive Technology	Energy Storage Research STO 871V	Ground vehicle applied research in energy storage devices such as advanced chemistry batteries and ultra-capacitors for starting, lighting, and ignition and silent watch reqs for powering vehicle electronics and communication systems with main engine off	Reduce Demand	2040	02	Research	0602601A	839	3,694

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
ARMY	Combat Vehicle and Automotive Technology	Energy Storage Research STO 87SV	Ground vehicle applied research in energy storage devices such as advanced chemistry batteries and ultra-capacitors for starting, lighting, and ignition and silent watch reqs for powering vehicle electronics and communication systems with main engine off	Reduce Demand	2040	02	Research	0602601A	1,480	6,156
ARMY	Combat Vehicle and Automotive Technology	Ground Vehicle APU Research 88	Ground vehicle applied research in auxiliary power unit technology	Reduce Demand	2040	02	Research	0602601A	1,315	6,108
ARMY	Combat Vehicle and Automotive Technology	Ground Vehicle APU Research 88I	Ground vehicle applied research in auxiliary power unit technology	Reduce Demand	2040	02	Research	0602601A	477	2,360
ARMY	Combat Vehicle and Automotive Technology	Ground Vehicle APU Research STO 88V	Ground vehicle applied research in auxiliary power unit technology	Reduce Demand	2040	02	Research	0602601A	117	4,124
ARMY	Combat Vehicle and Automotive Technology	High Voltage Power Generation Research 89	Ground vehicle applied research in high voltage power generation	Reduce Demand	2040	02	Research	0602601A	-	2,594
ARMY	Combat Vehicle and Automotive Technology	High Voltage Power Generation Research STO 89SV	Ground vehicle applied research in a high voltage power generation	Reduce Demand	2040	02	Research	0602601A	1,218	3,328
ARMY	Combat Vehicle and Automotive Technology	Next Generation Engine Research 90	Ground vehicle applied research in a high power density low heat rejection, fuel efficient engine technology	Reduce Demand	2040	02	Research	0602601A	-	3,052
ARMY	Combat Vehicle and Automotive Technology	Next Generation Engine Research STO 90V	Ground vehicle applied research in a high power density low heat rejection, fuel efficient engine technology	Reduce Demand	2040	02	Research	0602601A	2,705	11,590
ARMY	Combat Vehicle and Automotive Technology	Pulse Power for Advanced Armors 96	Ground vehicle applied research in pulse power for future armor	Diversify Supply	2040	02	Research	0602601A	-	3,726
ARMY	Combat Vehicle and Automotive Technology	Pulse Power for Advanced Armors STO 96IV	Ground vehicle applied research in pulse power for future armor	Diversify Supply	2040	02	Research	0602601A	3,423	14,274
ARMY	Ballistics Technology	Disruptive Energetics and Propulsion Technologies 68	Applied research in energetics and energetics propulsion	Reduce Demand	2040	02	Research	0602618A	-	15,022
ARMY	Electronics and Electronic Devices	High Power and Energy Technologies 01	Applied research electronic materials, structures, and components for higher energy density and efficiency required by future Army systems such as electromagnetic armor, directed energy weapons, power grid protection, and other pulsed-power systems	Reduce Demand	2040	02	Research	0602705A	1,233	6,394
ARMY	Electronics and Electronic Devices	High Energy Laser Enabling Technologies for Tactical Directed Energy Weapons 03	Applied research in novel solid-state laser concepts, architectures, and components with the goal of providing technology to Army directed energy weapon developers	Reduce Demand	2040	02	Research	0602705A	2,000	10,040
ARMY	Electronics and Electronic Devices	Electronic Components and Materials Research 09	Applied research in compact, high-efficiency, high-temp, high-power component technologies (semiconductor, magnetic, and dielectric devices) for hybrid-electric propulsion, electric power gen and conversion, and smart/micro-grid power distribution	Reduce Demand	2040	02	Research	0602705A	3,234	17,435
ARMY	Electronics and Electronic Devices	Pulsed Power Components and Systems Research 10	Applied research in energy storage capacitors, high voltage converters, semiconductor switches, and explosive based pulse generators, that improve pulsed-power components for applications such as EM armor, electronic fuse initiators, and electronic protect	Reduce Demand	2040	02	Research	0602705A	1,514	7,560

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
ARMY	Electronics and Electronic Devices	Power System Components Integration and Control Research 13	Applied research in electronic components and control strategies for high-power density and high efficiency power use in current and future platform sub-systems, vehicle, and micro-grid (installation) applications	Reduce Demand	2040	02	Research	0602705A	1,837	10,508
ARMY	Electronics and Electronic Devices	Electronic Warfare/Electronic Attack/Directed Energy Technologies 14	Applied research in DE technology, electronic warfare (EW) survivability/lethality, and supporting high power components with the goal of enhancing the survivability/lethality of Army platforms	Reduce Demand	2040	02	Research	0602705A	1,715	8,781
ARMY	Electronics and Electronic Devices	Tactical Power Generation 06	Soldier transportable power source applied research	Reduce Demand	2040	02	Research	0602705A	6,710	39,518
ARMY	Electronics and Electronic Devices	Energy Informed Operations 07I	Applied research for tactical power generation technology	Reduce Demand	2040	02	Research	0602705A	-	8,040
ARMY	Electronics and Electronic Devices	Energy Informed Operations STO 07TV	Applied research for tactical power generation technology	Reduce Demand	2040	02	Research	0602705A	5,000	5,000
ARMY	Electronics and Electronic Devices	Lightweight Portable and Soldier Power Sources 42T	Applied research in soldier and portable power sources: batteries, fuel cells, generators	Reduce Demand	2040	02	Research	0602705A	100	200
ARMY	Electronics and Electronic Devices	Efficient Compact Portable Power 68	Applied research in compact portable power sources	Reduce Demand	2040	02	Research	0602705A	862	4,457
ARMY	Electronics and Electronic Devices	Microsystem Power Components 69	Applied research in electronics and electronic components and devices for C4ISR applications and battlefield power and energy applications	Reduce Demand	2040	02	Research	0602705A	1,375	7,100
ARMY	Electronics and Electronic Devices	Compact High Performance Thermal Mgmt 70	Applied Research in MEMS based components to improve power generation and micro-cooling technology for both dismounted Soldier other future applications	Reduce Demand	2040	02	Research	0602705A	1,137	5,876
ARMY	Electronics and Electronic Devices	High Density E-Chem Sources & Storage 71	Applied research in higher energy density batteries and power sources	Reduce Demand	2040	02	Research	0602705A	2,784	14,378
ARMY	Electronics and Electronic Devices	Logistic Fuel Reform & Processing 72	Applied research in reforming logistics fuel for fuel cell hydrogen	Reduce Demand	2040	02	Research	0602705A	1,187	6,132
ARMY	Electronics and Electronic Devices	Energy Harvesting Technologies 83	Applied research in soldier energy scavenging technology	Reduce Demand	2040	02	Research	0602705A	2,340	15,687
ARMY	Warfighter Advanced Technology	Situational Awareness Displays: Integration & Portrayal 44	Soldier small unit Intelligence Surveillance & Reconnaissance (ISR) information portrayal providing actionable information for the Soldier and Small unit	Reduce Demand	2040	03	Research	0603001A	-	10,474
ARMY	Warfighter Advanced Technology	Soldier and Small Unit Power and Energy Demand Management 45	Systematic examination of inherent energy inefficiencies and rethinking of innovative and new design approaches. Implement and demonstrate automatic and programmable prioritization of power usage by electronic devices to optimize power source duration	Reduce Demand	2040	03	Research	0603001A	2,317	9,172
ARMY	Warfighter Advanced Technology	Power Source Optimization for Small Unit Networked Electronics 46	Evaluate innovative Soldier power and energy sources for small unit networked electronics to include high energy/power conformal battery, advanced wearable hybrid fuel cell, and multi-fueled man pack power source	Reduce Demand	2040	03	Research	0603001A	-	4,127

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ARMY	Aviation Advanced Technology	Next Generation Rotorcraft Transmission 15	Matures and demonstrates components, subsystems and systems for rotorcraft transmissions (both manned and unmanned)	Reduce Demand	2040	03	Research	0603003A	-	8,844
ARMY	Aviation Advanced Technology	Future Affordable Turbine Engine 03	Matures and demonstrates rotorcraft turbine engine technologies through design, fabrication, and evaluation of advanced engine components in order to improve the performance of turbine engines for rotorcraft	Reduce Demand	2040	03	Research	0603003A	8,216	8,216
ARMY	Aviation Advanced Technology	Alternative Concept Engine 07	Advanced technology demonstration of power system technologies through design, fabrication, and evaluation of advanced engine components in order to improve the performance of turbine engines for rotorcraft	Reduce Demand	2040	03	Research	0603003A	-	23,451
ARMY	Weapons and Munitions Advanced Technology	Thermal Mgmt Integration 05A	Matures and demonstrates thermal management technologies for future directed energy weapons technology	Reduce Demand	2040	03	Research	0603004A	-	7,692
ARMY	Weapons and Munitions Advanced Technology	Power Mgmt Integration 06A	Matures and demonstrates power management technologies for future directed energy weapons technology	Reduce Demand	2040	03	Research	0603004A	-	6,136
ARMY	Combat Vehicle and Automotive Advanced Technology	Alternative Fuels and Petroleum, Oil & Lubricants 51	Ground vehicle alternative fuels and petroleum, oil & lubricants advanced technology development	Diversify Supply	2040	03	Research	0603005A	-	6,315
ARMY	Combat Vehicle and Automotive Advanced Technology	Alternative Fuels and Petroleum, Oil & Lubricants STO 51TV	Ground vehicle alternative fuels and petroleum, oil & lubricants advanced technology development	Diversify Supply	2040	03	Research	0603005A	1,100	1,927
ARMY	Combat Vehicle and Automotive Advanced Technology	Efficient Powertrain Technology Integration 55	Ground vehicle Efficient Powertrain Technology Integration advanced technology development	Reduce Demand	2040	03	Research	0603005A	-	5,321
ARMY	Combat Vehicle and Automotive Advanced Technology	Efficient Powertrain Technology Integration STO 55V	Ground vehicle Efficient Powertrain Technology Integration advanced technology development	Reduce Demand	2040	03	Research	0603005A	5,000	19,793
ARMY	Combat Vehicle and Automotive Advanced Technology	Energy Storage Systems Development 57	Ground vehicle Energy Storage Systems advanced technology Development	Reduce Demand	2040	03	Research	0603005A	-	3,200
ARMY	Combat Vehicle and Automotive Advanced Technology	Energy Storage Systems Development STO 57IV	Ground vehicle Energy Storage Systems advanced technology Development	Reduce Demand	2040	03	Research	0603005A	404	2,534
ARMY	Combat Vehicle and Automotive Advanced Technology	Energy Storage Systems Development STO 57JV	Ground vehicle Energy Storage Systems advanced technology Development	Reduce Demand	2040	03	Research	0603005A	1,059	4,359
ARMY	Combat Vehicle and Automotive Advanced Technology	Energy Storage Systems Development STO 57V	Ground vehicle Energy Storage Systems advanced technology Development	Reduce Demand	2040	03	Research	0603005A	1,463	5,334
ARMY	Combat Vehicle and Automotive Advanced Technology	Ground Vehicle APU System Development 58	Ground Vehicle APU System advanced technology Development	Reduce Demand	2040	03	Research	0603005A	1,389	7,687
ARMY	Combat Vehicle and Automotive Advanced Technology	Ground Vehicle APU System Development 58I	Ground Vehicle APU System advanced technology Development	Reduce Demand	2040	03	Research	0603005A	1,707	6,142

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ARMY	Combat Vehicle and Automotive Advanced Technology	High Voltage Power Generation Development 59	This project matures and demonstrates advanced mobility and electric technologies for advanced propulsion, power, and electrical components and subsystems to enable lightweight, agile, deployable, fuel efficient, and survivable ground vehicles	Reduce Demand	2040	03	Research	0603005A	-	2,895
ARMY	Combat Vehicle and Automotive Advanced Technology	High Voltage Power Generation Development STO 59IV	This project matures and demonstrates advanced mobility and electric technologies for advanced propulsion, power, and electrical components and subsystems to enable lightweight, agile, deployable, fuel efficient, and survivable ground vehicles	Reduce Demand	2040	03	Research	0603005A	2,909	11,810
ARMY	Combat Vehicle and Automotive Advanced Technology	Hybrid / High Power Vehicle Evaluations 60	Hybrid / High Power ground Vehicle technology Evaluations	Reduce Demand	2040	03	Research	0603005A	-	2,444
ARMY	Combat Vehicle and Automotive Advanced Technology	Hybrid / High Power Vehicle Evaluations STO 60IV	Hybrid / High Power ground Vehicle technology Evaluations	Reduce Demand	2040	03	Research	0603005A	1,299	1,666
ARMY	Combat Vehicle and Automotive Advanced Technology	Hybrid / High Power Vehicle Evaluations STO 60V	Hybrid / High Power ground Vehicle technology Evaluations	Reduce Demand	2040	03	Research	0603005A	193	2,626
ARMY	Combat Vehicle and Automotive Advanced Technology	High Performance Track Development 61	Ground vehicle high performance track development	Reduce Demand	2040	03	Research	0603005A	-	2,042
ARMY	Combat Vehicle and Automotive Advanced Technology	High Performance Track Development 61I	Ground vehicle high performance track development	Reduce Demand	2040	03	Research	0603005A	2,000	7,002
ARMY	Combat Vehicle and Automotive Advanced Technology	Advanced Suspension Development (Ride & Handling) 62	This project matures and demonstrates advanced mobility and electric technologies for advanced propulsion, power, and electrical components and subsystems to enable lightweight, agile, deployable, fuel efficient, and survivable ground vehicles	Reduce Demand	2040	03	Research	0603005A	2,731	11,841
ARMY	Combat Vehicle and Automotive Advanced Technology	Advanced Suspension Development (Ride & Handling) STO 62V	This project matures and demonstrates advanced mobility and electric technologies for advanced propulsion, power, and electrical components and subsystems to enable lightweight, agile, deployable, fuel efficient, and survivable ground vehicles	Reduce Demand	2040	03	Research	0603005A	273	680
ARMY	Combat Vehicle and Automotive Advanced Technology	Integration of Advanced Armors and Energy Weapons 65	This project matures and demonstrates advanced mobility and electric technologies for advanced propulsion, power, and electrical components and subsystems to enable lightweight, agile, deployable, fuel efficient, and survivable ground vehicles	Reduce Demand	2040	03	Research	0603005A	-	4,839
ARMY	Combat Vehicle and Automotive Advanced Technology	Integration of Advanced Armors and Energy Weapons 65I	This project matures and demonstrates advanced mobility and electric technologies for advanced propulsion, power, and electrical components and subsystems to enable lightweight, agile, deployable, fuel efficient, and survivable ground vehicles	Reduce Demand	2040	03	Research	0603005A	599	1,191
ARMY	Combat Vehicle and Automotive Advanced Technology	Integration of Advanced Armors and Energy Weapons STO 65IV	This project matures and demonstrates advanced mobility and electric technologies for advanced propulsion, power, and electrical components and subsystems to enable lightweight, agile, deployable, fuel efficient, and survivable ground vehicles	Reduce Demand	2040	03	Research	0603005A	3,224	16,723

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
ARMY	Combat Vehicle and Automotive Advanced Technology	Powertrain/Energy Storage/Survivability Demonstrator STO DTAV	This project matures and demonstrates advanced mobility and electric technologies for advanced propulsion, power, and electrical components and subsystems to enable lightweight, agile, deployable, fuel efficient, and survivable ground vehicles	Reduce Demand	2040	03	Research	0603005A	6,000	22,518
ARMY	Combat Vehicle and Automotive Advanced Technology	Powertrain/Energy Storage/Survivability Demonstrator DTAZ	This project matures and demonstrates advanced mobility and electric technologies for advanced propulsion, power, and electrical components and subsystems to enable lightweight, agile, deployable, fuel efficient, and survivable ground vehicles	Reduce Demand	2040	03	Research	0603005A	5,000	32,704
ARMY	Combat Vehicle and Automotive Advanced Technology	Vehicle Electronics Architecture and Standards 15	Ground vehicle electronics architecture and standards advanced development	Reduce Demand	2040	03	Research	0603005A	1,342	9,551
ARMY	Combat Vehicle and Automotive Advanced Technology	Vehicle Electronics Architecture and Standards 15I	Ground vehicle electronics architecture and standards advanced development	Reduce Demand	2040	03	Research	0603005A	810	5,192
ARMY	Combating Terrorism, Technology Development	AVPTA AVP	Conducts Ground Vehicle Power Technology efforts with DoE	Reduce Demand	2040	03	Research	0603125A	5,162	26,628
ARMY	Combating Terrorism, Technology Development	Powertrain/Energy Storage/Survivability Technology STO DRLV	This project matures and demonstrates advanced mobility and electric technologies for advanced propulsion, power, and electrical components and subsystems to enable lightweight, agile, deployable, fuel efficient, and survivable ground vehicles	Reduce Demand	2040	03	Research	0603125A	831	4,403
ARMY	Combating Terrorism, Technology Development	Powertrain/Energy Storage/Survivability Technology DRLZ	This project matures and demonstrates advanced mobility and electric technologies for advanced propulsion, power, and electrical components and subsystems to enable lightweight, agile, deployable, fuel efficient, and survivable ground vehicles	Reduce Demand	2040	03	Research	0603125A	2,169	14,169
Navy	NATIONAL DEFENSE SEALIFT FUND	Future Initiatives	This item represents funding that is set aside to implement initiatives that are currently unidentified but will be developed from the Broad Agency Announcement and Energy Initiative Studies and Development	Reduce Demand	4557N	02	Research	0408042N	-	8,211
Navy	NATIONAL DEFENSE SEALIFT FUND	HVAC&R Efficiency Improvement	Implementation of automating plant control systems, matching plant generation to demand, and using Variable Air Volume design; HVAC&R plants can be made efficient through a range of conditions and still retain the full maximum capacity. Examples of initiatives include T-AKE Intelligent HVAC, Endocube and the implementation of intelligent HVAC on other ship classes. Combined with same "HVAC&R Efficiency Improvement" BA Code 04, projected to save approximately 376,000 barrels of fuel from FY2010-2020	Reduce Demand	4557N	02	Direct	0408042N	3,635	14,207
Navy	Hull, Mechanical & Electrical Support	Shipboard Incentivized Energy Conservation Program	The Shipboard Incentivized Energy Conservation Program (i-ENCON) provides ships with operational techniques to reduce fuel consumption. Naval Sea Systems Command provides ships with the necessary training, tools and guidance that helps to increase ships' underway operating hours for improved fleet readiness	Reduce Demand	1804	04	Direct	0708017N	578	2,989

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Navy	NATIONAL DEFENSE SEALIFT FUND	Improved Metering and Monitoring	Installation of fuel meters and shore power meters. This fuel metering technology corrects for density, technology, and air entrainment and can thereby measure flow to an accuracy of around 0.01% error. A Shore Power Monitor stores energy and power quality data including cumulative kWh, peaks, and several power quality metrics. The compiled data enables MSC to monitor and manage shore power usage and implement appropriate energy conservation measures. The combination of these meters will feed into an Energy Dashboard that will be used to monitor real time energy usage, which will enable ship operators to make operational changes that decrease overall energy usage	Reduce Demand	4557N	02	Indirect	0408042N	2,665	3,151
Navy	NATIONAL DEFENSE SEALIFT FUND	Lighting Upgrades	Upgrade currently installed lighting with newer technologies to increase energy efficiency. Initiatives include using T8 fluorescent bulbs, Light Emitting Diode (LED) technology, installing light switches and intelligent lighting technology such as motion and occupancy sensors. Projected to save approximately 170,000 barrels of fuel from FY 2010-2020	Reduce Demand	4557N	02	Direct	0408042N	216	2,386
Navy	Advance Surface Machinery Sys	Advanced Power Generation Module & Non Energy Related Efforts incorrectly tagged in PBIS	Advanced gas turbine to provide better fuel efficiency, meet requirements for advanced sensors and future weapons, reduce weight, and lower life cycle costs. Potentially, DDG-51 Flight III ships could be forward fit with three GTG rather than four. Supported initiatives include evaluating other opportunities for Gas Turbine Efficiency Upgrades. This Initiative also includes Non-Energy related efforts that are currently tagged erroneously as Energy in PBIS	Reduce Demand	1319	04	Research	0603573N	4,500	22,650
Navy	Surface Combatant Maintenance & Modernization	Bow Bulb Optimization	Bow bulb optimization modifies the shape of the bow bulb by adding an appendage above the sonar dome on DDG class ships. This appendage reduces hull wave drag without increasing hull resistance, impinging on sonar operations or reducing maneuverability	Reduce Demand	1810	01	Direct	0204228N	1,401	14,701
Navy	Amphib Maintenance & Modernization	Directional Stability	Installation of two medium sized fixed fins will improve directional stability and could reduce power up to 13% and increase fuel efficiency by 3%	Reduce Demand	1804	01	Direct	0204411N	1,100	1,100
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	Reduce Demand	1319	04	Research	0603724N	-	8,191
Navy	NATIONAL DEFENSE SEALIFT FUND	Policy Guidance & Development and Training & Incentive Program	Implementing class-wide or fleet-wide policy that can result in more efficient ship operation. Integrating energy efficiency training into existing Civilian Mariner Engineering Officer (CMEO) Training program Implementing an incentive program to incentivize efficient ship operation and the generation of energy conservation initiatives. Combined with same "Policy Guidance & Development and Training & Incentive Program" BA Code 04, projected to save approximately 10,000 barrels of fuel from FY 2010-FY20	Future Force	4557N	02	Direct	0408042N	27	138

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (S Thousands)	FYDP (S Thousands)
Navy	NATIONAL DEFENSE SEALIFT FUND	Pump & Motor Efficiency Improvements	Implementing the use of variable speed technology to increase the efficiency of existing pumps and motors to better match actual demand. Also installing newer, more efficient pump and motor options. Combined with same "Pump & Motor Efficiency Improvements" BA Code 04, projected to save approximately 126,000 barrels of fuel from FY 2010-2020	Reduce Demand	4557N	02	Direct	0408042N	1,088	4,742
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	Reduce Demand	1319	04	Direct	0603724N	6,039	13,156
Navy	Advance Surface Machinery Sys	Energy Storage & Non Energy Related Efforts incorrectly tagged in PBIS	ESO assumes responsibility for developing Next Generation Integrated Power System (NGIPS) technology aboard Navy Ships to provide smaller, simpler, more affordable, and more capable power systems. Supported initiatives include Energy Storage for Stable Backup Power (SBP). This Initiative also includes Non-Energy related efforts that are currently tagged erroneously as Energy in PBIS	Reduce Demand	1319	04	Research	0603573N	5,100	18,100
Navy	NATIONAL DEFENSE SEALIFT FUND	Route Planning & Optimization	Implementing route planning programs, such as the Replenishment At Sea Planner (RASP), that can improve MSC's scheduling of ships between ports and underway combatant customer ships, thereby reducing fuel consumption. Once underway, ship optimization tools can be used to optimize the ship's equipment to further reduce fuel consumption. Combined with same "Route Planning & Optimization" BA Code 04, projected to save approximately 297,000 barrels of fuel from FY10-FY20	Reduce Demand	4557N	02	Direct	0408042N	706	4,041
Navy	NATIONAL DEFENSE SEALIFT FUND	Auditing, Modeling & Savings Analysis	Operational Logistics (OPLLOG) R&D with Military Sealift Command (MSC) will manage and conduct energy audits to analyze energy usage onboard ships, facilitate and optimize energy reduction methods, and analyze the alternatives to reduce energy costs. This data will feed into the ENCON Calibrated Baseline Model for each ship class. Once calibrated through audit data input, the model serves as an accurate and flexible tool to generate baseline energy usage profiles for various missions, load-outs, area or operations, and operating conditions. Projected to save approximately 18,000 barrels of fuel from FY 2010-2020	Future Force	4557N	04	Research	0408042N	1,542	6,981
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	Reduce Demand	1319	04	Direct	0603724N	-	700

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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	Reduce Demand	1319	04	Direct	0603724N	879	4,879
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	Reduce Demand	1319	04	Direct	0603724N	2,360	2,850
Navy	NATIONAL DEFENSE SEALIFT FUND	Energy Conservation Broad Agency Announcement	Naval Surface Warfare Center Carderock Division's (NSWCCD) Energy Conservation (ENCON) Broad Agency Announcement (BAA) is intended to solicit industry, academia, and government agencies to discover new, cost-effective, and innovative ways of using energy through new equipment or technology. Projected to save approximately 94,000 barrels of fuel from FY 2010-2020	Reduce Demand	4557N	04	Research	0408042N	2,775	16,441
Navy	NATIONAL DEFENSE SEALIFT FUND	Energy Initiative Studies and Development	Researching, identifying, and developing energy saving initiatives to the point where they can be directly applied to ship-based environments	Reduce Demand	4557N	04	Research	0408042N	1,727	11,348
Navy	Ship Contract Design/Live Fire T&E	Hybrid Electric Drive Implementation	Complete Machinery Software System (MCS) integration development. Completion of Factory Acceptance Test (FAT), environmental qualification testing (EQT) and performance testing in Land Based Engineering Site (LBES). Complete Integrated Logistics Support (ILS) certifications and ship design development. Commencement, completion, delivery and installation of Low Rate Initial Production (LRIP) units to achieve fuel efficiency and increase on-station time	Reduce Demand	1319	05	Direct	0604567N	4,222	11,149
Navy	Hybrid Electric Drive (HED)	Hybrid Electric Drive Implementation	Funds HED shipsets to include the propulsion motors, motor drives and the associated controls, interfaces, and mounting equipment that will be required to install the HED on DDG 51 Class Ships. This budget supports HED installation on DDG 51 Class in-service ships (backfit) beginning in FY 2016	Reduce Demand	1810	01	Direct	0708017N	32,906	200,485
Navy	NATIONAL DEFENSE SEALIFT FUND	Hull Coatings	Testing and prototyping the application of commercially available hull coatings to better match hull coating to ship OPSTEMPO. The goal is to prevent biofouling so that propulsive efficiency is maximized	Reduce Demand	4557N	04	Direct	0408042N	150	351
Navy	Surface Combatant Maintenance & Modernization	LM2500 Efficiency Implementation	The LM2500 R&D Program will modify the engine controller; reduce leak paths in the LM2500 compressor; reduce flow losses in the air intake and exhaust ducts; improve hot section; improve depot repair standards; investigate energy recovery strategies and automate gas turbine on-line water wash	Reduce Demand	1810	01	Indirect	0204228N	-	4,825
Navy	ENERGY CONSERVATION	Maritime Energy Efficiency R&D	This supports overall FRRDP execution and currently unidentified projects in the out-years of the FYDP	Reduce Demand	1319	04	Research	0603724N	-	40,098
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	Reduce Demand	1319	04	Research	0603724N	-	635

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (S Thousands)	FYDP (S Thousands)
Navy	Amphib Maintenance & Modernization	Propeller Coatings	An easy-release propeller coating system allows amphibious ships with long pier-side periods to shed propeller bio-fouling once underway. This technology is currently achieving fuel savings for MSC ships and the commercial shipping industry	Reduce Demand	1804	01	Direct	0204411N	160	160
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	Reduce Demand	1319	04	Research	0603724N	-	8,252
Navy	NATIONAL DEFENSE SEALIFT FUND	HVAC&R Efficiency Improvement	Design and research of ways of automating plant control systems, matching plant generation to demand, and using Variable Air Volume design; HVAC&R plants can be made efficient through a range of conditions and still retain the full maximum capacity. Examples of HVAC&R initiatives include T-AKE Intelligent HVAC, Endocube and the implementation of intelligent HVAC on other ship classes. Combined with same "HVAC&R Efficiency Improvement" BA Code 02, projected to save approximately 376,000 barrels of fuel from FY10-FY20	Reduce Demand	4557N	04	Direct	0408042N	771	3,710
Navy	Surface Combatant Maintenance & Modernization	Solid State Lighting	Replacement of existing incandescent lighting fixtures on surface combatants with LED lights that will increase efficiency and operate for a much longer service life	Reduce Demand	1810	01	Direct	0204228N	2,920	18,052
Navy	Amphib Maintenance & Modernization	Solid State Lighting	Replacement of existing incandescent lighting fixtures on amphibious ships with LED lights that will increase efficiency and operate for a much longer service life	Reduce Demand	1810	01	Direct	0204411N	3,767	3,767
Navy	ENERGY CONSERVATION	Thermal Management	This project will be utilized to identify and evaluate potential uses for Thermal Management techniques designed to reduce overall shipboard heat generation and reduce the shipboard electrical demand on HVAC systems	Reduce Demand	1319	04	Direct	0603724N	-	2,993
Navy	Surface Combatant Maintenance & Modernization	Thermal Management Control System (TMCS)	Utilizing a centralized control system, which gathers information compartment by compartment and provides the appropriate conditioning for the compartment, the TMCS could determine the required number and location of AC plants best able to cool the area	Reduce Demand	1810	01	Direct	0204228N	11,656	39,827
Navy	Surface Combatant Maintenance & Modernization	Triton Fuel Penalty Tool	This initiative will develop, install, and optimize a system capable of reporting in real time when a ship's powering condition has degraded due to increased drag from biofouling. The system will provide data to the Energy Dashboard to report the fuel penalty produced by hull and propeller fouling, at a confidence level of 95%. Understanding of the fouling condition could influence cleaning frequency and increase efficiency	Reduce Demand	1810	01	Direct	0204228N	-	4,880

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
Navy	Amphib Maintenance & Modernization	Variable Speed Drive (VSD) Port Use Fan (PUF)	Modernization of the operation of the PUF provides ships a reliable alternative to operating the FDBs while in-port steaming. This modification will facilitate the use of the PUF with a variable speed drive (VSD) to throttle the speed of the PUF as needed to provide proper combustion air while keeping the PUF vanes wide open. This modification will greatly improve efficiency and reduce fuel consumption while steaming in port	Reduce Demand	1804	01	Indirect	0204411N	640	640
Navy	Surface Combatant Maintenance & Modernization	Variable Speed Drive (VSD) Collective Protection System (CPS)	This system uses an efficient variable speed drive in the CPS to reduce energy consumption by allowing the system to operate in states other than fully on or off	Reduce Demand	1810	01	Indirect	0204228N	4,417	19,807
Navy	NATIONAL DEFENSE SEALIFT FUND	Improved Metering and Monitoring	Design of work packages for fuel meters and shore power meters. This fuel metering technology corrects for density, technology, and air entrainment and can thereby measure flow to an accuracy of around 0.01% error. A Shore Power Monitor stores energy and power quality data including cumulative kWh, peaks, and several power quality metrics. The compiled data enables MSC to monitor and manage shore power usage and implement appropriate energy conservation measures. The combination of these meters will feed into an Energy Dashboard used to monitor real time energy usage, which will enable ship operators to make operational changes that decrease overall energy usage	Reduce Demand	4557N	04	Indirect	0408042N	308	1,044
Navy	NATIONAL DEFENSE SEALIFT FUND	Policy Guidance & Development and Training & Incentive Program	Developing class-wide or fleet-wide policy that can result in more efficient ship operation. Integrating energy efficiency training into existing Civilian Mariner Engineering Officer (CMEO) Training program. Developing an incentive program to incentivize efficient ship operation and the generation of energy conservation initiatives. Combined with same "Policy Guidance & Development and Training & Incentive Program" BA Code 02, projected to save approximately 10,000 barrels of fuel from FY 2010-2020.	Future Force	4557N	04	Direct	0408042N	540	2,598
Navy	Surface Combatant Maintenance & Modernization	Shipboard Energy Dashboard	Energy Dashboard uses the Integrated Condition Assessment System (ICAS) to collect data from shipboard equipment. It includes the Fuel Management System (FMS), which assists pre-underway planning by recommending efficient equipment lineups. Energy Dashboard calculates and instantly displays daily energy consumption rates	Reduce Demand	1810	01	Direct	0204228N	612	5,496

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
Navy	NATIONAL DEFENSE SEALIFT FUND	Route Planning & Optimization	Developing route planning programs, such as the Replenishment At Sea Planner (RASP), that can improve MSC's scheduling of ships between ports and underway combatant customer ships, thereby reducing fuel consumption. Once underway, ship optimization tools can be used to optimize the ship's equipment to further reduce fuel consumption. Combined with same "Route Planning & Optimization" BA Code 02, projected to save approximately 297,000 barrels of fuel from FY 2010-2020	Reduce Demand	4557N	04	Direct	0408042N	441	2,121
Navy	Aircraft Energy Conservation	Air ENCON	Develop, implement and sustain Aircraft Energy Conservation Program Office to identify, validate, disseminate, and incentivize energy conservation best practices within the Naval Aviation community. Targets include culture, fueling, mission planning, and maintenance	Reduce Demand	1319	04	Direct	0603724N	1,242	6,156
Navy	Aircraft Energy Conservation	F/A-18 Magic Carpet	Augmented-pilot flight control mode for integration into F/A-18E/F and EA-18G Reduce pilot workload and simplify the carrier landing task via advanced flight controls and enhanced pilot cueing. Increase pilot performance and pilot/ship safety, reduce requirement for Field Carrier Landing Practice between 25%-50%. Potential fuel savings: 1-2 M gallons / year. N98 funding available FY 2016+.	Reduce Demand	1319	04	Direct	0603724N	17,200	35,100
Navy	Aircraft Energy Conservation	F-35 Advanced Flight Management System	F-35 program seeks to validate 10-25% potential fuel savings through advanced flight management system capabilities: 1.) Mission Segment Fuel Savings (Optimum Launch & Recovery Profiles, Continuous Decent Approach, Cruise-Climb, Optimized Holding Pattern, etc.) 2.) Total Mission Fuel Minimization (In-flight Trajectory Optimization, Required Navigation Performance) 3.) Reclamation of Airspace Inefficiencies	Reduce Demand	1319	04	Direct	0603724N	-	15,631
Navy	Aircraft Energy Conservation	F-35 Trim-Optimizing Flight Control	F-35 program seeks to leverage F/A-18 Trim-Optimizing Flight Control investments to achieve a 1.8% reduction in surface control drag (15 nm mission radius improvement)	Reduce Demand	1319	04	Direct	0603724N	-	13,574
Navy	Aircraft Energy Conservation	F-35 'Smart Start' Energy Conservation Mode	This initiative will optimize the fuel efficiency of the F-35 air vehicle by optimizing the amount of preflight checks that can be performed using the power Thermal Management System (PTMS) vice the main engine. Validation testing will ensure that there are no adverse impacts to any of the aircraft subsystems. These technologies will be forward fit in F-35 Block 4B (2022) and beyond	Reduce Demand	1319	04	Direct	0603724N	2,566	13,619

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
Navy	Aircraft Energy Conservation	F-35 Engine Efficiency	This initiative will optimize the fuel efficiency of the F-35 engine with various technologies, including Advanced Compressor Technology, Optimized Turbine Cooling, Advanced Turbine Clearance Control, and Fuel Burn Optimized Control Mode. These technologies will be forward fit in F-35 Block 4B (2022) and beyond with the potential to be retrofitted into existing systems during planned depot maintenance	Reduce Demand	1319	04	Direct	0603724N	18,143	22,138
Navy	Aircraft Energy Conservation	New Opportunity Studies	The aircraft energy conservation RDTEN project identifies, evaluates, validates, and advocates for implementation of energy savings initiatives for legacy aircraft by engaging technical experts from across Naval aviation, other services, allies, industry, and academia	Reduce Demand	1319	04	Research	0603724N	-	48,730
Navy	Aircraft Energy Conservation	F/A-18 Trim-Optimizing Flight Control	By optimizing aircraft trim configuration across a variety of flight conditions, a control algorithm developed by NASA Dryden was able to reduce F/A-18A fuel consumption by 3.5% across three test flights without negatively impacting transient performance. Technology transition efforts are focused on the F/A-18 E/F and E/A-18 G	Reduce Demand	1319	04	Direct	0603724N	2,004	7,158
Navy	Common Group Equipment	Simulator Upgrades	The Navy Aviation Simulator Master Plan (NASMP) identified capability (fidelity) and capacity upgrades required to maximize T&R simulation for F/A-18E/F, EA-18G, and MH-60R/S aircraft given fiscal, technological, and minimum flight time limitations	Reduce Demand	1506	07	Indirect	0804743N	79,303	400,511
Navy	Mobility Fuels	Alternative Fuels Test and Qualification Program	This program develops technical data through the execution of laboratory, component, engine, fuel system, and weapon system tests, which evaluates the effects of changes in fuel chemistry and properties on the performance and reliability of Naval ship, aircraft, and fuel distribution systems	Diversify Supply	1319	04	Research	0603724N	12,509	62,629
Navy	Defense Research Sciences	Synthetic Biology for Sensing & Energy Production	Studies microbial physiology mechanisms that mediate electro synthesis (use of electrical current as an electron donor for metabolic processes) and novel bioengineering tools and strategies for enabling microbes to detect and produce physical and/or chemical signals	Diversify Supply	1319	01	Research	0601153N	300	1,500
Navy	Defense Research Sciences	Microbial and Biomolecular Fuel Cell	Elucidate/optimize marine microbes and mechanisms responsible for electron transfer to anodes (in sediments) and cathodes (in overlying water) and configure electronics to allow practical powering of low-power devices	Diversify Supply	1319	01	Research	0601153N	500	500
Navy	Defense Research Sciences	Naval Future Fuels	Accelerate the adoption of biofuels and blended logistic fuels by supporting Navy certification process, and understand and mitigate the impact of emerging fuels on naval power systems and operations	Diversify Supply	1319	01	Research	0601153N	769	4,017
Navy	Defense Research Sciences	Power and Energy Materials Research - Chemical Dynamics	Conduct fundamental research to identify and investigate suitable materials for energy storage (e.g. advanced polymer, composite dielectric film, multi-layer glass-ceramic composite).	Diversify Supply	1319	01	Research	0601153N	1,234	6,488

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Navy	Defense Research Sciences	Heat Transfer & Thermal Management Science	Fundamental studies and physics-based models of evaporative cooling, including heat transfer and critical heat flux.	Reduce Demand	1319	01	Research	0601153N	1,636	9,123
Navy	Defense Research Sciences	Power and Energy Materials Research - Electrochemical Materials S&T	Conduct fundamental research to identify and investigate suitable materials for energy storage (e.g. advanced polymer, composite dielectric film, multi-layer glass-ceramic composite).	Diversify Supply	1319	01	Research	0601153N	2,010	10,566
Navy	Defense Research Sciences	Ship Hydrodynamics	Provide design tools for high performance, efficient, low signature hull forms and propulsors and optimize integration of the hull-propulsor as a system.	Reduce Demand	1319	01	Research	0601153N	2,100	10,500
Navy	Defense Research Sciences	Propulsion Basic Research	The Propulsion focus area of the Sea-Based Aviation National Naval Responsibility will provide innovative research and technology in propulsion, power, and thermal management-related fields including Energy-Efficient Processes and Subsystems for future Naval Aviation needs	Reduce Demand	1319	01	Research	0601153N	2,130	9,501
Navy	Defense Research Sciences	Power and Energy Materials Research - Functional Polymeric Materials	Conduct fundamental research to identify and investigate suitable materials for energy storage (e.g. advanced polymer, composite dielectric film, multi-layer glass-ceramic composite)	Diversify Supply	1319	01	Research	0601153N	2,230	11,724
Navy	Defense Research Sciences	Distribution/Control of Power Science	Explore design concepts for advanced power distribution, including multifunctional power controllers, electronic decoupling concepts, adaptive and reconfigurable power technology, and high power switching and pulse forming networks.	Reduce Demand	1319	01	Research	0601153N	2,325	12,096
Navy	Defense Research Sciences	Energy Storage and Power Management	Understand fundamental chemistry, physics and the effects of scale. Develop novel materials and architectures for energy storage and novel materials to enable energy transformation processes. Synthesis of novel polymer and composite dielectric materials and optimization of discharge rates	Reduce Demand	1319	01	Research	0601153N	2,373	12,348
Navy	Force Protection Applied Research	Energy Efficiency & Alternative Energy Technologies - Energy Efficiency & Maintenance Synergies	Develop and demonstrate novel power generation, energy storage and efficiency technologies	Reduce Demand	1319	02	Research	0602123N	500	2,500
Navy	Force Protection Applied Research	Next Generation Integrated Power System	Explore design concepts for advanced power distribution, including multifunctional power controllers, electronic decoupling concepts, adaptive and reconfigurable power technology, and high power switching and pulse forming networks	Reduce Demand	1319	02	Research	0602123N	933	4,618
Navy	Force Protection Applied Research	Energy Efficiency & Alternative Energy Technologies - Photovoltaics	Improve the photovoltaic device and system efficiency for lightweight, low-cost Photovoltaic (PV) power systems	Reduce Demand	1319	02	Research	0602123N	1,000	5,000
Navy	Force Protection Applied Research	Energy Efficiency & Alternative Energy Technologies - Unmanned Systems	Develop and demonstrate hydrogen powered fuel cells for small Unmanned Aerial Vehicles (UAVs) to address size, performance and endurance	Diversify Supply	1319	02	Research	0602123N	1,000	5,000
Navy	Force Protection Applied Research	Energy Efficiency & Alternative Energy Technologies - Biofuels	Determine the viability of alternative fuels derived from biomass and waste sources for naval gas turbine and diesel engine operations	Diversify Supply	1319	02	Research	0602123N	2,000	10,000

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Navy	Force Protection Applied Research	Ship Hydrodynamics	Provide design tools for high performance, efficient, low signature hull forms and propulsors and optimize integration of the hull-propulsor as a system	Reduce Demand	1319	02	Research	0602123N	2,064	11,408
Navy	Force Protection Applied Research	Naval Future Fuels	Accelerate the adoption of biofuels and blended logistic fuels by supporting Navy certification process, and understand and mitigate the impact of emerging fuels on naval power systems and operations	Diversify Supply	1319	02	Research	0602123N	2,500	12,500
Navy	Force Protection Applied Research	Propulsion Applied Research	The Propulsion focus area of the Sea-Based Aviation National Naval Responsibility will provide innovative research and technology in propulsion, power, and thermal management-related fields including Energy Efficient Processes and Subsystems for future Naval Aviation needs	Reduce Demand	1319	02	Research	0602123N	4,250	18,611
Navy	Force Protection Applied Research	Energy Efficiency & Alternative Energy Technologies - Sustainability/Outreach	Investigate, develop and/or evaluate and demonstrate alternative energy and energy efficiency technologies; and support STEM and Veteran/Wounded Warrior energy education pilot program	Reduce Demand	1319	02	Research	0602123N	6,859	39,120
Navy	Force Protection Applied Research	Platforms	Sea-Based Aviation NNR applied research efforts in Design, materials selection, fabrication, inspection and maintenance related to air-vehicle structures research	Reduce Demand	1319	02	Research	0602123N	8,478	42,983
Navy	Force Protection Applied Research	Electric Ship Research & Development Consortium	A consortium of virtually linked academic institutions with hardware-in-the-loop capability coupled with physics based models for system design, testing, and validation.	Reduce Demand	1319	02	Research	0602123N	10,129	53,660
Navy	Warfighter Sustainment Applied Research	Synthetic Biology for Sensing & Energy Production	Studies microbial physiology mechanisms that mediate electro synthesis (use of electrical current as an electron donor for metabolic processes) and novel bioengineering tools and strategies for enabling microbes to detect and produce physical and/or chemical signals.	Diversify Supply	1319	02	Research	0602236N	150	750
Navy	Warfighter Sustainment Applied Research	Bio centric Technology - Microbial Fuel Cell	Elucidate/optimize marine microbes and mechanisms responsible for electron transfer to anodes (in sediments) and cathodes (in overlying water) and configure electronics to allow practical powering of low-power devices.	Diversify Supply	1319	02	Research	0602236N	750	2,750
Navy	Undersea Warfare Applied Research	USW Power & Energy	Develop and demonstrate high speed, long endurance undersea weapons	Reduce Demand	1319	02	Research	0602747N	1,200	6,000
Navy	Undersea Warfare Applied Research	Long Duration Unmanned Undersea Vehicle	Develop high endurance power and air-independent propulsion for UUVs.	Reduce Demand	1319	02	Research	0602747N	4,100	4,100
Navy	Future Naval Capabilities Applied Research	Corrosion Resistant Surface Treatment (FNC)	An integrated system that provides corrosion protection and fouling control, and threat detection.	Reduce Demand	1319	02	Research	0602750N	210	210
Navy	Future Naval Capabilities Applied Research	Renewable Thermal Engine (FNC)	3-5 kW tactical deployable thermal engine capable of utilizing existing and alternative fuels, and concentrated solar thermal energy	Reduce Demand	1319	02	Research	0602750N	513	513

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
Navy	Future Naval Capabilities Applied Research	High Power Solid State Circuit Protection for Power Distribution and Energy Storage (FNC)	Develop and demonstrate high speed, medium voltage direct current circuit breakers for ship power distribution system	Reduce Demand	1319	02	Research	0602750N	2,675	5,175
Navy	Future Naval Capabilities Applied Research	Air Independent Propulsion System (FNC)	Develop and demonstrate a long endurance, scalable air independent energy storage solution for undersea vehicles to support long complex multi-mission scenarios	Reduce Demand	1319	02	Research	0602750N	712	712
Navy	Force Protection Advanced Technology	Naval Variable Cycle Engine Technology	Identify and mature critical, relevant variable/adaptive cycle system technologies for the next generation carrier-based aircraft that combine high performance with fuel efficiency.	Reduce Demand	1319	03	Research	0603123N	6,139	31,186
Navy	Future Naval Capabilities Advanced Technology Development	Corrosion Resistant Surface Treatment (FNC)	An integrated system that provides corrosion protection and fouling control, and threat detection.	Reduce Demand	1319	03	Research	0603673N	841	841
Navy	Future Naval Capabilities Advanced Technology Development	Advanced Material Propeller (FNC)	Develop a pitch-adapting composite submarine propeller with a flexible tip for pitch adaptation, and blade-to-hub joint for modularity and replaceability.	Reduce Demand	1319	03	Research	0603673N	200	200
Navy	Future Naval Capabilities Advanced Technology Development	High Power Solid State Circuit Protection for Power Distribution and Energy Storage (FNC)	Develop and demonstrate high speed, medium voltage direct current circuit breakers for ship power distribution system	Reduce Demand	1319	03	Research	0603673N	2,125	8,675
Navy	Future Naval Capabilities Advanced Technology Development	Renewable Thermal Engine (FNC)	3-5 kW tactical deployable thermal engine capable of utilizing existing and alternative fuels, and concentrated solar thermal energy	Reduce Demand	1319	03	Research	0603673N	2,054	2,054
Navy	Future Naval Capabilities Advanced Technology Development	Air Independent Propulsion System (FNC)	Develop and demonstrate a long endurance, scalable air independent energy storage solution for undersea vehicles to support long complex multi-mission scenarios	Reduce Demand	1319	03	Research	0603673N	2,849	2,849
Navy	Items less than \$5 Million	Expeditionary Trailer Mounted ECU/Generator (ETMEG)	This initiative is a phased replacement of the existing Generator ECU Trailer (GET), which uses components that are less efficient than current generation technology. The Expeditionary Trailer-Mounted ECU Generator (ETMEG) capability will be a self-contained system consisting of a diesel generator and Collective Protection-approved ECU mounted on an M-Series style single-axle trailer. By leveraging current technology a 20% reduction from current fuel burn rates of the GET are expected.	Reduce Demand	1810	05	Indirect	0204455N	202	11,367

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
Navy	Construction & Maint Equip	Advanced Medium Mobile Electric Power Sources (AMMPS)	The current legacy Tactical Quiet Generators are currently being replaced with Advanced Medium Mobile Electric Power Sources (AMMPS). AMMPS is a technologically advanced, third generation family of medium power military generators (5-60 kilowatts (kW)). AMMPS delivers 21 percent better fuel efficiency (average across fleet) and significantly exceeds the reliability of the second generation generator (Tactical Quiet Generator). These are 1 to 1 replacements with the current system.	Reduce Demand	1810	05	Direct	0204455N	442	2,126
Navy	Items less than \$5 Million	Environmental Control Unit 50 (ECU50)	This initiative procures and fields next generation, high efficiency, environmental control units (ECUs) for the expeditionary force. ECUs used by Navy Expeditionary Combat Command (NECC), NBG and NSW are a significant energy consumer at forward bases where the cost of delivered energy is among the highest on the battlefield. Technologies pursued through the ECU50 RDT&E initiative--energy reduction of 50% objective to 20% threshold--will be transitioned to this procurement program to replace overage assets beginning in 2018 to help meet the OPNAV goal of 15% reduction in operational energy consumption.	Reduce Demand	1810	05	Direct	0204455N	-	9,000
Navy	Items less than \$5 Million	Expeditionary Power Integration and Control (EPIC)	Power generation and distribution at the Navy's expeditionary camps is distributed, redundant, and inefficient. This initiative implements technologies developed by the other Services in a configuration and manner that meets the Navy's requirements to integrate, manage, control, and distribute electric power, with energy savings in excess of 50% expected. The solution to be fielded, Expeditionary Power Integration and Control (EPIC), will provide an autonomous capability to intelligently integrate and control multiple generators of varying size through phase balancing, monitoring and metering; load shedding and load adjustment; provide uninterrupted power while power generation is secured; and accept and control input from optional renewable power generation sub-systems.	Reduce Demand	1810	05	Direct	0204455N	-	20,340
Navy	Items less than \$5 Million	Improved Environmental Control Unit (IECU)	Replacement of Environmental Control Units (ECUs) with units that incorporate variable speed fan drives and multi-frequency drive components which are ~20% more energy efficient.	Reduce Demand	1810	05	Indirect	0204455N	-	73
Navy	Combat Support Forces	LED Lights	This initiative is to integrate more efficient lighting into newly designed facilities for the NECC Enterprise Tactical Command and Control (NETC2) system. The initiative replaces traditional incandescent bulbs with LED fixtures and leverages RDT&E efforts already undertaken by the Army.	Reduce Demand	1804	01	Direct	0204455N	500	500

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
Navy	Combat Support Forces	Solar Shades (ULCANS/ARCAS)	This initiative is to procure and field solar shades for soft-walled shelters used in expeditionary tent camps. In extensive testing performed by the Army and Air Force, shades reduced the solar load on the skin of shelters by up to 80%, improving energy efficiency by 25%. Shades already exist in the expeditionary tent camps; however, they've been primarily employed for camouflage capability vice for energy savings. This initiative increases the density of assets across the TOAs and will contribute to the OPNAV goal of 15% reduction in operational energy.	Reduce Demand	1804	01	Direct	0204455N	2,000	2,000
Navy	Combat Support Forces	Energy Efficient Liners	This initiative is to outfit existing soft-walled shelters used in expeditionary tent camps with energy efficient liners. The existing, uninsulated shelters drive energy consumption at forward bases where the cost of delivered energy is among the highest on the battlefield. The liners improve the R factor of the shelter, improving the energy efficiency of the shelter by approximately 21% based on extensive testing performed by Army Force Sustainment Systems.	Reduce Demand	1804	01	Indirect	0204455N	2,500	5,000
Navy	Facilities Improvement	Environmental Control Unit 50 (ECU50)	This initiative matures high efficiency environmental control unit (ECU) technologies from Technology Readiness Level 6 to TRL 7/8 to support phased replacement of expeditionary ECUs, which are a significant energy consumer at forward bases where the cost of delivered energy is among the highest on the battlefield. To dramatically increase ECU efficiency (50% objective/20% threshold), NAVFAC, OPNAV N45E and DOE's Advanced Research Projects Agency (ARPA-E) jointly developed a proposal to leverage ARPA-E's Program for Building Energy Efficiency Through Innovative Thermodevices. The proposal was funded by OSD OEPP and the project is on track to deliver two promising technologies for transition to this initiative (Sterling cycle and generator waste heat recovery), and a third, less-developed technology (dehumidification) has been identified for further development either by OEPP or ONR.	Reduce Demand	1319	04	Direct	0603725N	3,497	5,493
USMC	Advanced Power Sources	SPACES, GREENS, RPAs	Advanced Power Sources is a family of small power devices to provide portable electric power for legacy and future weapons, optics, sensors, medical, intelligence and communications systems. The Family consists of multiple suites, to include: Family of USMC Standard Power Supplies, Family of Radio Power Adaptors, Battery Management and Sustainment Systems, Communications / Electronics batteries, Lead acid batteries Battery Chargers and Analyzers, Solar and Renewable Energy Systems, Mobile Electric Hybrid Power Systems (MEHPS), Emerging requirements that involve standardizations, and Naval Lithium Battery Safety Program management.	Diversify Supply	1106	01	Direct	0203761 M	-	1,858

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USMC	Advanced Power Sources	SPACES. GREENS, RPAs	Advanced Power Sources is a family of small power devices to provide portable electric power for legacy and future weapons, optics, sensors, medical, intelligence and communications systems. The Family consists of multiple suites, to include: Family of USMC Standard Power Supplies, Family of Radio Power Adaptors, Battery Management and Sustainment Systems, Communications / Electronics batteries, Lead acid batteries Battery Chargers and Analyzers, Solar and Renewable Energy Systems, Mobile Electric Hybrid Power Systems (MEHPS), Emerging requirements that involve standardizations, and Naval Lithium Battery Safety Program management.	Diversify Supply	1109	06	Direct	0206211 M	12,311	53,160
USMC	Advanced Power Sources	SPACES. GREENS, RPAs	Advanced Power Sources is a family of small power devices to provide portable electric power for legacy and future weapons, optics, sensors, medical, intelligence and communications systems. The Family consists of multiple suites, to include: Family of USMC Standard Power Supplies, Family of Radio Power Adaptors, Battery Management and Sustainment Systems, Communications / Electronics batteries, Lead acid batteries Battery Chargers and Analyzers, Solar and Renewable Energy Systems, Mobile Electric Hybrid Power Systems (MEHPS), Emerging requirements that involve standardizations, and Naval Lithium Battery Safety Program management.	Diversify Supply	1109	06	Direct	0502511 M	2,244	11,131
USMC	Advanced Power Sources	SPACES. GREENS, RPAs	Advanced Power Sources is a family of small power devices to provide portable electric power for legacy and future weapons, optics, sensors, medical, intelligence and communications systems. The Family consists of multiple suites, to include: Family of USMC Standard Power Supplies, Family of Radio Power Adaptors, Battery Management and Sustainment Systems, Communications / Electronics batteries, Lead acid batteries Battery Chargers and Analyzers, Solar and Renewable Energy Systems, Mobile Electric Hybrid Power Systems (MEHPS), Emerging requirements that involve standardizations, and Naval Lithium Battery Safety Program management.	Diversify Supply	1106	01	Direct	0206624 M	1	5

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
USMC	Advanced Power Sources	Next Generation SPACES, GREENS	Advanced Power Sources is a family of small power devices to provide portable electric power for legacy and future weapons, optics, sensors, medical, intelligence, and communications systems. The Family consists of multiple suites, to include: Family of USMC Standard Power Supplies, Family of Radio Power Adaptors, Battery Management and Sustainment Systems, Communications / Electronics batteries, Lead acid batteries Battery Chargers and Analyzers, Solar and Renewable Energy Systems, Mobile Electric Hybrid Power Systems (MEHPS), Emerging requirements that involve standardizations, and Naval Lithium Battery Safety Program management.	Diversify Supply	1319	07	Direct	0206624 M	846	7,367
USMC	Advanced Power Sources	SPACES, GREENS, RPAs	Advanced Power Sources is a family of small power devices to provide portable electric power for legacy and future weapons, optics, sensors, medical, intelligence, and communications systems. The Family consists of multiple suites, to include: Family of USMC Standard Power Supplies, Family of Radio Power Adaptors, Battery Management and Sustainment Systems, Communications / Electronics batteries, Lead acid batteries Battery Chargers and Analyzers, Solar and Renewable Energy Systems, Mobile Electric Hybrid Power Systems (MEHPS), Emerging requirements that involve standardizations, and Naval Lithium Battery Safety Program management.	Diversify Supply	1106	03	Direct	0804771 M	102	530
USMC	Advanced Technology Demo	Energy Efficient Processors/Sensors, Scalable High-Efficiency Fuel Cells, Water Purification and Desalination, Advanced Vehicle Transmissions and Power plants	Tactical Sensor: Solar Powered Image Exploring Sensor (SPIES): Development of ground sensors capable of running advanced signal processing algorithms on batter power by leveraging advances in massively parallel processors. Nano-Composite Electrodes for SOFC: High Efficiency electrodes for Fuel Cells, Intelligent Small Unit Power: Hybrid generator for small units (3kW), Mobile Solar Power: Flexible high-efficiency photovoltaics, UV-LED Water Purifier: Water disinfection using UV-LEDs, Hybrid Adsorption Water Pre-treatment system: Elimination of biofouling on water filter surfaces by using Aluminum Oxide particle deposition, High output Piezoelectrics: High-efficiency piezoelectrics using novel materials for energy scavenging, Thermoacoustic Generator/Heat Pump: High-efficiency energy generation using thermoacoustics, First Response Freshwater Purifier: Energy-efficient desalination, NanoRad Power Pack: Packaging of an Alpha-emitter with a Uranium oxide semiconductor to produce extremely energy-dense storage. Continuously Variable Transmission: Provide a lighter, smaller, and more efficient advanced transmission for Marine Corps amphibious and land platforms in the medium to heavy weight class.	Reduce Demand	1319	03	Research	0603640 M	7,900	47,922

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (\$ Thousands)	FYDP (\$ Thousands)
USMC	Applied Research	Precision Fires and MEMS, Energy Efficient Processors/Sensors, Opportune Lift Optimization and Autonomous Resupply and Material Handling, Energy Scavenging, Water Desalination, Fuel Efficiency	On-board/Off-board WAAS Data Conditioning and Alerting: Development of a power efficient airborne processor capable of running scene understanding and trackers without reducing operational range. Hybrid Multi-Fuel Power Generator: Waste-to-Energy system for expeditionary forces, JP-8 Fuel Cell: Scalable high-efficiency fuel cell running on JP-8, Vortex Desalination: Novel desalination mechanism that uses a low-pressure vortex to evaporate freshwater from a salinated supply. Reduce fuel consumption of the marine Corps' MTRV fleet by at least 15%.	Reduce Demand	1319	02	Research	0602131 M	2,650	13,068
USMC	Combat Operations Center (COC)	Combat Operations Center (COC)	The Combat Operations Center provides the necessary infrastructure for a scalable transportable Command and Control Capability.	Reduce Demand	1106	01	Indirect	0206626 M	1,500	7,500
USMC	Environmental Control Equipment	Improved Environmental Control Units	Family includes ECUs. Portfolio is horizontal/vertical configured MC Standard air conditioners. ECUs range fr 9,000 to 120,000 BTUs for 50/60/400HZ. EECU provides ~17% increased efficiency across the portfolio of systems.	Reduce Demand	1319	07	Indirect	0206624 M	204	2,098
USMC	Environmental Control Equipment	Improved Environmental Control Units	Family includes ECUs. Portfolio is horizontal/vertical configured MC Standard air conditioners. ECUs range fr 9,000 to 120,000 BTUs for 50/60/400HZ. EECU provides ~17% increased efficiency across the portfolio of systems.	Reduce Demand	1109	06	Indirect	0206315 M	-	1,711
USMC	Environmental Control Equipment	Improved Environmental Control Units	Family includes ECUs. Portfolio is horizontal/vertical configured MC Standard air conditioners. ECUs range fr 9,000 to 120,000 BTUs for 50/60/400HZ. EECU provides ~17% increased efficiency across the portfolio of systems.	Reduce Demand	1106	01	Indirect	0206624 M	55	314
USMC	Environmental Control Equipment	Improved Environmental Control Units	Family includes ECUs. Portfolio is horizontal/vertical configured MC Standard air conditioners. ECUs range fr 9,000 to 120,000 BTUs for 50/60/400HZ. EECU provides ~17% increased efficiency across the portfolio of systems.	Reduce Demand	1109	06	Indirect	0502514 M	95	7,776
USMC	Expeditionary Energy Office	Experimental Forward Operational Base (ExFOB)	Semi-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.	Future Force	1319	07	Direct	0206313 M	2,257	11,268
USMC	Expeditionary Energy Office	Expeditionary Energy Office	USMC Senior Official for Operational Energy, Plans and Programs. Tasked by CMC to analyze, develop, and direct the Marine Corps' energy strategy in order to optimize expeditionary capabilities across all Warfighting functions.	Future Force	1106	04	Direct	0902498 M	3,429	17,611
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.	Reduce Demand	1319	07	Direct	0206623 M	181	1,097
USMC	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	Diversify Supply	1319	03	Research	0603640 M	470	865

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (S Thousands)	FYDP (S Thousands)
USMC	LAV Modification and Sustainment	Mobility & Obsolescence Program (MOB)	Replace the obsolete Full-Up Power pack with a smaller, more efficient off-the-shelf unit	Reduce Demand	1109	06	Direct	0206211 M	-	45,190
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 enabler	Reduce Demand	1106	01	Direct	0702808 M	1,998	5,139
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 enabler	Reduce Demand	1319	07	Direct	0206624 M	2,892	5,090
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	Reduce Demand	1109	05	Direct	0206315 M	1,212	23,855
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 and Distribution Equipment to include the AMMPS system, and 22 different TAMCNs. The Family of Mobile Electric Power Equipment consists of skid and trailer mounted tactical generators ranging from 2 to 200 kilowatts, Mobile Electric Power Distribution Systems, Floodlight Sets, Load Banks and Electrician's 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, and water purification systems.	Reduce Demand	1109	06	Direct	0206315 M	745	27,300
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 and Electrician's 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, and water purification systems.	Reduce Demand	1106	01	Direct	0206624 M	101	518

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (S Thousands)	FYDP (S Thousands)
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 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 and Electrician's Tool Kits. 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 & messing facilities, environmental control equipment, and water purification systems.	Reduce Demand	1319	07	Direct	0206624 M	500	500
USAF	Defense Research Sciences	Bioenergy and Biofuels Research	To develop new methods to slit and store hydrogen, turn CO2 into fuels using solar energy and to produce hydrogen with photosynthetic molecules	Diversify Supply	3600	01	Research	0601102F	780	4,020
USAF	Defense Research Sciences	Dynamic Data Driven Applications Systems (formerly Computational Intelligence)	Optimizing efficiency through computational data decisions with regard to which data to absorb, when it should be absorbed, and how it should be absorbed.	Reduce Demand	3600	01	Research	0601102F	780	4,020
USAF	Defense Research Sciences	Novel Power and Energy Efficient Systems	Determine if carbon nanostructures may lead to the discovery of highly efficient photovoltaics, thermoelectrics, and new super conductors	Reduce Demand	3600	01	Research	0601102F	4,900	25,100
USAF	Defense Research Sciences	Fuel Chemistry and Combustion M&S	To develop detailed and reduced mechanisms for the combustion of surrogates of petroleum fuels	Diversify Supply	3600	01	Research	0601102F	490	2,485
USAF	University Research Initiative	Novel Power and Energy Efficient Systems	Develop carbon nanostructures for new logic gates, highly efficient photovoltaics, thermoelectrics, and fuel cells	Diversify Supply	3600	01	Research	0601103F	4,500	12,000
USAF	University Research Initiative	Fuel Chemistry and Combustion M&S	To develop detailed and reduced mechanisms for the combustion of surrogates of petroleum fuels	Diversify Supply	3600	01	Research	0601103F	1,500	5,625
USAF	Materials	2700 Deg F SiC-SiC Composites for Hot Turbines	Develop and predict behavior and life of SiC/SiC ceramic disk composites for ADVENT and HEETE engine demonstrators	Reduce Demand	3600	02	Research	0602102F	4,263	14,705
USAF	Materials	Flexible Materials & Devices	Develop new materials and architectures for advanced energy and power devices	Reduce Demand	3600	02	Research	0602102F	2,335	11,882
USAF	Advanced Materials for Weapon Systems	Next Generation Turbine Engine Disk	Demonstrate improved alloys, process and life prediction methods for engine disks	Reduce Demand	3600	03	Research	0603112F	1,576	17,670
USAF	Materials	Integrated Computational Methods for Composite Materials	Accelerate materials design/development/test cycle for energy efficient aircraft design	Diversify Supply	3600	02	Research	0602102F	7,686	9,339
USAF	Aerospace Vehicle Technologies	Legacy Fleet Energy Efficiency	Develop fuel burn reduction technologies for the legacy and future fleets	Reduce Demand	3600	02	Research	0602201F	2,744	8,064
USAF	Aerospace Propulsion	Highly Efficient Embedded Turbine Engine (HEETE)	Develop fuel efficient large fan/jet propulsion technologies supporting extreme endurance and range	Reduce Demand	3600	02	Research	0602203F	1,209	1,209
USAF	Aerospace Propulsion	Adaptive Engine Technology Development (AETD)	Mature ADVENT technologies and accelerate EMD with preliminary design and risk reduction	Reduce Demand	3600	02	Research	0602203F	518	518

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (S Thousands)	FYDP (S Thousands)
USAF	Aerospace Propulsion	Efficient Small Scale Propulsion (ESSP)	Develop 10X propulsion capability for small engines that increase thrust to weight and decrease specific fuel consumption	Reduce Demand	3600	02	Research	0602203F	3,100	13,900
USAF	Aerospace Propulsion	Integrated Vehicle Energy Tech (INVENT)	Develop an integrated suite of efficient, mission adaptive, robust electrical and thermal management systems to reduce aircraft energy demand	Reduce Demand	3600	02	Research	0602203F	3,799	8,752
USAF	Aerospace Propulsion	Fuel Assessment and Evaluation	Evaluate advanced fuels for performance, environmental impact and system operations	Diversify Supply	3600	02	Research	0602203F	5,036	26,137
USAF	Aerospace Technology Development/Demonstration	Legacy Fleet Energy Efficiency	Demonstrate improved alloys, process and life prediction methods for engine disks	Reduce Demand	3600	03	Research	0603211F	1,600	2,688
USAF	Advanced Materials for Weapon Systems	2700 Deg F SiC-SiC Composites for Hot Turbines	Demonstrate SiC/SiC ceramic disk composites for ADVENT and HEETE engine demonstrators	Reduce Demand	3600	03	Research	0603112F	4,516	12,824
USAF	Aerospace Technology Development/Demonstration	Light Weight and Advanced Composite Structures	Demonstrate light weight composite structures to reduce weight, manufacturing cost, and are air worthiness certifiable	Reduce Demand	3600	03	Research	0603211F	1,300	2,200
USAF	Aerospace Propulsion and Power Technology	Fuel Assessment and Evaluation	Demonstrate fuels for performance, environmental impact, and system operations	Diversify Supply	3600	03	Research	0603216F	2,286	11,659
USAF	Aerospace Propulsion and Power Technology	Integrated Vehicle Energy Tech (INVENT)	Demonstrate advanced aircraft subsystem components for on-demand subsystems	Reduce Demand	3600	03	Research	0603216F	2,690	2,690
USAF	Aerospace Propulsion and Power Technology	Adaptive Engine Technology Development (AETD)	Mature ADVENT Technologies and accelerate EMD with preliminary design and risk reduction	Reduce Demand	3600	03	Research	0603216F	45,800	45,800
USAF	Human Effectiveness Applied Research	Learning management tech. for distributed mission operations and live virtual and constructive operations	Develop and demonstrate interactive toolset for live virtual training	Reduce Demand	3600	03	Research	0603456F	3,200	23,800
USAF	AMC Command & Control	Mission Indexed Flying (MIF)	Procured COTS Mission Indexed Flying (MIF) software for KC-10 and KC-135 fleets to use inflight to reduce fuel consumption by flying at optimum altitudes and speeds; also procured for C-17 and C-5 fleets using TWCF funds	Reduce Demand	3400	02	Research	0401840F	36	150
USAF	KC-135s	KC-135 Engine Upgrades	CFM Propulsion Upgrade Program (C-PUP) inserts modern technology into F-108 engine. Initiative will change/upgrade the high pressure (HP) turbine nozzle, turbine shroud assembly, turbine blades, and compressor blades/vanes	Reduce Demand	3400	02	Research	0401218F	24,800	50,400
USAF	Dominant Information Sciences and Methods	Robust and Secure Systems	Attack resistant and energy efficient processor	Reduce Demand	3600	02	Research	0602788F	4,466	22,514
USAF	Dominant Information Sciences and Methods	Agile Intelligent Systems	Energy efficient, multifunction processing	Reduce Demand	3600	02	Research	0602788F	3,566	20,905
USAF	Dominant Information Sciences and Methods	Agile Intelligent Systems	Energy efficient, multifunction processing	Reduce Demand	3600	03	Research	0603788F	611	3,875
USAF	SAF/IEN Funding	SAF/IEN Strategic Priorities	Develop policy and framework to support OE	Future Force	3400	04	Direct	0905015F	1,478	6,960

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (S Thousands)	FYDP (S Thousands)
USAF	Aerospace Propulsion	Adaptive Engine Technology Development (AETD) and Adaptive Engine Transition Program	Mature adaptive engine technologies to TRL 7 for future integration and flight	Reduce Demand	3600	04	Research	0604858F	75,153	2,088,213
USAF	Aerospace Vehicle Technologies	Composite Certification	Develop Tools to apply Air Force Damage Tolerance Methods to Composite Structures. Develop Life Prediction Tools for Composite Airframes. Tools to understand critical design data earlier	Reduce Demand	3600	02	Research	0602201F	8,648	51,833
USAF	Aerospace Vehicle Technologies	Next Generation Mobility Advanced Structures	Develop enhanced systems capability by dramatically increasing reach, effectiveness, and responsiveness for legacy and future mobility A/C	Reduce Demand	3600	02	Research	0602201F	1,841	15,592
USAF	Aerospace Vehicle Technologies	Surfing Aircraft Vortices for Energy (SAVE) Formation Flight Advanced Technology	Fly aircraft in formation, autonomously, at safe distances to save energy, like migratory birds. Application is C-17A (existing hardware enables software only solution only)	Reduce Demand	3600	02	Research	0602201F	250	1,255
USAF	Aerospace Vehicle Technologies	Legacy Fleet Energy Efficiency	Develop fuel burn reduction technologies for legacy and future transport/tanker aircraft	Reduce Demand	3600	02	Research	0602201F	1,233	5,527
USAF	Aerospace Vehicle Technologies	Next Generation Mobility	Develop enhanced systems capability by dramatically increasing reach, effectiveness, and responsiveness for legacy and future mobility A/C	Reduce Demand	3600	02	Research	0602201F	7,323	51,878
USAF	Aerospace Vehicle Technologies	Surfing Aircraft Vortices for Energy (SAVE) Formation Flight Advanced Technology	Fly aircraft in formation, autonomously, at safe distances, to save energy, like migratory birds. Application is C-17A (existing hardware enables software only solution only)	Reduce Demand	3600	02	Research	0602201F	550	850
USAF	Aerospace Propulsion	Power Management and Distribution Product Area	Improved stability, efficiency, and protection for current and future electrical power systems, including wider temperature tolerance	Reduce Demand	3600	02	Research	0602203F	5,867	33,257
USAF	Aerospace Propulsion	Aircraft Energy Storage Product Area	Develop safe, compact, high-power energy storage for small UAS to large aircraft.	Reduce Demand	3600	02	Research	0602203F	3,155	36,628
USAF	Aerospace Propulsion	Aircraft Thermal Systems Product Area	Fundamental and applied thermal acquisition, transport, rejection and storage R&D to address current and future aircraft performance limitations	Reduce Demand	3600	02	Research	0602203F	8,012	25,309
USAF	Aerospace Propulsion	Electro-Mechanical Power Systems Product Area	Technologies to improve the size, weight, and energy efficiency of electro-mechanical energy transfer processes.	Reduce Demand	3600	02	Research	0602203F	4,183	25,880
USAF	Aerospace Propulsion	Computational Engineering	Address the Air Force need to assess military air platform capabilities through the creation of a validated, integrated, dynamical, tip-to-tail modeling capability	Reduce Demand	3600	02	Research	0602203F	3,774	15,828
USAF	Aircraft Sustainment	Composite Certification	Develop Tools to apply Air Force Damage Tolerance Methods to Composite Structures. Develop Life Prediction Tools for Composite Airframes. Tools to understand critical design data earlier	Reduce Demand	3600	03	Research	0603199F	4,515	37,598
USAF	Aerospace Technology Development/Demonstration	Next Generation Mobility	Demonstrate light weight composite structures to reduce weight, manufacturing cost, and are air worthiness certifiable	Reduce Demand	3600	03	Research	0603211F	5,419	48,114

ORG	OE Program Title	OE Initiative Title	OE Project Description	OE Objectives	Treasury Code	BA Code	OE Investment	Program Element	FY 2016 (S Thousands)	FYDP (S Thousands)
USAF	Aerospace Technology Development/Demonstration	Surfing Aircraft Vortices for Energy (SAVE) Formation Flight Advanced Technology	Fly aircraft in formation, autonomously, at safe distances to save energy, like migratory birds. Application is C-17A (existing hardware enables software only solution only)	Reduce Demand	3600	03	Research	0603211F	1,639	2,328
USAF	Aerospace Technology Development/Demonstration	Power Management and Distribution	Improved stability, efficiency, and protection for current and future electrical power systems, including wider temperature tolerance	Reduce Demand	3600	03	Research	0603216F	624	12,942
USAF	Aerospace Technology Development/Demonstration	Aircraft Thermal Systems Product Area	Fundamental and applied thermal acquisition, transport, rejection and storage R&D to address current and future aircraft performance limitations	Reduce Demand	3600	03	Research	0603216F	1,495	6,026
USAF	Aerospace Technology Development/Demonstration	INVENT Spiral III	Demonstrate component and subsystem technologies for a fully integrated propulsion, power, and thermal management system that enables next generation game changing high power demand capabilities	Reduce Demand	3600	03	Research	0603216F	-	22,206
USAF	Aerospace Technology Development/Demonstration	Electro-Mechanical Power Systems	Technologies to improve the size, weight, and energy efficiency of electro-mechanical energy transfer processes	Reduce Demand	3600	03	Research	0603216F	1,559	4,240
USAF	Materials	Efficient Propulsion	Develop new materials and architectures for advanced energy and power devices	Reduce Demand	3600	03	Research	0603112F	-	9,868
DLA	Innovative Products and Services for DLA Customers	Energy Efficiency & Alternative Energy Technologies - Alternative Fuels	Energy Readiness program (ERP) supports Alternative Energy Development to include test and certification to support the addition of synthetic and alternative fuels to mobility fuel specifications	Diversify Supply	0400	03	Research	0603712S	1,774	9,228
DLA	Battery Network (BATTNET)	Energy Efficiency & Alternative Energy Technologies - Alternative Fuels	BATTNET is focused on improving the supply and reducing 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 is a community of practice of battery supply chain members, engineering support activities, researchers, and users. BATTNET conducts R&D to address sustainment gaps and bridge technical solutions into higher MRLs for specific groups of batteries	Diversify Supply	0400	07	Research	0708011S	2,024	10,506
OSD	Operational Energy Capability Improvement Funding	Operational Energy Capability Improvement Funding (OECIF)	Improves the Department's OE effectiveness via targeted S&T investments	Reduce Demand	0400	03	Research	0604055D	37,420	199,833
OSD	Operational Energy Plans and Programs Office	Operational Energy Plans and Programs Office	OSD Senior Officials for Operational Energy, Plans and Programs. Tasked to analyze, develop, and direct OE's energy strategy	Reduce Demand	0100	04	Direct	0901388D 8Z	5,569	27,845
TOTAL									1,804,105	11,291,448

**APPENDIX E:
FISCAL YEAR 2016 FUEL BUDGET ESTIMATES**

Revolving Funds, Fuel Summary (\$ in Millions)

	<u>FY 2014 Actuals¹</u>	<u>Price Change³</u>	<u>Program Change³</u>	<u>FY 2015 Estimate²</u>	<u>Price Change³</u>	<u>Program Change³</u>	<u>FY 2016 Estimate²</u>
Fuel	\$13,672.81	+\$307.65	+\$248.53	\$14,228.9	-\$1,022.01	-\$223.72	\$12,983.26

1 Fuel is not a separate line item in DoD budgets or execution reports. The FY 2014 Actuals column represents the cost to customers at the budgeted standard price.

2 FY estimates represent fuel funded by both base and contingency appropriations.

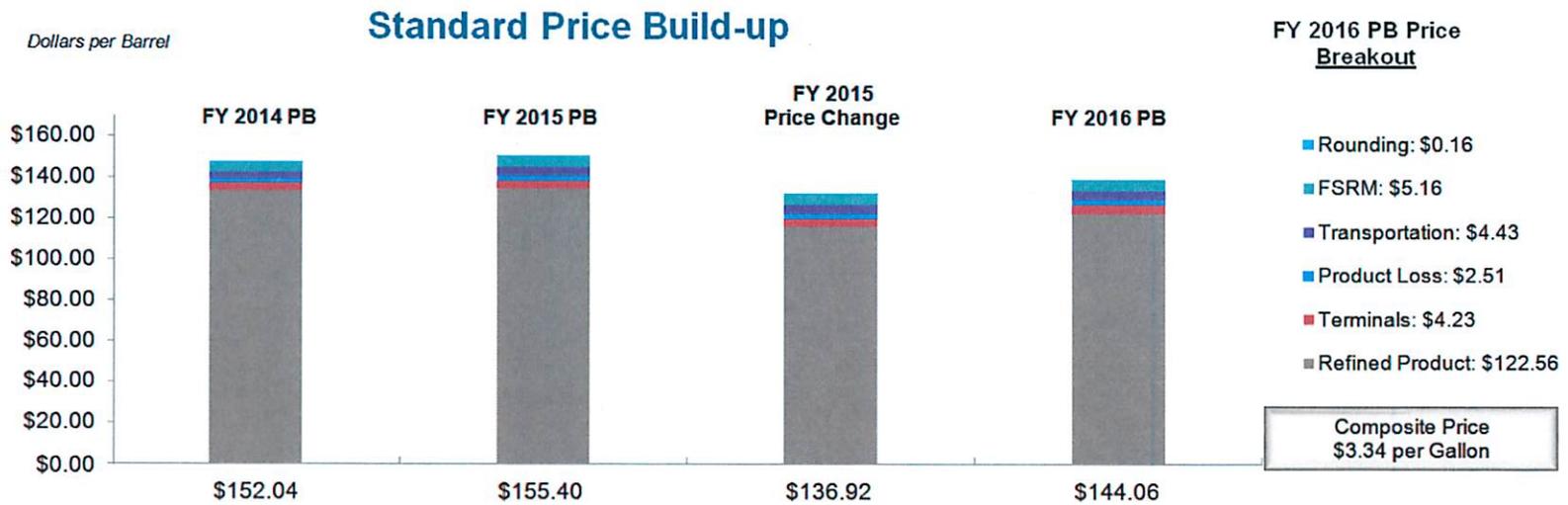
3 Price and program change calculated based on estimated sales at the budgeted price.

I. Standard Fuel Price Development:

Overview: Pursuant to House Report 112-479, this information provides Congress with energy and fuel budget justification material. DLA is the sole source fuel supplier for DoD. Fuel is purchased in real-time throughout the execution year because the DLA does not have storage capacity to hold a year’s worth of fuel purchased in advance. It is important to note that the DoD purchases only refined products. The cost of refined fuel products constitutes nearly 90 percent of the price the DLA charges customers, so the key to maintaining stabilized rates in execution is the Office of Management and Budget forecast—a year in advance of the petroleum market prices.

Protecting customer programs is a primary goal of the Working Capital Fund (WCF). Fuel market volatility is the wild card in the WCF’s ability to budget for and customers’ ability to buy fuel at a stabilized price. 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.

Prices: The Department sets the price of fuel to break even in the budget year by recouping the cost of refined products and the non-product costs of terminal operations, storage, transportation, and facilities maintenance. DoD sets the standard fuel price based on the Administration’s economic assumptions for refined petroleum products plus the non-product price of the DLA’s projected operating costs. The following table shows the components of the standard price as developed for President’s Budget requests for FY 2014 through FY 2016.

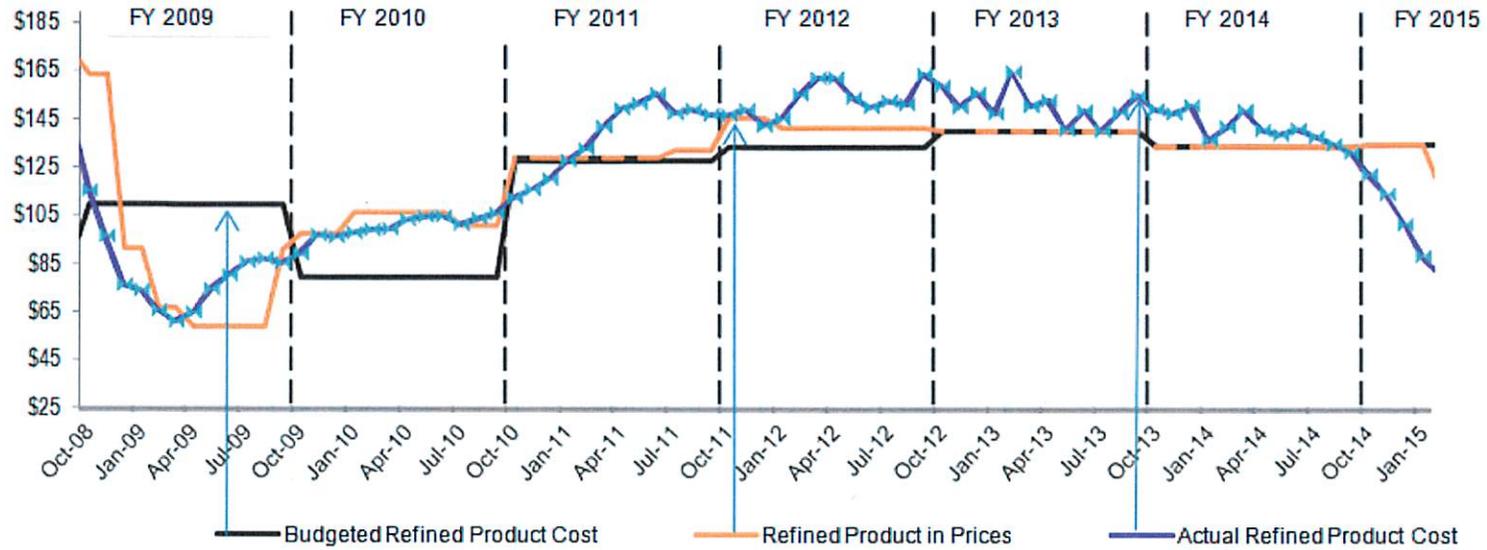


Price History: The refined petroleum market’s most volatile calendar years were 2008, 2009, and 2012. FY 2014 was only the second year since FY 2004 (FY 2013 was the first) in which the Department maintained the budgeted per barrel (bbl) fuel price level (152.04 bbl) throughout the year. Although there was no price change to customers, the Department experienced higher than expected fuel costs. During FY 2014, the WCF lost \$9.81 per barrel. The Department’s Defense-Wide WCF cash account was able to absorb the loss without a year of execution price change.

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 (irregular line) exceeds the refined product in prices (lightest line).

Refined Petroleum Product Volatility

Cost Per Barrel



Note: Refined Product Pricing reflects the change in refined product estimates based on year of execution price changes.

Execution Year Adjustments: The Defense-Wide WCF cash balance is the only tool available to stabilize DoD customer rates despite crude oil 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 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.

On October 1, 2014, the Department implemented the President's Budget FY 2015 price of \$155.40/bbl. Due to FY 2015 decreases in refined oil products costs and the resulting effect on the Defense-Wide WCF cash balance, effective February 1, 2015, the Department decreased the standard price of fuel by \$18.48 per barrel, from \$155.40 to \$136.92 per barrel.

II. Future Pricing Initiatives:

The goal of the WCF and the Department is to maintain a stabilized price through the fiscal year to protect readiness and customer programs. Recognizing the volatility in the fuel market, DoD makes every effort to accurately project fuel prices and is seeking opportunities to stabilize the year of execution price. DoD is constantly looking at various options that range from modifying the formula used to develop the standard price to changing the benchmark source.

CLEARANCE REQUEST FOR PUBLIC RELEASE OF DEPARTMENT OF DEFENSE INFORMATION

(See Instructions on back.)

(This form is to be used in requesting review and clearance of DoD information proposed for public release in accordance with DoDD 5230.09.)

TO: (See Note) Chief, Office of Security Review, 1155 Defense Pentagon, Washington, DC 20301-1155

Note: Regular mail address shown above. For drop-off/next day delivery, use:
Room 12047, 1777 North Kent Street, Rosslyn, VA 22209-2133

1. DOCUMENT DESCRIPTION

a. TYPE <p align="center">Report</p>	b. TITLE Fiscal Year 2016 Operational Energy Budget Certification
c. PAGE COUNT <p align="center">60</p>	d. SUBJECT AREA Annual Report on ASD(EI&E) assessment of Services Operational Energy POM

2. AUTHOR/SPEAKER

a. NAME (Last, First, Middle Initial)	b. RANK	c. TITLE
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3. PRESENTATION/PUBLICATION DATA (Date, Place, Event)

Request to release the report (TAB A) as public information, releasable and postable to the Operational Energy website.
http://www.acq.osd.mil/eie/OE/OE_library.html. This is consistent with our past practices: FY 12 and FY 13 Budget certification reports as well as FY 2013 - FY 2016 preliminary Budget certification reports are posted on or website.

4. POINT OF CONTACT

5. PRIOR COORDINATION

a. NAME (Last, First, Middle Initial)	b. OFFICE/AGENCY	c. TELEPHONE NO. (Include Area Code)
See attached coordination sheet -TAB C	CLEARED For Open Publication OCT 21 2016 Office of Security Review Department of Defense	11

6. REMARKS

Title 10 U.S.C section 2926(c) directs the Department of Defense to review the president's Budget to certify the level of funding of Operational Energy initiatives is adequate for carrying out the Departments Operational Energy Strategy. TAB A is the report. The DUSD(AT&L) signed transmittal letters (TAB B) and the Congressional Management Office mailed the reports to Congress on 22 July 2016. As in previous years, request to post this report to the operational Energy web site.

7. RECOMMENDATION OF SUBMITTING OFFICE/AGENCY

a. THE ATTACHED MATERIAL HAS DEPARTMENT/OFFICE/AGENCY APPROVAL FOR PUBLIC RELEASE (qualifications, if any, are indicated in Remarks section) AND CLEARANCE FOR OPEN PUBLICATION IS RECOMMENDED UNDER PROVISIONS OF DODD 5230.09. I AM AUTHORIZED TO MAKE THIS RECOMMENDATION FOR RELEASE ON BEHALF OF:

DASD(OE)

b. CLEARANCE IS REQUESTED BY 20161020 (YYYYMMDD).

c. NAME (Last, First, Middle Initial)	d. TITLE
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