

DEPARTMENT OF DEFENSE

June 2012

**ENERGY INVESTMENTS FOR
MILITARY OPERATIONS :
FOR FISCAL YEAR 2013**

ENERGY.DEFENSE.GOV



WASHINGTON D.C.

Report Documentation Page

*Form Approved
OMB No. 0704-0188*

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE JUN 2012	2. REPORT TYPE	3. DATES COVERED 00-00-2012 to 00-00-2012			
4. TITLE AND SUBTITLE Energy Investments for Military Operations: For Fiscal Year 2013		5a. CONTRACT NUMBER			
		5b. GRANT NUMBER			
		5c. PROGRAM ELEMENT NUMBER			
6. AUTHOR(S)		5d. PROJECT NUMBER			
		5e. TASK NUMBER			
		5f. WORK UNIT NUMBER			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Assistant Secretary of Defense for Operational Energy Plans & Programs, 3700 Defense Pentagon, Washington, DC, 20301-3700		8. PERFORMING ORGANIZATION REPORT NUMBER			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)			
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)			
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified	Same as Report (SAR)	45	

**Preparation of this study/report cost the Department of
Defense a total of approximately \$191,000 for the 2012
Fiscal Year.**

Generated on 2012May03 1508 RefID: A-D38D2E4



ASSISTANT SECRETARY OF DEFENSE

3700 DEFENSE PENTAGON
WASHINGTON, DC 20301-3700

OPERATIONAL ENERGY
PLANS AND PROGRAMS

JUN 14 2012

On December 11, 2011, General John Allen directed all U.S. forces in Afghanistan to take steps to improve the energy security of the mission. "Operational energy," he wrote, "is about improving combat effectiveness. It's about increasing our forces' endurance, being more lethal, and reducing the number of men and women risking their lives moving fuel." General Allen's memo and the Department's May 2011 Operational Energy Strategy send a consistent message: Improvements in military energy security provide the Department with a unique opportunity to improve efficiency while increasing operational effectiveness. As part of my authorities for advancing military energy security (10 USC 138c), I am required to review DoD's proposed annual budget and report to the Secretary of Defense whether the budget is adequate for meeting the goals of the strategy. This report satisfies that requirement for the FY 2013 budget.

Last year, the Department consumed 116.8 million barrels (mbbls) of fuel at a cost of \$17.2B (\$3.51/gallon). For FY 2013, the Department budgeted approximately \$16.3B for 104 mbbls of fuel and approximately \$1.6B for operational energy initiatives. As the Assistant Secretary of Defense for Operational Energy Plans and Programs, I certify the proposed budgets are adequate for the implementation of the DoD Operational Energy Strategy.

The FY 2013 Operational Energy Budget Certification is my second certification effort and the process differed significantly from last year. For the FY 2013 certification, I evaluated the Components' budgets against the DoD Operational Energy Strategy and the targets provided in its associated implementation plan. We benefited from the Office of the Director for Cost Assessment and Program Evaluation (CAPE) development and deployment of an Operational Energy Select and Native Programming (SNaP) exhibit, which proved invaluable for the timely collection of the detailed program and funding data. I also formed a Certification Advisory Working Group (CAWG) with representatives from my office, CAPE, the Office of the Under Secretary of Defense (Comptroller), the Joint Staff, the Services, and the Defense Logistics Agency to conduct an assessment of the adequacy of each Component's proposed budget and provide certification recommendations.

I expect my FY 2014 Operational Energy Budget Certification to be methodologically similar to this one. I do expect that the CAWG will have sufficient information for the first time to make recommendations in regards to investments that can be streamlined or strengthened. In particular, I will task the CAWG to identify gaps or overlaps in investments, insufficient migration from science and technology to deployment, and insufficient attention to legacy system improvements. Improving these areas will benefit mission effectiveness and promote interoperability of equipment as well as potentially saving money.

Sharon E. Burke

Attachment:
Fiscal Year 2013 Operational Energy Budget Certification Report

TABLE OF CONTENTS

FOREWORD..... 1

EXECUTIVE SUMMARY..... 4

APPROACH TO BUDGET CERTIFICATION..... 9

DEPARTMENT OF THE ARMY OPERATIONAL ENERGY BUDGET CERTIFICATION..... 11

DEPARTMENT OF THE NAVY OPERATIONAL ENERGY BUDGET CERTIFICATION..... 20

DEPARTMENT OF AIR FORCE OPERATIONAL ENERGY BUDGET CERTIFICATION..... 35

DEFENSE AGENCIES AND OFFICE OF THE SECRETARY OF DEFENSE..... 41

EXECUTIVE SUMMARY

This is the second Operational Energy Budget Certification. It differs significantly from the inaugural effort and sets the tone for subsequent efforts. The Department of Defense’s *Operational Energy Strategy*, published in May 2011, was not available to influence the Components’ development of the proposed FY 2013 budgets. Nevertheless, I chose to evaluate the military departments’ proposed budgets against the DoD *Operational Energy Strategy* given the goal of the DoD Operational Energy Strategy is to promote military energy security, or reliable supplies of energy to military operation. The strategy identifies redirecting the demand for fuel, expanding and/or diversifying the supplies of fuel, and incorporating energy security into the future force as the principal ways to reach that goal. Operational Energy Plans and Program prepared this certification report to reflect the strategy’s implementation plan, which has seven targets that are consistent with the military departments’ energy strategies. (See below)

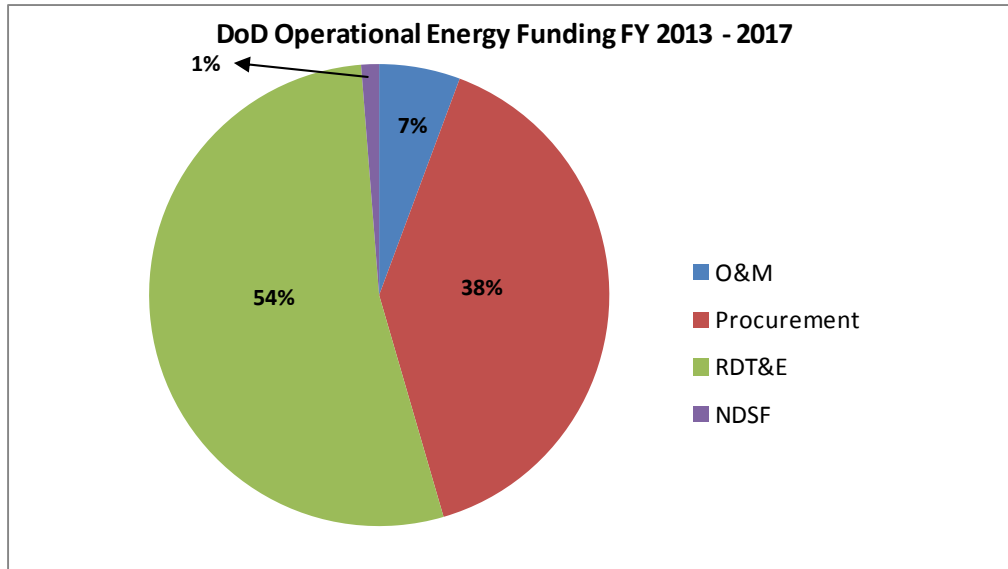
More Fight, Less Fuel: Reduce the demand for energy in military operation	
Target 1	Measure Operational Energy Consumption
Target 2	Improve Energy Performance and Efficiency in Operations and Training
Target 3	Promote Operational Energy Innovation
More options, less risk: Expand and secure the supply of energy to military operations	
Target 4	Improve Operational Energy Security at Fixed installations
Target 5	Promote the Development of Alternative Fuels
More capability, less cost: Build energy security into the future force	
Target 6	Incorporate Energy Security Considerations into Requirements/Acquisition
Target 7	Adapt Policy, Doctrine, Professional Military Education and Combatant Command Activities

To support this certification effort, the Office of the Director for Cost Assessment and Program Evaluation (CAPE) provided an Operational Energy Select and Native Programming (SNaP) exhibit, which proved invaluable for the timely collection of the detailed program and funding data. Finally, I formed a Certification Advisory Working Group (CAWG) with representatives from my office, CAPE, the Office of the Under Secretary of Defense (Comptroller), the Joint Staff, the Services, and the Defense Logistics Agency to conduct an assessment of the adequacy of each Component’s proposed budget and provide certification recommendations. I expect to continue to evaluate the proposed budgets against the DoD *Operational Energy Strategy*, gain invaluable insights from CAPE’s SNaP Operational Energy SNaP exhibit, and use the CAWG to evaluate the proposed budgets and provide me with recommendations.

For FY 2013, DoD budgeted approximately \$1.6B for operational energy initiatives and approximately \$16.3B for fuel purchases. The Future Years Defense Program (FYDP) budget total for operational energy initiatives is approximately \$9.0B.

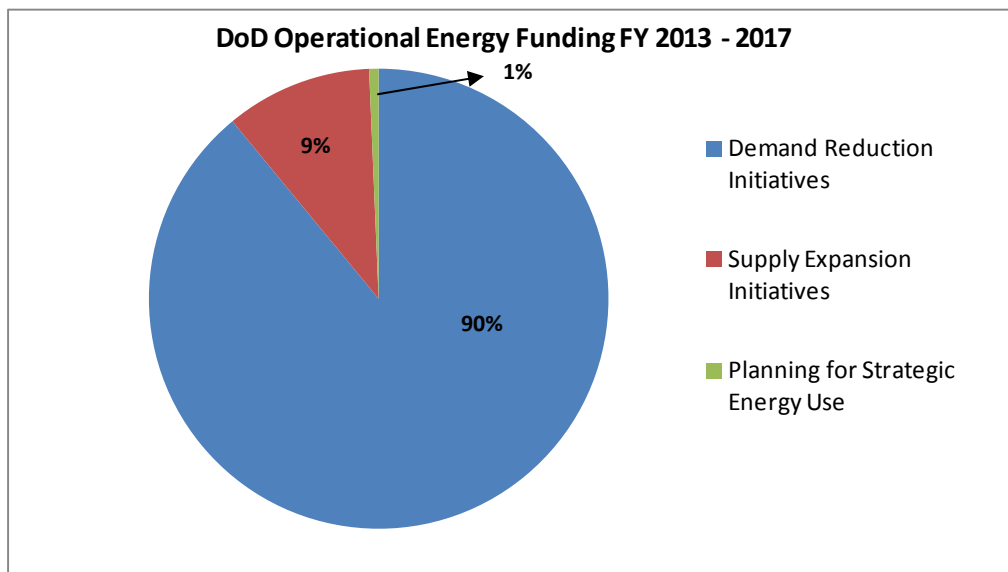
Report on Operational Energy Budget Certification for Fiscal Year 2013

The distribution of FY 2013 -2017 FYDP funding for operational energy initiatives across the appropriations is shown below:



The majority of the operational energy initiative funding, approximately 54 percent, is in RDT&E with Procurement accounting for approximately 38 percent across the FYDP. Operations and Maintenance and National Defense Sealift Fund account for the remaining eight percent of operational energy funding.

The figure below shows DoD’s FYDP budget total for Operational energy initiatives arranged by the three Operational Energy Strategy Objectives:



Approximately 90 percent of the funding, \$8.1B FY 2013 - 2017, is focused on initiatives to reduce demand with approximately 9 percent, \$822.9M FY 2013 – 2017, for supply expansion initiatives. The remaining one percent is allocated to planning for strategic energy use.

Report on Operational Energy Budget Certification for Fiscal Year 2013

The **Department of the Army** budgeted \$562.4M in FY 2013 and approximately \$4.2B across the FYDP for operational energy initiatives. Approximately 89 percent of the funding (\$3.7B) across the FYDP is budgeted for demand reduction initiatives while the remaining 11 percent (\$469.0M) is aligned to supply expansion initiatives. Approximately 79 percent of the funding across the FYDP supports Target #2, Improve Energy Performance and Efficiency in Operations and Training while approximately 21 percent is aligned to Target #3, Promote Operational Energy Innovation. Army initiatives for improving Energy Performance and Efficiency in Operations and Training include: generators and microgrids improvements; combat vehicle improvements; an improved rotary-winged aircraft engine; Aviation Simulators Ground Soldier Systems; and new, more-efficient Force Provider modules and associated equipment. Army Operational Energy Innovation initiatives include: combat vehicle and automotive technologies; aviation technologies; Warfighter (Soldier) technologies; and Defense Research Sciences, e.g. basic research efforts. The Department of the Army could strengthen its operational energy efforts by budgeting for the development and implementation of the tools and systems required to incorporate energy security considerations into Requirements and Acquisition. This is important for ensuring that future investments in equipment and capabilities will incorporate improved energy security. Additionally, I remain concerned about the Department's efforts towards improving the energy performance of the future ground tactical fleet.

The **Department of the Navy** budgeted \$402.1M in FY 2013 and approximately \$2.2B across the FYDP for operational energy initiatives. The Department of the Navy's funding encompasses both the Navy (\$337.7M FY 2013, \$1.9B FYDP) and the Marine Corps (\$64.4M FY 2013, \$352.1M FYDP). Within the Navy's budget, approximately 83 percent of the funding across the FYDP is budgeted for demand reduction initiatives with the supply expansion initiatives accounting for the remaining 17 percent. Approximately 58 percent of the funding across the FYDP supports Target #2, Improve Energy Performance and Efficiency in Operations and Training, while 30 percent is aligned to Target #3, Promote Operational Energy Innovation. Navy initiatives for improving Energy Performance and Efficiency in Operations and Training include: the Hybrid Electric Drive Development and Implementation; Electric Ships Office Efficiency Initiatives; and Simulator Upgrades, along with on-going Shipboard Incentivized Energy Conservation Program and the newly established Air Energy Conservation Program. Navy Operational Energy Innovation initiatives include both demand reduction and supply expansion. Demand reduction innovation efforts include: Naval Variable Cycle Engine Technology; Electric Ship Research & Development Consortium; Ship Hydrodynamics; and the Turbine Engine Technology Demonstration. Supply expansion innovations include: Unmanned Undersea Vehicle (UUV) initiatives; Energy Efficiency & Alternative Energy Technologies; and Power and Energy Materials Research. The USMC is primarily focused on demand reduction initiatives with approximately 89 percent (\$315.6M) across the FYDP for programs such as Advanced Power Sources, Family of Shelters and Shelter Equipment, Family of Expeditionary Water Systems, Family of Mobile Electric Power Equipment, and Medium Tactical Vehicle

Report on Operational Energy Budget Certification for Fiscal Year 2013

Replacement. The Department of the Navy could strengthen its operational energy efforts by budgeting for the development and implementation of the tools and systems required to incorporate energy security considerations into Requirements and Acquisition. This is important for ensuring that future investments in equipment and capabilities will incorporate improved energy security.

The **Department of the Air Force** budgeted \$573.5M in FY 2013 and approximately \$2.4B across the FYDP for operational energy initiatives. Approximately 93 percent of the funding across the FYDP is budgeted for demand reduction initiatives with the supply expansion initiatives accounting for 6.5 percent and planning for strategic energy use the remaining 0.5 percent. Approximately 52 percent of the funding across the FYDP supports Target #3, Promote Operational Energy Innovation, while 48 percent is aligned to Target #2, Improve Energy Performance and Efficiency in Operations and Training. Air Force Operational Energy Innovation initiatives include: Aerospace Propulsion and Power Technologies, Aerospace Vehicle Technologies; ADVENT Technology Maturation; Materials Technologies; and alternative fuels technology development. Air Force initiatives for improving Energy Performance and Efficiency in Operations and Training include: procurement and sustainment of Basic Expeditionary Airfield Resources (BEAR) sets; KC-135 engine modifications to increase efficiency; KC-10 drag reduction efforts; and the Automatic Dependent Surveillance – Broadcast (ADS-B) technology insertion. The Department of the Air Force could strengthen its operational energy efforts by budgeting for greater energy efficiency in the legacy and future fixed wing fleet and the development and implementation of the tools and systems required to incorporate energy security considerations into Requirements and Acquisition. This is important for ensuring that future investments in equipment and capabilities will incorporate improved energy security.

The **Defense Logistics Agency (DLA)**, **Defense Advanced Research Projects Agency (DARPA)**, and **Office of Secretary of Defense (OSD)** provide an additional \$102.2M in FY 2013 and \$256.1M across the FYDP. These programs provide valuable investments into alternative fuels certification, battery manufacturing technologies, operational effectiveness via targeted science and technology investments, and biofuel production. I have concerns about DARPA's elimination of funding for energy programs and encourage the agency to reconsider funding meritorious projects in this area along with considering the energy required of existing projects.

After careful consideration, I certify each DoD Component's proposed budget is adequate for implementation of the operational energy aspects of their energy strategy. Nevertheless, I have the following concerns:

- The Department needs to develop and implement the tools and systems required to incorporate energy security considerations into Requirements and Acquisition. The Army has not budgeted for the sustainment and improvement of the "Sustain the Mission" modeling and simulation tool, which is a foundational tool for the Army to evaluate fuel

Report on Operational Energy Budget Certification for Fiscal Year 2013

logistics plans. Neither the Navy nor the Air Force has budgeted for the development of the modeling and simulation tools to enable force planners to simulate and assess the combat capability effects of enemy attacks on U.S. logistics forces.

- The Department should take steps to improve the energy performance of the legacy and future ground and fixed-wing fleets. The Army has budgeted for and is working on energy efficiency improvements for the Bradley and Abrams fleets, but the High Mobility Multipurpose Wheeled Vehicle (HMMWV) and Mine Resistant Ambush Protected (MRAP) fleets have no planned energy performance upgrades. The future ground tactical fleet includes the Ground Combat Vehicle (GCV) and the Joint Light Tactical Vehicle (JLTV) and the Army has stated their commitment to improve the energy efficiency of these systems over the systems they will replace. The Air Force has funded improvements to the KC-10, but many potential improvements for the C-130 and C-17 fleets remain unfunded.

I expect my next budget certification to be methodologically similar to this one. The Department-wide *Operational Energy Strategy* will shape the development of proposed FY 2014 budgets. We will work with Components to improve the Operational Energy SNaP submission, and I will once again use the CAWG to provide me analysis and recommendations. I do expect that the CAWG will have sufficient information for the first time in the FY 2014 Operational Energy Budget Certification to make recommendations in regards to investments that can be streamlined or strengthened. In particular, I am concerned that there may be gaps or overlaps in some investments, insufficient migration from science and technology to deployment, and insufficient attention to legacy system improvements. Improving these areas will benefit mission effectiveness and promote interoperability of equipment as well as potentially saving money.

APPROACH TO BUDGET CERTIFICATION

For this FY 2013 budget certification assessment, I evaluated the Military Departments', Defense Agencies' and OSD's proposed budgets against the Department of Defense (DoD) *Operational Energy Strategy*. The goal of the DoD Operational Energy Strategy is to ensure reliable supplies of energy for 21st century military missions. The strategy provides three principal objectives for reaching that goal and the Implementation Plan provides specific targets for each objective:

- More fight, less fuel: Reduce the demand for energy in military operations.
 - Target 1: Measure Operational Energy Consumption.
 - Target 2: Improve Energy Performance and Efficiency in Operations and Training.
 - Target 3: Promote Operational Energy Innovation.
- More options, less risk: Expand and secure the supply of energy to military operations.
 - Target 4: Improve Operational Energy Security at Fixed Installations.
 - Target 5: Promote the Development of Alternative Fuels.
- More capability, less cost: Build energy security into the future force.
 - Target 6: Incorporate Energy Security Considerations into Requirements and Acquisition.
 - Target 7: Adapt Policy, Doctrine, Professional Military Education, and Combatant Command Activities.

These operational energy objectives and targets were the criteria used for evaluating the certification of the DoD Components' proposed budgets.

I took a near- and far-term approach to "Target 2: Improve Energy Performance and Efficiency in Operations and Training" by focusing on two broad areas: Support Current Operations with Energy Improvements and Improve the Operational Energy Efficiency of the Military Departments. For my evaluation, Support Current Operations with Energy Improvements includes efforts to improve energy performance and efficiency in operations, such as the fielding of fuel demand management improvements by the Military Departments to Afghanistan and other locations in support of contingency operations. These improvements range from energy efficiency measures to renewable energy technologies. Generally, these efforts are funded with Operations and Maintenance or Procurement appropriations and may be funded within the base or the Overseas Contingency Operations (OCO) budget. Improve the Operational Energy Efficiency of the Military Departments includes efforts to reduce the demand for fuel and increase capability in both current operations and the future force. Generally, these efforts are funded in Procurement or Research, Development, Test & Evaluation Budget Activity 4-7 appropriations, funded within the base budget, and are an Acquisition Category I-III program.

Report on Operational Energy Budget Certification for Fiscal Year 2013

“Target 3: Promote Operational Energy Innovation” differs from “Target 2: Improve Energy Performance and Efficiency in Operations and Training” as it captures our science and technology investments supporting operational energy. Generally, these efforts are funded in the Research, Development, Test & Evaluation Budget Activity 1-3 appropriation in the base budget.

The initiatives falling within “Target 4: Improve Operational Energy Security at Fixed Installations” are overseen and reported by the Office of the Deputy Under Secretary of Defense for Installations and Environment (DUSD(I&E)). These initiatives are primarily funded with Military Construction, and Operations and Maintenance. To reduce reporting redundancy, I have deferred comments in this area to the DUSD(I&E), but OEPP follows mission energy security at installations in support of DUSD (I&E).

To facilitate the documentation of operational energy funding at the appropriate level of detail, my staff worked with the Office of the Director for Cost Assessment and Program Evaluation (CAPE) to develop an Operational Energy Select & Native Programming (OE SNaP) exhibit prior to the submission of the FY 2013 – 2017 Program Objective Memorandum. The SNaP display proved invaluable for the timely collection of the detailed program and funding data and we will refine it in the coming months to capture improvements suggested by the Components.

Finally, I formed a Certification Advisory Working Group (CAWG) with representatives from my office, the Office of the Under Secretary of Defense (Comptroller), CAPE, the Joint Staff, the Services, and Defense Logistics Agency. The CAWG spent a significant amount of time reviewing and evaluating each component’s operational energy efforts and provided recommendations on the adequacy of resourcing of each target. I considered the CAWG’s recommendations and made my assessment, using a stoplight rating chart. A target I judged to be adequately funded was rated as “green;” a target I judged to be marginally funded was rated as “yellow;” and a target I judged to be inadequately funded was rated “red.”

Department of the Army Operational Energy Budget Certification

US Army Operational Energy Staff

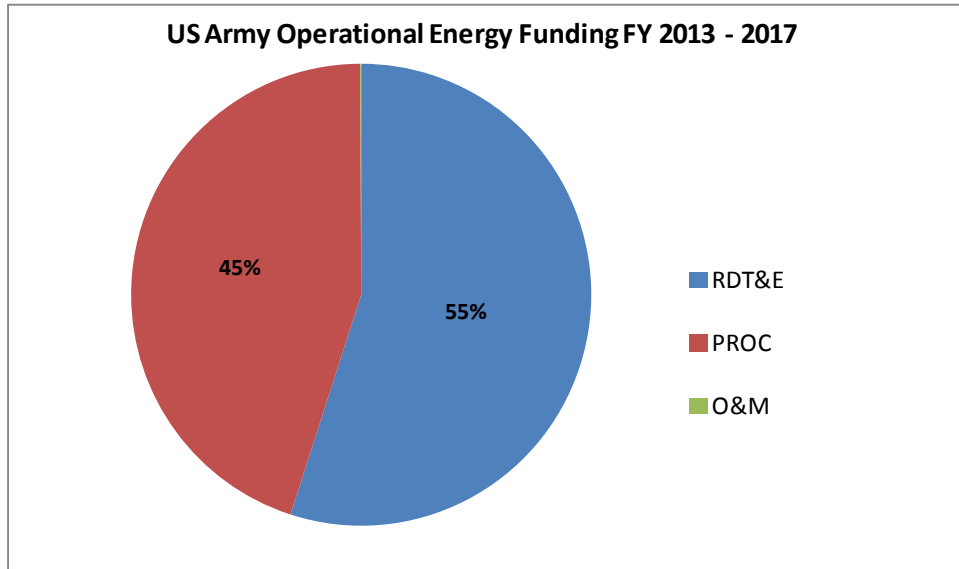
The Deputy Assistant Secretary of the Army for Energy and Sustainability (DASA(E&S)), reporting to the Assistant Secretary of the Army for Installations, Energy, and Environment (ASA (IE&E)), is the Army's Senior Energy Executive responsible for integrating and coordinating the efforts of all Army installation and operational energy stakeholders. Within the ODASA(E&S), a Colonel (O-6) directs Operational Energy activities, with support from selected staff as required. Going forward, the ASA (IE&E) plans to establish a senior staff-led directorate dedicated to Operational Energy and Contingency Basing that will work directly with the Army's Director of Logistics (G-4) to support development and execution of short and long-term energy solutions across Doctrine, Organization, Training, Materiel, Leadership, Personnel, and Facilities (DOTMLPF) domains.

The Army G-4 devotes five personnel to operational energy efforts and anticipates increasing the staff to nine in the second quarter of FY 2012. Additionally, the Logistics Innovation Agency (LIA), the G-4 Field Operating Agency, also supports the Army's operational energy efforts with two dedicated personnel and various experts assigned based on project requirements. As of December 2011, LIA has six personnel assigned to operational energy projects.

Various other organizations within the Army Staff, Army Secretariat, and major Army Commands have personnel to support Operational Energy programs and initiatives. One of the most significant for the long-term future of the force is the appointment of a PhD level expert as the dedicated Director for Power and Energy by the Deputy Assistant Secretary of the Army for Science and Technology, with responsibility for managing the Army's science and technology portfolio of operational energy development investments. Numerous experts on operational energy-relevant subjects can be found in the Army's laboratories and acquisition programs. To better coordinate and manage the scope of these technical efforts, the Army Materiel Command's (AMC) Research, Development and Engineering Command (RDECOM) has appointed a Technology Focus Team (TFT) on Power and Energy with two personnel devoted to the TFT, and part-time efforts of more than twenty Army subject matter experts. The Training and Doctrine Command develops energy-related requirements and the Army Corps of Engineers plays a significant role in fielding efficient and renewable energy solutions at both Continental United States (CONUS) and forward locations.

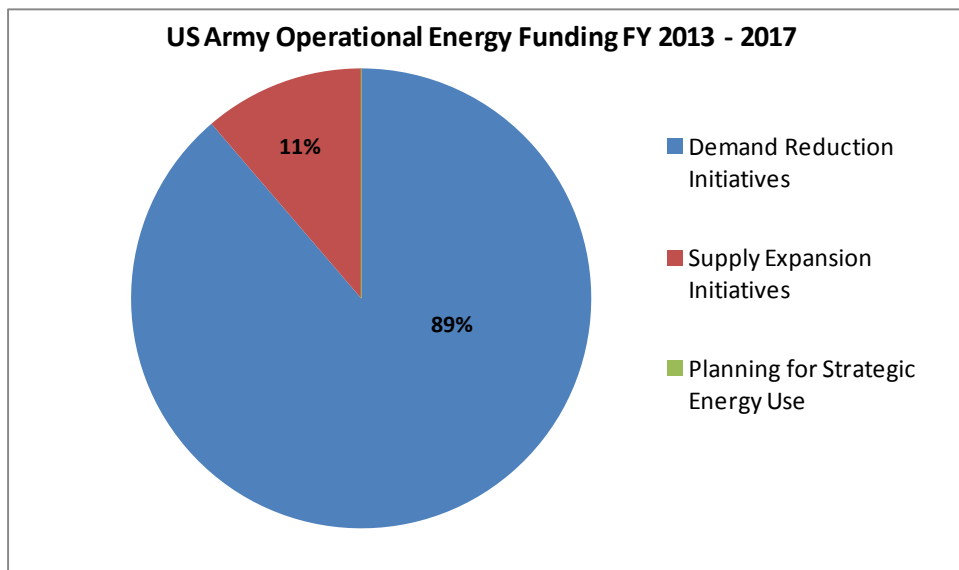
US Army FY 2013 Operational Energy Budget

The Army budgeted \$562.4M in FY 2013 and approximately \$4.2B across the FYDP for operational energy initiatives. The distribution across appropriations is shown below:



The majority of this funding, approximately 55 percent across the FYDP, is in RDT&E (\$359.7M FY 2013, \$2.3B FYDP). Procurement funding (\$201.3M FY 2013, \$1.9B FYDP) and Operations and Maintenance funding (\$1.4M FY 2013, \$2.8M FYDP) accounts for the remaining 45 percent of the funding across the FYDP.

Army funding tracks with the DoD Operational Energy Strategy three principal goals as follows:



The Army budgeted \$464.0M of FY 2013 funding and approximately \$3.7B across the FYDP to Operational Energy Demand Reduction Initiatives (Strategic Objective 1). FY 2013 funding of

\$98.5M and \$469.0M across the FYDP was budgeted for Supply Expansion Initiatives (Strategic Objective 2).

More Fight, Less Fuel: Reduce Demand for Energy in Military Operations.

Target 1: Measure Operational Energy Consumption.

The Army budgeted \$4.1M in FY 2013 and approximately \$17.7M across the FYDP for initiatives to address “Target 1: Measure Operational Energy Consumption.” Efforts funded include the Fuel System Supply Point (FSSP) Advanced Development and Tactical Fuels Manager Defense (TFMD) sustainment.

The Army budgeted \$2.7M in FY 2013 and approximately \$14.9M across the FYDP for the FSSP Advanced Development to develop and test automated tank gauging solutions and associated devices that transmit and store data, better account for fuel, and inform management decisions from the tactical through strategic levels of war. The Army also provided \$1.4M in both FY 2013 and FY 2014 for TFMD sustainment. TFMD is an adaptation of the standard Defense Logistics Agency fuel accountability program and Army has fielded TFMD to 36 locations in Afghanistan. It provides an automated tool that allows for enterprise wide visibility of petroleum consumption, stock availability, and identification of potential illegal activities at forward operating locations. The TFMD petroleum consumption data provided to OASD(OEPP) has been very helpful in understanding fuel distribution and consumption. The results of TFMD use in Afghanistan will influence Army decisions on automated petroleum accountability and management for future procurement and programming.

Also, the Army tracks mileage, hours and fuel use for tactical platforms through its standard logistics information systems. This information is aggregated in the Operating and Support Management Information System (OSMIS) relational database and available for analysis.

These efforts amount to an acceptable level of investment in this budget submission. However, I have concerns about the quality and usefulness of the ground and rotary-wing fleets’ fuel consumption data. We will examine this issue within a data working group with representatives from OSD and the Services, and reevaluate the level of investment in next year’s budget certification.

Target 2: Improve Energy Performance and Efficiency in Operations and Training.

The Army budgeted \$402.4M in FY 2013 and approximately \$3.3B across the FYDP for initiatives to address “Target 2: Improve Energy Performance and Efficiency in Operations and Training.” Army efforts aligned to Support Current Operations with Energy Improvements are funded with Overseas Contingency Operations (OCO) and/or reprogrammed appropriated funding and include:

- **U. S. Army Corps of Engineers (USACE) Electrical Grid Projects.** These tactical microgrid projects replace inefficient spot generators.
- **USACE Power Distribution and Energy Projects.** These efforts improve electrical distribution efficiencies and reduce fuel costs.
- **Advanced Medium Mobile Power Source (AMMPS).** AMMPS generators reduce fuel and maintenance costs; the Army accelerated procurement for distribution in AFG
- **Reduce-Hybrid 1-2 Transportable Wind Solar.** This effort deploys a solar microgrid to reduce fuel consumption.
- **Tactical Garbage-To-Energy.** This Waste-to-Energy-System assists with reducing solid waste while providing additional power to the base camp grid.
- **Photovoltaic (Pv) Integrated Solar Shades.** Solar shades reduce air conditioning requirements, generate low levels of power, and reduce fuel consumption.
- **Kuwait Energy Efficient Base Camp Project.** This project at Camp Buehring, Kuwait, includes replacing selected tents with re-locatable energy efficient structures, right-sizing the HVAC equipment, integrating area lighting and solar panels on the shelters, and balancing the existing grid to reduce energy demands for a semi-enduring tactical site.

Army's funded efforts also fall under Target 2's objective to Improve the Operational Energy Efficiency of the Military Departments, accounting for \$402.4M in FY 2013 and approximately \$3.3B across the FYDP. These efforts include generators and microgrid improvements, combat vehicle improvements, an improved rotary-winged aircraft engine, Aviation Simulators Ground Soldier Systems, and new, more efficient Force Provider modules and associated equipment.

- **Power Source and Generators** (\$60.4M FY 2013 and \$783.8M FYDP). The generator improvements include development and procurement of Advanced Medium Mobile Power Source (AMMPS), Large Advanced Mobile Power Source (LAMPS), and Small Tactical Electric Power (STEP) generators.
- **Combat Vehicle Improvements** (\$192.4M FY 2013 and \$1.5B FYDP). This effort includes increasing the fuel efficiency of the Abrams and Bradley fleet. The Abrams fleet is incorporating an Auxiliary Power Unit (APU) through an engineering change proposal. The APU provides power to the Abrams systems during operational watch periods in lieu of using the engine. It is anticipated the APU will result in overall Abrams fleet fuel savings of three percent. The Bradley fleet is incorporating an improved transmission, which will also result in fuel savings. In addition, both of these changes will improve the power management of the vehicles, increasing combat capabilities while providing Soldiers an alternative source of power while mounted. This will also allow for the incorporation of new communications, sensing, and networking capabilities. Altogether, they will extend the useful life of these vehicles by decades.
- **Improved Turbine Engine Program (ITEP)** (\$8.4M FY 2013 and \$518.6M FYDP). This effort includes an improved engine for the Apache and Blackhawk helicopter fleets. It is

Report on Operational Energy Budget Certification for Fiscal Year 2013

being developed as a replacement to the current T-700 engine and is expected to produce greater power along with a 25 percent fuel reduction. The ITEP will improve operational effectiveness by giving commanders an improved aviation fleet with longer loiter time, increased altitude limits, increased payload, and lower fuel and maintenance costs.

- **Aviation Simulators** (\$105.4M FY 2013 and \$369.4M FYDP). These simulators enable realistic training while reducing training costs and fuel consumption. The Army is procuring additional simulators for the Apache, Blackhawk, and Chinook helicopters to reap these benefits.
- **Ground Soldier Systems** (\$25.5M FY 2013 and \$369.4M FYDP). This initiative includes the Soldier Power effort, which conducts research to improve battery output, reduce weight, and the ability to recharge batteries from alternative energy sources. The Ground Soldier Ensemble (GSE) project line funds procurement of improved batteries, alternative energy source battery charging equipment, and more efficient battery chargers. Support for the GSE is a key component of the Bradley engineering change proposal and will extend the tactical range of infantry units while reducing their need for resupply.
- **Energy Efficiency Improvements** (\$10.2M FY 2013 and \$15.5M FYDP). These improvements provide Force Provider tent liners, tent shades, LED lighting, microgrids, improved water heaters, improved refrigerators, improved kitchens, and wastewater re-use systems to reduce fuel use by 50 percent and water use by 75 percent.

The Army FY 2013 budget also has significant funding for the development and procurement of the Ground Combat Vehicle (GCV) and Joint Light Tactical Vehicle (JLTV). These programs are early in the development process and the Army has committed to seeking energy and fleet efficiencies over the systems they replace. I encourage the Army to aggressively pursue energy efficiencies in these programs and/or efficiencies within the combat unit, e.g. Brigade Combat Team. I will be expecting these efforts to be robustly funded in future budget submissions as I have concerns regarding the improvement of the energy efficiency of the future ground tactical fleet.

The Army also is actively encouraging the use of renewable batteries in lieu of non-rechargeable, disposable batteries. In FY 2012, the Army expects to spend more on rechargeable than on non-rechargeable, disposable batteries for the first time. The Army has achieved this through education and information, and by modifying logistics systems to notify Item Managers when requisitions for non-rechargeable, disposable batteries are received. Not only will this effort reduce operating costs, it will lessen the weight Soldiers need to carry as the Army deploys systems such as the Rucksack Enhanced Portable Power System (REPPS). These systems allow the recharging of batteries in a tactical environment from all available sources, increasing the range and endurance of dismounted Soldiers.

Target 3: Promote Operational Energy Innovation.

The Army budgeted \$155.9M in FY 2013 and approximately \$869.3M across the FYDP for science and technology initiatives that address Target 3: Promote Operational Energy Innovation. Efforts in this target include demand reduction and supply expansion.

Funding for demand reduction innovation efforts is \$83.0M FY 2013 and \$481.6M across the FYDP and is primarily focused on component technologies and systems that improve engine efficiencies. These efforts include combat vehicle and automotive technologies, aviation technologies, Defense Research Sciences, and other efforts.

- **Combat Vehicle and Automotive Technologies** (\$49.4M FY 2013 and \$269.1M FYDP). This effort includes Power and Mobility Technologies for Ground Vehicles, Fuel Cell Auxiliary Power Unit (APU) Development, Hybrid Electric Advanced Componentry Systems Integration Lab, Power Management Technologies, High Temp Power Electronics and Hybrid Electric Components, Efficient Powertrain Technologies for High Power Onboard Electric Generation, and other efforts to enable lightweight, agile, deployable, fuel efficient, and survivable ground vehicles.
- **Aviation Technologies** (\$20.7M FY 2013 and \$110.5M FYDP). These initiatives include the Future Affordable Turbine Engine, Future Advanced Rotorcraft Drive System, Next Generation Rotorcraft Transmission, High Efficiency Engine Component Technology, Advanced Affordable Turbine Engine (AATE), and other efforts.
- **Defense Research Sciences** (\$9.4M FY 2013 and \$49.0M FYDP). This program comprises basic research projects designed to advance the state of the art in Propulsion, Energetics and Flight; Vehicle Propulsion and Power; High Efficiency Propulsion; and other research efforts.

Funding for supply expansion innovation efforts is \$73.0M FY 2013 and \$383.2M across the FYDP. These are primarily technologies, components and systems that develop new and/or more efficient power sources. These efforts can be broadly classified as combat vehicle and automotive technologies, Warfighter (Soldier) technologies, and Defense Research Sciences, e.g. basic research efforts.

- **Combat Vehicle and Automotive Technologies** (\$15.5M FY 2013 and \$106.8M FYDP). This initiative includes National Automotive Center (NAC) Alternative Energy Program; High Power Non-Primary Power for Spin Out Technologies; Hybrid Electric Components for High Power Density; High Power, Hybrid Electric Pulse Power Source; JP8 Fuel Cell APU System and other efforts for application in combat and tactical vehicles. The Army also addresses the use of alternative fuels within this category and budgeted \$3.4M in FY 2013 and approximately \$22.1M across the FYDP to assess the effect of using emerging alternative fuels in tactical/combat vehicles, tactical generator sets, and other deployable assets. The alternative fuels effort also identifies and addresses potential

changes needed in fuel specifications to implement alternative fuels into current and future Army systems.

- **Warfighter Technologies and Electronic Devices** (\$35.3M FY2013 and \$171.9M FYDP). This effort captures technologies for Soldier and base camp applications to include Power Sources for Dismounted Soldiers, Mobile Power, Efficient Compact Portable Power, Micro-system Power Components and other efforts.
- **Defense Research Sciences** (\$9.7M FY 2013 and \$49.1M FYDP). This program includes Novel Materials for Compact Power, Advanced Soldier Power Research, and Bio Inspired Sensing and Power.

More Options, Less Risk: Expand and Secure Energy Supplies for Military Operations.

Target 5: Promote the Development of Alternative Fuels.

The Army is committed to contributing to our Nation's energy security by reducing dependence on foreign oil through the use of advanced alternative fuels as they become available in the marketplace. Army's efforts to support this goal are discussed as part of Target 3: Promote Operational Energy Innovation, as these are funded in RDT&E Budget Activities 2 and 3. The RDT&E funding is adequate for this target at this time.

More Capability, Less Cost: Build Energy Security into the Future Force.

Target 6: Incorporate Energy Security Considerations into Requirements and Acquisition.

This target is not necessarily driven by funding, but by policy and analytical tools. Therefore, the Army's FY 2013 budget does not include specific funding to support this target given that such projects are most likely to come from current year unspecified operational funds. Nevertheless, the Army has on-going efforts supporting this initiative. At the macro-level, the Army has begun annual Weapon Systems Reviews where the program managers will address the operational energy considerations of the acquisition programs. Additionally, the Army G-3 has planned a Capability Portfolio Review of Army Operational Energy programs to ensure investments are complementary, not redundant, and sufficient to reach energy security goals. At the micro-level, the Army has programs and projects such as the Sustain the Mission Project (SMP) and the Energy and Reset Analysis. SMP enables force and scenario dependent estimates of the fully burdened cost of energy (FBCE), water (FBCW), and waste (FBC Waste - solid, hazardous and medical) to provide energy informed decision making and capability trade analysis. Energy and Reset Analysis initiatives include the Spray Polyurethane Foam (SPF) Tent Insulation Capability Based Assessment (CBA), Thermo Electric Generator CBA, and tactical battery consumption.

These efforts amount to acceptable levels of investment in this budget submission. However, I have concerns about whether the Army has planned adequate future investments for the development and implementation of the tools and systems required to incorporate energy security considerations into Requirements and Acquisition. For example, the Army has

not budgeted for the sustainment and improvement of the "Sustain the Mission" modeling and simulation tool, which is a foundational tool for the Army to evaluate fuel logistics plans. In the past, this has required approximately \$500K to \$1M per year to provide basic training, support and content development. Further, the Army has no funding plans to integrate combat and logistics capabilities into a common modeling and simulation tool, for the purpose of evaluating the effect of growing fuel logistics demands on combat capability. The Army has an unfunded plan for developing this capability, under the title Methodology and Analysis for Energy Security in Military Operations (MAESMO). This is a vital capability in the evaluation of major defense acquisition programs, and in setting threshold and objective levels of energy demand as required by the newly revised Joint Staff instruction on the Joint Capability Integration and Development System (JCIDS) (JCIDS 3170.01H and JCIDS Manual).

Target 7: Adapt Policy, Doctrine, PME, and CCMD Activities.

The Army's FY 2013 budget includes funding to support this target, but it is subsumed within existing funding lines. Thus, it is not readily identifiable in the budget database, and is likely, a relatively small amount. The Army is developing programs of instruction for Power Generation Equipment Repairer (Military Occupational Specialty 91D) and unit-level power and energy management specialists. The Program of Instruction will ensure Soldiers can design efficient energy grids and employ energy-saving equipment. The initiative should decrease power generation expenditures, improve delivery, and reduce maintenance costs at tactical sites. The Army also is also conducting a study on cultural change towards energy that will develop a variety of recommendations, concepts, and potential actions in key areas that will affect an enduring culture change to reduce operational energy use. The way that Soldiers think about and use energy can have a significant effect on the Army's overall energy use. The resulting changes in training will be designed to ensure Soldiers make energy a consideration all tactical and operational activities.

Summary

My assessment of the adequacy of the funding for implementing the DoD *Operational Energy Strategy* is shown below:

US Army	
Operational Energy Targets	Rating
Target 1: Measure Operational Energy Consumption.	G
Target 2: Improve Energy Performance and Efficiency in Operations and Training.	G
Target 3: Promote Operational Energy Innovation.	G
Target 5: Promote the Development of Alternative Fuels.	G
Target 6: Incorporate Energy Security Considerations into Requirements and Acquisition.	Y
Target 7: Adapt Policy, Doctrine, PME, and CCMD Activities.	G

I certify the Army’s FY 2013 budget as being adequate for the implementation of the DoD Operational Energy Strategy. Nevertheless, I do have concerns regarding the development and implementation of the tools and systems required to incorporate energy security considerations into Requirements and Acquisition; and the improvement of the energy performance of the future ground tactical fleet. These areas may require additional investments in the FY 2014 budget in order to achieve a certified budget.

Department of the Navy Operational Energy Budget Certification

The Department of the Navy (DON) budgeted \$402.1M in FY 2013 and approximately \$2.2B across the FYDP for operational energy initiatives. Approximately 84 percent of this funding across the FYDP is for Demand Reduction Initiatives (Strategic Objective 1) with 14 percent focused on Supply Expansion initiatives (Strategic Objective 2), and the remaining 2 percent budgeted for Build Energy Security into the Future Force (Strategic Objective 3). Navy and Marine Corps funding is addressed separately in the below discussion.

Department of the Navy Operational Energy Staff

The Assistant Secretary of the Navy (Energy, Installations and Environment) (ASN(EI&E)) is the Navy's senior energy official. The ASN(EI&E) executes operational energy oversight and guidance through the Deputy Assistant Secretary of the Navy for Energy (DASN(Energy)) who has a Director, Operational Energy (GS-15), and two additional staff members focused on operational energy issues.

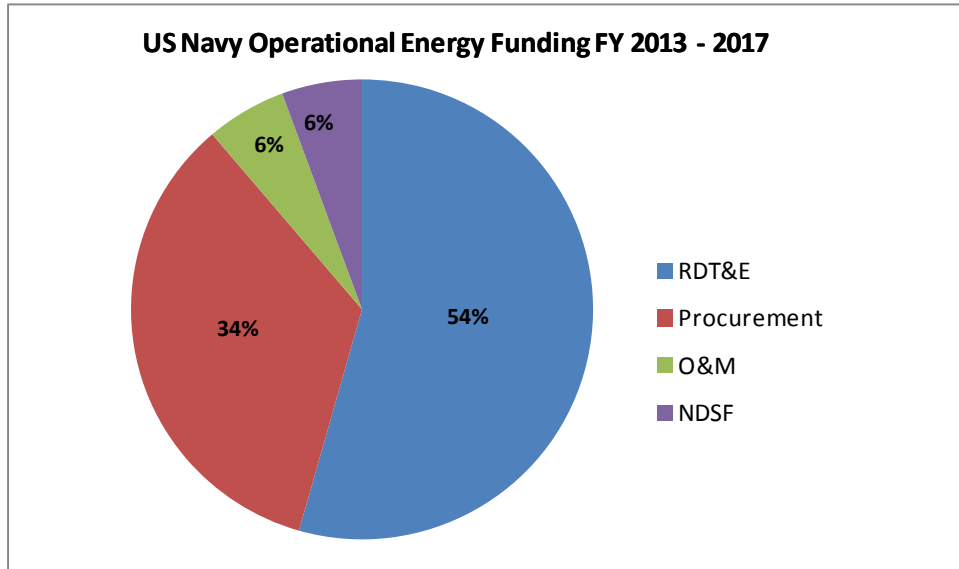
US Navy Operational Energy Program

US Navy Operational Energy Staff

The Navy office with primary responsibility for operational energy is Chief of Naval Operations, Energy and Environmental Readiness Division, Navy Energy Coordination Office (OPNAV N45E), which is led by a Captain (O-6) with a staff of five. N45E reports to N45, a Rear Admiral (O-8), who serves as the Navy's Senior Operational Energy Official and Director, Navy Task Force Energy (TFE). N45 reports to the Deputy Chief of Naval Operations for Fleet Readiness and Logistics (N4), a Vice Admiral (O-9). Approximately fifteen individuals serve as main points of contact for TFE Working Groups (Aviation, Maritime, Expeditionary, Shore, Fuels), which are co-chaired by the corresponding Systems Commands and Resource Sponsors. Combined with staff support for the Working Group co-leads, the total number of individuals regularly engaging on operational energy issues Navy-wide is approximately thirty. The TFE Executive Steering Committee is comprised of flag-level co-chairs of the Working Groups, as well as representatives from the Office of Naval Research, System Commands, and a number of other organizations, such as the OPNAV Assessment Division (N81), the OPNAV Strategy & Policy Division (N51), and the Fleet.

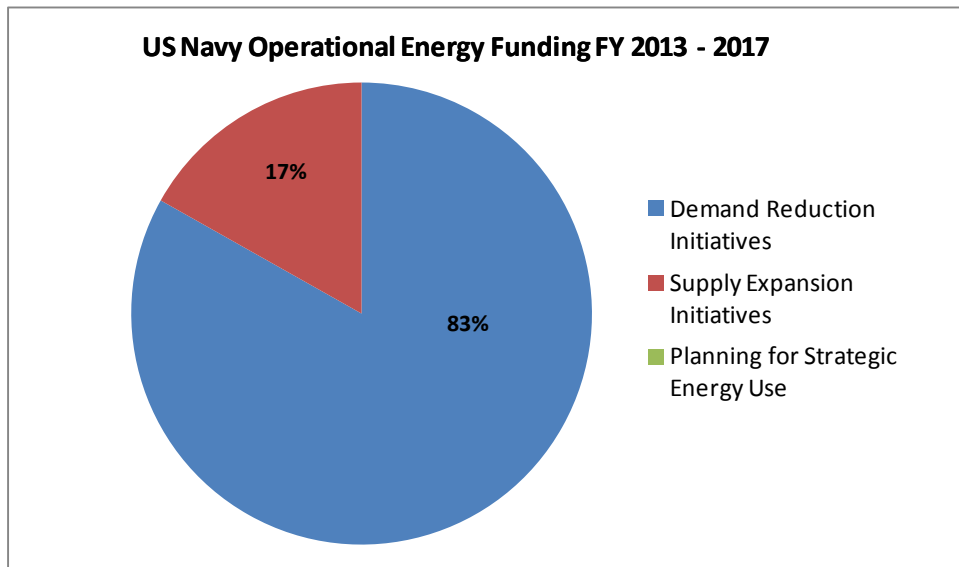
US Navy FY 2013 Operational Energy Budget

The Navy budgeted \$337.7M in FY 2013 and approximately \$1.9B across the FYDP for operational energy initiatives. The distribution across appropriations is shown below:



The majority of this funding, approximately 54 percent across the FYDP, is in RDT&E (\$222.2M FY 2013, \$1.0B FYDP). Procurement funding (\$85.6M FY 2013, \$655.2M FYDP) accounts for 34 percent of the funding across the FYDP while O&M (\$6.2M FY 2013, \$107.4M FYDP) and the National Defense Sealift Fund (\$23.7M FY 2013, \$107.6M FYDP) account for approximately 6 percent each.

The Navy funding distributed across the DoD Operational Energy Strategy three principal objectives is shown below:



Report on Operational Energy Budget Certification for Fiscal Year 2013

The Navy budgeted \$289.1M of FY 2013 funding and approximately \$1.6B across the FYDP to Operational Energy Demand Reduction Initiatives. FY 2013 funding of \$48.4M and \$321.8M across the FYDP was budgeted for Supply Expansion Initiatives.

More Fight, Less Fuel: Reduce Demand for Energy in Military Operations.

Target 1: Measure Operational Energy Consumption.

The Navy budgeted \$20.9M FY 2013 and approximately \$108.4M across the FYDP for initiatives to address “Target 1: Measure Operational Energy Consumption.” Efforts funded include the Integrated Condition Assessment System (ICAS), the Fleet Readiness R&D Program, Navy Energy Utilization Reporting Service (NEURS) Plus, and other programs.

The Integrated Condition Assessment System (ICAS) (\$3.4M FY 2013 and \$10.5M FYDP) enables review of hull, mechanical, and electrical data ashore. It consists of software, portable data terminals, and workstations. ICAS will interface with the Energy Dashboard under development by the Fleet Readiness R&D Program. The Fleet Readiness R&D Program (FRR&DP) (\$8.8M FY 2013 and \$59.6M FYDP) focuses on technologies that can be quickly transitioned to increase energy efficiency and reduce maintenance costs. This effort includes the Energy Dashboard, Smart Voyage Planning Decision Aid, and T&E of various initiatives. The Energy Dashboard is a ship-wide monitoring system that conveys the power usage of numerous systems while underway and in-port. SVPDA is software for Naval Maritime Forecast Centers that uses local weather, current, hull form, and propulsion data to plan fuel-efficient voyage routes. The Navy Energy Utilization Reporting Service (NEURS) Plus (\$250K FY 2013 and \$1.3M FYDP) is an updated version of the NEURS that will include shore power data and improve accuracy, accountability, and ease of reporting.

Target 2: Improve Energy Performance and Efficiency in Operations and Training.

The Navy budgeted \$169.6M FY 2013 and approximately \$1.1B across the FYDP for initiatives to address “Target 2: Improve Energy Performance and Efficiency in Operations and Training.” Efforts aligned to Support Current Operations with Energy Improvements account for \$72.3M in FY 2013 and include Improved Environmental Control Unit (ECU), Integrated Generator and ECU, and Simulator Upgrades along with the Shipboard Incentivized Energy Conservation Program, Air Energy Conservation Program and other programs. I do have questions about how these investments align with similar programs and projects in other services. I will task the CAWG to examine these issues closely as part of the FY 2014 Operational Energy Budget Certification process and develop recommendations to streamline and strengthen operational energy investments.

- **Environmental Control Unit** (\$2.0M FY 2013 and \$11.1M FYDP). This improved program replaces ECUs with more energy-efficient units that incorporate variable speed fan drives and multi-frequency drive components.

Report on Operational Energy Budget Certification for Fiscal Year 2013

- **Integrated Trailer-ECU-Generator (ITEG)** (\$1.0M FY 2013 and \$4.2M FYDP). This initiative is an integrated, HMMWV-towable unit that supports highly-mobile command and control systems and other forward-deployed operations centers and activities, and provides greater performance with lower energy requirements than existing units.
- **Simulator Upgrades** (\$64.0M FY 2013 and \$331.2M FYDP). The majority of the funding for this target is focused on simulator upgrades. The Navy Aviation Simulator Master Plan (NASMP) identified capability (fidelity) and capacity upgrades required to maximize training and readiness (T&R) simulation for F/A 18 A/C, F/A-18E/F, EA-18G, MH-60R/S, and E-2C aircraft given fiscal, technological, and minimum flight time limitations. The NASMP improvements in simulator capability and capacity will permit Fleet squadrons to accomplish a greater degree of T&R in the simulator vice in the aircraft, resulting in reduction of Flying Hour Program (FHP) requirements with associated fuel savings.

The on-going Shipboard Incentivized Energy Conservation Program (i-ENCON) (\$500K FY 2013 and \$2.9M FYDP) provides ships with operational techniques to reduce fuel consumption. Naval Sea Systems Command provides ships with the necessary training, tools, and guidance that help to reduce the cost of training/operating (e.g., fuel efficiency), for improved fleet readiness. The i-ENCON best practices can improve fuel efficiency up to 30 percent depending on mission requirements. Additionally, Commanders of United States Fleet Forces and Pacific Fleet have identified the need to assist the Fleet in energy conservation initiatives through the resourcing of Fleet Energy Managers in their respective concentration areas. Fleet Energy Managers are providing ships with the education and awareness needed to support energy initiatives in-port and underway. Advanced metering, integrated with digital controls and supervisory control and data acquisition will also aid operational forces when in-port to monitor utility usage and modify behavior to increase efficiency and decrease consumption. The newly established Air Energy Conservation Program (\$1.6M FY 2013 and \$12.5M FYDP) seeks to identify, validate, disseminate, and incentivize energy conservation best practices within the naval aviation community. Targets include culture, fueling, mission planning, and maintenance.

Navy's funded efforts impacting Improve the Operational Energy Efficiency of the Military Departments account for \$91.3M in FY 2013 and include Hybrid Electric Drive Development and Implementation, Energy Storage and Other R&D, Aviation Energy Conservation RDTE-focused on F-35 efficiencies, LM2500 Efficiency Implementation, Propeller Coatings, and other efforts.

- **Hybrid Electric Drive Development and Implementation** (\$16.4M FY 2013 and \$238.3M FYDP). This program provides for an electric motor attached to the main reduction gear of DDG-51-class ships to provide an electric propulsion mode resulting in improved fuel economy.
- **Energy Storage and Other R&D** (\$21.4M FY 2013 and \$63.2M FYDP) and the **Advanced Power Generation Module** (\$7.0M FY 2013 and \$41.1M FYDP). These two significant efforts of the electric ships office efficiency programs transitions technologies from ONR, industry, and federal partners from S&T to more advanced RDT&E to provide

smaller, simpler, more-affordable, and more-capable power systems. The Advanced Power Generation Module is developing an advanced gas turbine with a high speed generator to provide better fuel efficiency, meet requirements for advanced sensors and future weapons, reduce weight, and lower life cycle costs.

- **Aviation Energy Conservation RDTE** (\$17.7M FY 2013 and \$142.2M FYDP). This initiative focused on F-35 efficiencies, including F-35 Engine Efficiency, F-35 Air Vehicle Efficiency, New Opportunity Studies, and other efforts.
 - **F-35 Engine Efficiency** (\$13.8M FY 2013 and \$71.3M FYDP). This effort seeks to optimize the fuel efficiency of the F-35 engine with various technologies, including Advanced Technology High Performance Controller (HPC), Optimized Turbine Cooling, Advanced Technology HPT, Turbine Clearance Control, and Fuel Burn Optimized Control Mode. These technologies will be forward fit in F-35 Block 5 (2020) and beyond.
 - **F-35 Air Vehicle Efficiency** (\$402K FY 2013 and \$39.2M FYDP). This project effort seeks to optimize the fuel efficiency of the F-35 air vehicle with attention to the Power Thermal Management System (PTMS) Pre-Flight Operational Mode, GPS Approach Capability, Conventional Takeoff & Landing/ Carrier Variant (CTOL /CV) Nozzle Optimization, and Subsystem Standby Modes. These technologies will be forward fit in F-35 Block 5 (2020) and beyond.
 - **New Opportunity Studies** (\$2.6M FY 2013 and \$30.6M FYDP). This effort 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.
- **LM2500 Efficiency Implementation** (\$0.0M FY 2013 and \$32.2M FYDP). This program begins in FY 2015 and 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.
- **Propeller Coatings** (\$500K FY 2013 and \$2.2M FYDP). This is an on-going program to deploy an easy-release propeller coating system which allows amphibious ships with long pier-side periods to shed propeller bio-fouling once underway. This technology is currently achieving fuel savings for Military Sealift Command (MSC) ships and the commercial shipping industry.

Target 3: Promote Operational Energy Innovation.

The Navy budgeted \$135.9M in FY 2013 and approximately \$561.5M across the FYDP for initiatives to address "Target 3: Promote Operational Energy Innovation". Efforts in this target include demand reduction and supply expansion.

Funding for demand reduction innovation efforts is \$98.6M FY 2013 and \$376.9M across the FYDP. These key efforts include Naval Variable Cycle Engine Technology, Electric Ship Research

& Development Consortium, Ship Hydrodynamics, and the Turbine Engine Technology Demonstration.

- **Naval Variable Cycle Engine Technology** (\$24.2M FY 2013 and \$104.4M FYDP). These efforts identify and mature critical, relevant variable/adaptive cycle system technologies for the next generation carrier-based aircraft that combine high performance with fuel efficiency. Current high performance military aircraft engines are fundamentally less fuel efficient than commercial aircraft engines.
- **Electric Ship Research & Development Consortium** (\$10.5M FY 2013 and \$54.6M FYDP). This initiative is a consortium of virtually linked academic institutions with hardware-in-the-loop capability coupled with physics-based models for system design, testing, and validation. Maximizing shipboard energy efficiency and supporting future weapons systems require new power distribution concepts.
- **Ship Hydrodynamics** (\$8.8M FY 2013 and \$47.5M FYDP). These efforts provide design tools for high performance, efficient, low-signature hull forms and propulsors and optimize integration of the hull-propulsor as a system. These efforts will improve the Navy's understanding of the governing physics, processes, prediction and control of ship and submarine motion.
- **Turbine Engine Technology Demonstration** (\$9.6M FY 2013 and \$13.6M FYDP). These projects design and develop advanced components and models using the technologies developed under Turbine Engine Materials Research. The advanced components are integrated into advanced demonstrator engines and validated through testing. Existing turbine engines are inefficient and expensive to build and maintain. Advanced materials contribute to higher engine efficiency, production cost avoidance, and maintenance cost reduction.

Funding for supply expansion innovation efforts is \$37.3M FY 2013 and \$184.6M across the FYDP. These efforts include Unmanned Undersea Vehicle (UUV) initiatives, Energy Efficiency & Alternative Energy Technologies, Power and Energy Materials Research, and other efforts.

- **UUV initiatives** (\$10.6M FY 2013 and \$49.8M FYDP). This program includes the UUV Power and Energy, UUV Power Systems, and Long Duration UUV programs, which develop high-endurance power and air-independent propulsion for UUVs. Two of the biggest challenges associated with UUVs are power and propulsion. These programs aim to increase endurance and optimize electric motor design to increase efficiency and reduce weight, volume, and signature.
- **Energy Efficiency & Alternative Energy Technologies** (\$7.7M FY 2013 and \$41.3M FYDP). These initiatives include efforts for Alternative Fuels, Photovoltaics, and Biofuel.
- **Power and Energy Materials Research** (\$10.3M FY 2013 and \$55.8M FYDP). This effort includes Electrochemical Materials S&T, Functional Polymeric Materials, Nanostructured Inorganic Materials, Chemical Dynamics, and Naval Future Fuels.

More Options, Less Risk: Expand and Secure Energy Supplies for Military Operations.

Target 5: Promote the Development of Alternative Fuels.

The Navy budgeted \$11.1M in FY 2013 and approximately \$137.3M across the FYDP to promote the development and use of alternative fuels. Navy will demonstrate a Green Strike Group in 2012, sail it as the "Great Green Fleet" in 2016, and has budgeted \$70M in the FYDP for the procurement of alternative fuels for these demonstrations. Navy also has budgeted \$11.1M in FY 2013 and \$67.2M across the FYDP for the Alternative Fuels Program. This is the Navy's only investment to approve aircraft and ship propulsion fuels produced from non-petroleum sources for use in Navy systems. The program captures technical data through the execution of laboratory, component, engine, fuel system, and weapon system tests, evaluating the effects of changes in fuel chemistry and properties on the performance and reliability of Naval ship, aircraft, and fuel distribution systems. Navy leadership has stated the Navy is taking these steps in order to be capable of purchasing alternative fuels when such fuels are available at market prices.

More Capability, Less Cost: Build Energy Security into the Future Force.

Target 6: Incorporate Energy Security Considerations into Requirements and Acquisition.

The Navy's budget does not reflect funding to support this target. Nevertheless, the Navy has taken some very significant action in this area. In particular, the Assistant Secretary of the Navy (Research, Development and Acquisition) released a memo in June 2011 mandating energy considerations in acquisition. The memo provides specific guidance regarding:

- Mandatory Calculation of Fully Burdened Cost of Energy
- Establishment of an Energy Component of the Affordability Target
- Energy Considerations in Acquisition Plans
- Energy Considerations in the Gate Review Process
- Energy Review of Legacy Systems

In response to this policy direction, OPNAV N45 is leading an Operational Energy in Acquisition Team (EN-ACQT) to provide a comprehensive Navy approach to integrating operational energy considerations into the full range of planning and force development activities. Currently, EN-ACQT is reviewing energy efficiency considerations in JCIDS documents, to be followed by a review of the Materiel Solution Analysis phase. In addition, OPNAV N45 is collaborating with individual programs, such as the Ohio-class submarine replacement program, LSD(X), Air and Missile Defense Radar (AMDR), and Joint Light Tactical Vehicle (JLTV) to ensure energy considerations are addressed. Upcoming efforts are expected to include T-AO(X), T-ATS(X), and UCLASS. As EN-ACQT and other groups define concepts and data required to implement ASN(RDA) guidance, the Navy will determine resources needed to support new analytical tools.

These efforts amount to an acceptable level of effort and investment in this budget submission. However, I have concerns as to whether the Navy has planned adequate future investments for the development and implementation of the tools and systems required to incorporate energy security considerations into Requirements and Acquisition. The Navy has no funding plans to develop the modeling and simulation tools to enable Department of the Navy force planners to simulate and assess the combat capability effects of enemy attacks on U.S. logistics forces. While we understand the STORM M&S tool the Navy has adopted has some innate capability to perform such simulations, there are no funding plans to vet the capability or to employ it to inform requirements development, acquisition program performance criteria or fully burdened cost of energy estimates. This is a vital capability in the evaluation of major defense acquisition programs, and in setting threshold and objective levels of energy demand as required by the newly revised Joint Staff instruction on the Joint Capability Integration and Development System (JCIDS) (CJCSI 3170.01H and JCIDS Manual).

Target 7: Adapt Policy, Doctrine, PME, and CCMD Activities.

The Navy's FY 2013 budget includes funding to support this target, but it is subsumed within existing funding lines. Thus, it is not readily identifiable in the budget database, and is likely to be a relatively small amount. Nevertheless, the Navy has developed a master's program in energy with tracks in technology and policy, as well as an executive seminar for senior executives and Fleet leaders at the Naval Postgraduate School. Additionally, the Navy continues to adapt policies in support of energy efficiency. For example, the Fleets have established a Fleet Excellence Award recognizing ships that consistently meet established goals for reducing fuel consumption and executing energy-saving initiatives.

Report on Operational Energy Budget Certification for Fiscal Year 2013

Summary

My assessment of the adequacy of the funding for implementing the DoD *Operational Energy Strategy* is shown below:

US Navy	
Operational Energy Targets	Rating
Target 1: Measure Operational Energy Consumption.	G
Target 2: Improve Energy Performance and Efficiency in Operations and Training.	G
Target 3: Promote Operational Energy Innovation.	G
Target 5: Promote the Development of Alternative Fuels.	G
Target 6: Incorporate Energy Security Considerations into Requirements and Acquisition.	Y
Target 7: Adapt Policy, Doctrine, PME, and CCMD Activities.	G

I certify the Navy's FY 2013 budget as being adequate for the implementation of the DoD *Operational Energy Strategy*. Nevertheless, I do have concerns regarding the development and implementation of the tools and systems required to incorporate energy security considerations into Requirements and Acquisition. This area may require additional investments in the FY 2014 budget in order to achieve a certified budget.

USMC Operational Energy Program

USMC Operational Energy Staff

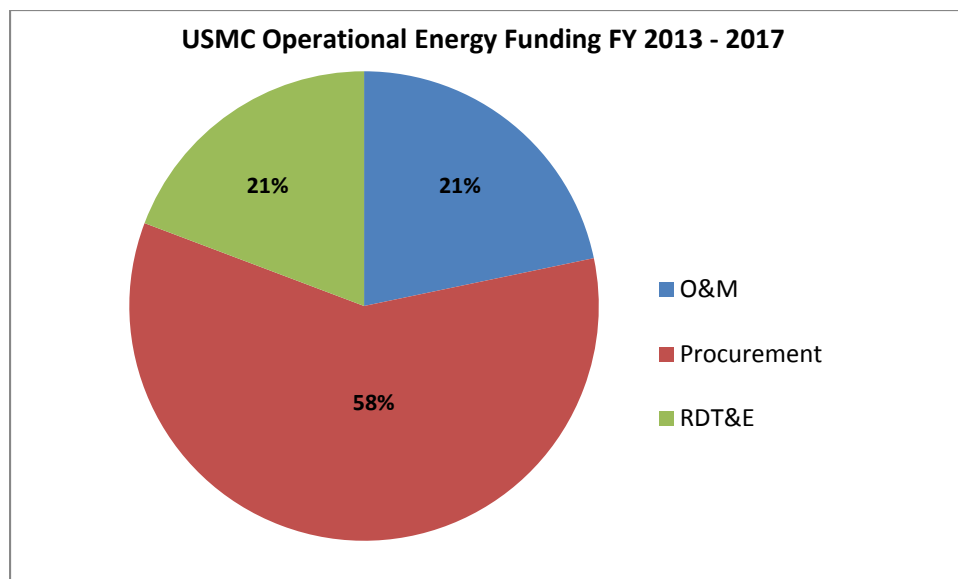
The USMC office with primary responsibility for operational energy is the Expeditionary Energy Office (E2O). Designated by the Secretary of the Navy as the Senior USMC Official for operational energy in accordance with the National Defense Authorization Act for FY2009, E2O is a Director-level office within HQS Marine Corps, reporting to the Assistant Commandant of the Marine Corps (ACMC). The Director, E2O, a Colonel (O-6), has a staff of five personnel to include a GS-15 Deputy Director, and three Marines.

In addition to E2O, the USMC Energy Strategy and Implementation Planning Guidance tasks key process owners across the Marine Corps to support the USMC expeditionary energy strategy to include:

- Director, Energy and Counter IED Systems Division, SIAT Marine Corps Systems Command (MARCORSYSCOM), is lead for energy matters in acquisition.
- Logistics Integration Division, within the Deputy Commandant for Combat Development and Integration (DC CD&I), is designated lead to coordinate support for combat development and requirements. DC/CD&I also leads training and doctrine development.
- Office of Naval Research supports USMC science and technology requirements and the Vice Chief of Naval Research is the Commander of the Marine Corps Warfighting Lab.
- Marine Corps Warfighting Lab (MCWL) chairs the Experimental Forward Operating Base (ExFOB) Executive Integrated Process Team.

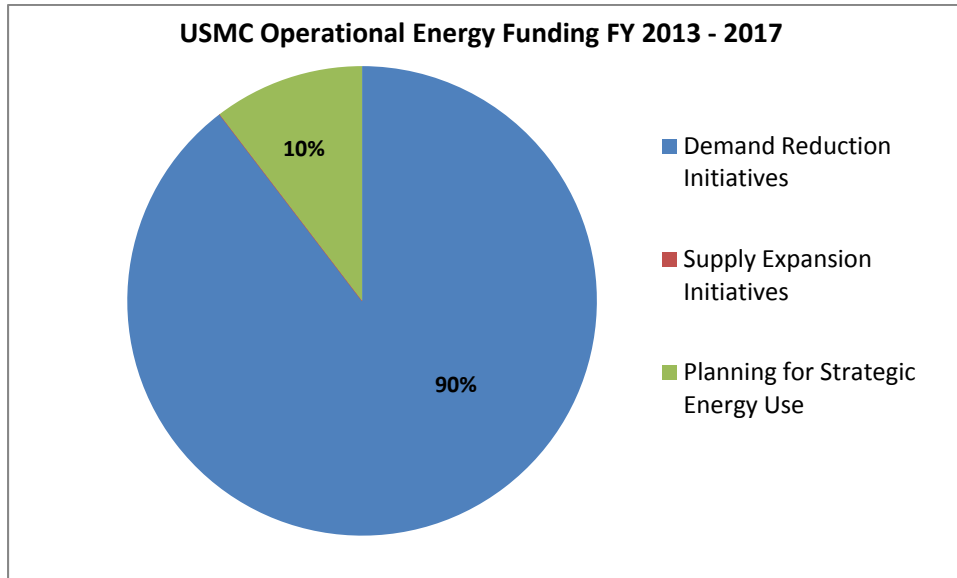
USMC FY 2013 Operational Energy Budget

The USMC budgeted \$64.4M in FY 2013 and \$352.1M across the FYDP for operational energy initiatives. The distribution across appropriations is shown below:



Report on Operational Energy Budget Certification for Fiscal Year 2013

The majority of this funding, approximately 58 percent across the FYDP, is in Procurement (\$31.0M FY 2013, \$204.6M FYDP). Operation & Maintenance funding (\$14.1M FY 2013, \$74.5M FYDP) accounts for 21 percent of the funding while RDT&E (\$19.4M FY 2013, \$73.0M FYDP) accounts for the remaining 21 percent across the FYDP. The USMC funding distributed across the DoD Operational Energy Strategy three principal objectives is shown below:



The USMC budgeted \$57.4M of FY 2013 funding and \$315.6M across the FYDP to Operational Energy Demand Reduction Initiatives. FY 2013 funding of \$7.0M and \$36.6M across the FYDP was budgeted for Planning for Strategic Energy Use initiatives.

More Fight, Less Fuel: Reduce Demand for Energy in Military Operations.

Target 1: Measure Operational Energy Consumption.

Marine Corps investments in this target area, as with other targets, are funded within the E2O budget, but are recognized under Target 6 – Incorporate Energy Security Considerations into Requirements and Acquisition. The E2O has established an initial Operational Energy Consumption Baseline for the USMC, continues to collect consumption data, and has developed tools to build upon the baseline. The initial baseline was derived from the actual Equipment Density List (EDL) and fuel consumption data from the I MEF (FWD) deployment to the Afghanistan theater of operations in 2010. The USMC tracks tactical fuel delivery data to the Forward Operating Base (FOB) level via the Marine Expeditionary Force (MEF) Bulk Petroleum Contingency Report. In early FY 2012, the Experimental Forward Operating Base (ExFOB) completed a comprehensive data collection/analysis of PB Boldak, in AFG. The E2O has developed the Marine Air-Ground Task Force (MAGTF) Power and Energy Model (MPEM) to build upon the Operational Energy Consumption Baseline. The MPEM is used to model the use of equipment, and the impact of investments on the MAGTF energy performance. Also, the USMC has published formal Marine Corps Requirements for operational energy management, metering and monitoring. The Expeditionary Energy Water and Waste

CBA/ICD identifies five "Tasks" requiring metering capability. Five priority "gaps" call for the capability to measure, meter and monitor; it also identifies both materiel and non-materiel solutions. These requirements provide the essential justification that the Marine Corps uses to identify and develop capabilities, and then fund programs to close the gaps.

Target 2: Improve Energy Performance and Efficiency in Operations and Training.

The USMC budgeted \$52.0M in FY 2013 and approximately \$288.3M across the FYDP for initiatives to address "Target 2: Improve Energy Performance and Efficiency in Operations and Training." FY 2013 efforts aligned to Support Current Operations with Energy Improvements total \$26.7M while efforts to Improve the Operational Energy Efficiency of the Military Departments account for \$25.3M.

The majority of the USMC's FY 2013 funding to Support Current Operations with Energy Improvements is focused on Advanced Power Sources (\$16.7M FY 2013 and \$86.3M FYDP), which provides the development, procurement, and sustainment of programs such as the Solar Portable Alternative Communications Energy System (SPACES), Ground Renewable Expeditionary Energy System (GREENS), on board power management, and radio power adapters. While these programs are deploying now, they are also part of the USMC equipment baseline, and are designed to support the future force. Other efforts include:

- **Family of Shelters and Shelter Equipment** (\$8.0M FY 2013 and \$39.3M FYDP). These initiatives seek to decrease shelter weight and increase insulation, replace current fluorescent shelter lights with energy-efficient lights, and decrease fuel consumption by using energy-efficient heating systems.
- **Family of Expeditionary Water Systems** (\$2.0M FY 2013 and \$11.3M FYDP). This program deploys technology upgrades to increase potable water output while reducing system energy demands in order to provide expeditionary point of production water at mid to small forward operating bases. This reduces resupply efforts.

USMC's funding to Improve the Operational Energy Efficiency of the Military Departments (\$25.3M FY 2013 and \$151.4M FYDP) includes Mobile Power Equipment, Medium Tactical Vehicle Replacement (MTVR), Environmental Control Equipment, and Family of Field Medical Equipment. I do have questions about how these investments align with similar programs and projects in other services. Again, in the FY 2014 Operational Energy Budget Certification process I will task the CAWG to examine investments in this area across the total force and develop recommendations to streamline and strengthen operational energy investments.

The majority of the USMC's FY 2013 funding to Improve the Operational Energy Efficiency of the Military Departments is focused on the Family of Mobile Electric Power Equipment (\$13.9M FY 2013 and \$45.9M FYDP) which consists of skid and trailer mounted tactical generators. Funds are included for the development, procurement, and operation and maintenance of

state-of-the-art equipment that is more energy efficient, highly reliable, and operationally suitable for the highly expeditionary nature of USMC operations.

Other significant efforts in this area include:

- **Environmental Control Equipment** (\$7.2M FY 2013 and \$62.7M FYDP). Efforts include environmental control units (ECUs) which demonstrate up to a 17 percent fuel efficiency improvement over existing ECUs.
- **Medium Tactical Vehicle Replacement (MTVR)** (\$1.5M FY 2013 and \$38.3M FYDP). USMC efforts on the MTVR include developing and demonstrating a fuel-efficiency improvement of 15 percent over the existing MTVR while maintaining affordability, mobility, and survivability. USMC has also funded the procurement of prototypes of the On-Board Vehicle Power sources to enable fuel reductions during periods when operational requirements demand extended idle times.
- **Family of Field Medical Equipment** (\$2.7M FY 2013 and \$4.5M FYDP). USMC efforts include procurement of LED surgical lighting and other energy-efficient medical equipment, energy-efficient medical/surgical sterilizer system, energy efficient digital x-ray systems, and LED dental lights.

Target 3: Promote Operational Energy Innovation.

The USMC leverages the innovation efforts and investments of both the Navy and Army along with budgeting \$5.5M in FY 2013 and approximately \$27.3M across the FYDP for operational energy innovation initiatives. Efforts in this target include:

- **Fuel Efficiency and Portable Electric Energy Advanced Technology Demonstrations** (\$3.8M FY 2013 and \$20.2M FYDP). Efforts include hybridization and microgrid concepts for small (3kW to 10kW) power sources; alternative JP-8 and waste to electric conversion technologies; energy efficient electronic devices (radios); and advanced vehicle transmission, power and propulsion technology, including hybridization.
- **Portable Electric Energy and Water Purification** (\$1.4M FY 2013 and \$6.9M FYDP). Research efforts include metal-air batteries, JP-8 fuel cell catalysis, electrochemical ultra-capacitors, wearable power distribution, and kinetic and solar energy harvesting. Research is also conducted in energy efficient small unit water purification technologies (filtration, desalination, sanitation) and vehicle fuel alternatives, vehicle propulsion, and vehicle battery technologies.
- **Foot Mobile Charger (FMC)/Squad Electric Power Network (SEPN)** (\$250K FY 2013 and \$250K FYDP). FMC seeks to develop a lightweight, Marine-portable system capable of accepting a variety of energy inputs that can charge/power electrical devices worn or employed by a Marine to include common battery types such as the BB-2590, AA, and CR-123, all while on-the-move.

More Options, Less Risk: Expand and Secure Energy Supplies for Military Operations.

Target 5: Promote the Development of Alternative Fuels.

The USMC defers to the Navy as the lead for this effort.

More Capability, Less Cost: Build Energy Security into the Future Force.

Target 6: Incorporate Energy Security Considerations into Requirements and Acquisition.

USMC efforts to support this target include the Expeditionary Energy Office (E2O) and the Experimental Forward Operating Base (ExFOB). The budget for these programs is \$7.0M in FY 2013 and \$36.6M across the FYDP. E2O is the USMC Senior Official for Operational Energy and is tasked by the Commandant, Marine Corps to analyze, develop, and direct the Marine Corps' energy strategy in order to optimize expeditionary capabilities across all warfighting functions. The ExFOB is a semi-annual process to evaluate technologies to support Marine Corps Expeditionary Energy Strategy goals of increased combat effectiveness and reduced dependence on liquid logistics on the battlefield.

In addition to these programs, the USMC has published its Expeditionary Energy Strategy and Implementation Plan; Expeditionary Energy, Water, and Waste (E2W2) Capability Based Assessment (CBA) Initial Capabilities Document (ICD); and its S&T Strategic Plan, which enable the incorporation of energy security considerations into requirements and acquisitions.

Target 7: Adapt Policy, Doctrine, PME, and CCMD Activities.

Marine Corps investments in this target area are funded in the E2O office budget. The E2O develops and promulgates operational energy policy and assists in the development of Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel and Facilities (DOTMLPF) solutions to support its strategy. The Corps has also established an Energy Efficiency (E2) Cell at the Marine Corps Engineering School in FY 2011 and is conducting Doctrine and Training & Readiness Manual reviews. The USMC is integrating operational energy into the Commander's Course and Expeditionary Warfare School, for example, and will participate in the Naval Postgraduate School's (NPS) newly established energy Master's program. They expect to graduate three Marines in FYs 2012 and 2013.

Report on Operational Energy Budget Certification for Fiscal Year 2013

Summary

My assessment of the adequacy of the funding for implementing the DoD *Operational Energy Strategy* is shown below:

US Marine Corps	
Operational Energy Targets	Rating
Target 1: Measure Operational Energy Consumption.	G
Target 2: Improve Energy Performance and Efficiency in Operations and Training.	G
Target 3: Promote Operational Energy Innovation.	G
Target 5: Promote the Development of Alternative Fuels.	N/A
Target 6: Incorporate Energy Security Considerations into Requirements and Acquisition.	G
Target 7: Adapt Policy, Doctrine, PME, and CCMD Activities.	G

I certify that the Marine Corps' FY 2013 budget is adequate for the implementation of the DoD *Operational Energy Strategy*.

Department of the Air Force Operational Energy Budget Certification

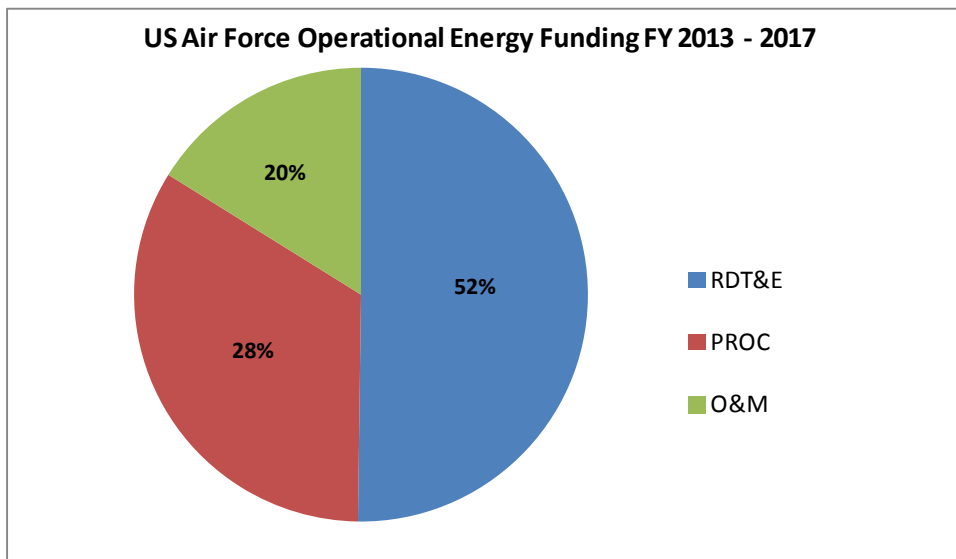
US Air Force Operational Energy Staff

The Under Secretary of the Air Force serves as the Senior Energy Official and is the Senior Operational Energy Official of the Air Force. The Assistant Secretary of the Air Force for Installations, Environment, and Logistics (SAF/IE) is responsible for supporting the Senior Energy Official and overseeing the energy program development and implementation. The Deputy Assistant Secretary of Air Force for Energy (SAF/IEN) provides guidance, direction, and oversight of Air Force matters related to energy and executes the day-to-day guidance of the Air Force's Senior Energy Official. The Deputy Assistant Secretary of Air Force for Energy is an SES and has a staff of eight personnel, one of which is focused on Operational Energy. Additional staff members are applied to the operational energy efforts as required. The Chief of Staff of the Air Force designated the Deputy Chief of the Air Force for Operations, Plans and Requirements (A3/5) as his lead on operational energy. The A3/5 has no staff focused on operational energy issues.

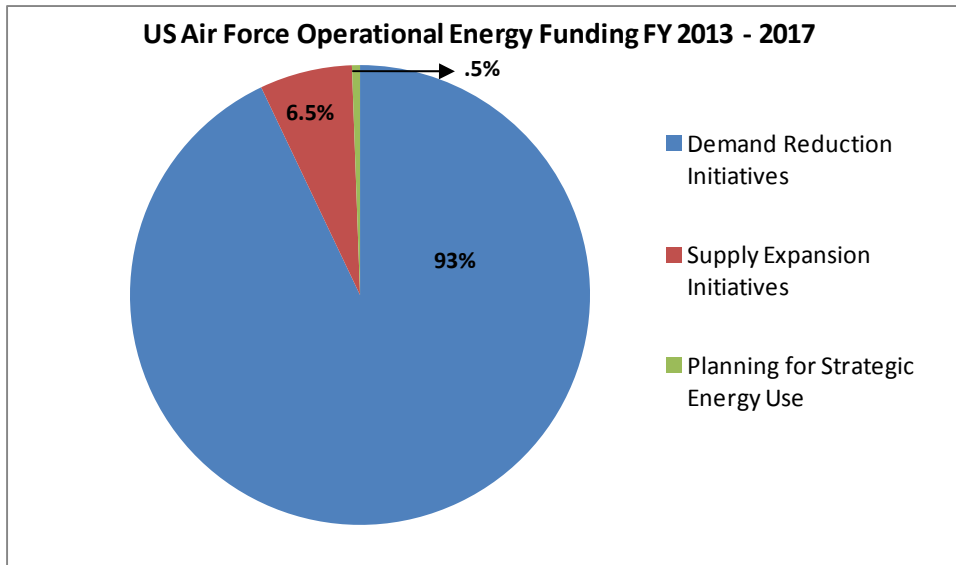
Air Force regulations direct the creation of a governance structure at the Department, Major Command, Direct-Reporting Unit, and Installation levels to manage energy. The structure provides cross-functional constructs to establish direction from the strategic to tactical level, as well as resolve issues impacting more than one organization or functional area. At the Department of the Air Force level, the Under Secretary of the Air Force and the Vice Chief of Staff of the Air Force co-chair the Air Force Energy Council. This council is supported by five steering groups and a Colonel's Action Group.

US Air Force FY 2013 Operational Energy Budget

The Air Force budgeted \$573.5M in FY 2013 and approximately \$2.4B across the FYDP for operational energy initiatives. The distribution across appropriations is shown below:



The majority of this funding, approximately 52 percent across the FYDP, is in RDT&E (\$344.4M FY 2013, \$1.3B FYDP). Procurement (\$95.9M FY 2013, \$674.3M FYDP) accounts for 28 percent of the funding through the FYDP while O&M (\$133.2M FY 2013, \$482.9M FYDP) accounts for the remaining 20 percent of the funding across the FYDP. The Air Force funding distributed across the DoD Operational Energy Strategy three principal objectives is shown below:



The Air Force budgeted \$536.7M FY 2013 and approximately \$2.2B across the FYDP for Operational Energy Demand Reduction Initiatives. FY 2013 funding of \$33.0M and \$157.1M across the FYDP was budgeted to Supply Expansion Initiatives. The remaining funding of \$3.8M in FY 2013 and \$13.7M across the FYDP was budgeted for Planning for Strategic Energy use.

More Fight, Less Fuel: Reduce Demand for Energy in Military Operations

Target 1: Measure Operational Energy Consumption

The Air Force has a number of initiatives on-going to include the Air Force Total Ownership Cost (AFTOC) database and the Air Force Energy Dashboard. The AFTOC database captures detailed fuel consumption data among other costs at the aircraft tail-number level. The Energy Dashboard provides visibility on energy consumption across the Air Force by collecting Vehicle data monthly and Aviation data quarterly. These efforts amount to an acceptable level of effort and investment at this time.

Target 2: Improve Energy Performance and Efficiency in Operations and Training

The Air Force budgeted \$232.7M in FY 2013 and approximately \$1.2B across the FYDP for initiatives to address “Target 2: Improve Energy Performance and Efficiency in Operations and Training.” Efforts aligned to Support Current Operations with Energy Improvements account for \$196.1M while efforts aligned to Improve the Operational Energy

Efficiency of the Military Departments account for \$36.7M in FY 2013.

Funded efforts aligned to Support Current Operations with Energy Improvements (\$196.1M FY 2013, \$957.8M FYDP) include procurement of vehicles supporting the Air Force deployable units along with the procurement and sustainment of Basic Expeditionary Airfield Resources (BEAR) sets. I do have questions about how these investments align with similar programs and projects in other services. I will task the CAWG to examine these issues closely as part of the FY 2014 Operational Energy Budget Certification process and develop recommendations to streamline and strengthen operational energy investments.

Funded efforts aligned to Improve the Operational Energy Efficiency of the Military Departments include funding (\$29M FY 2013, \$159.5M FYDP) for the KC-135 for procurement of 93 CFM Product Upgrade Program (C-PUP) kits in FY13 and 100 kits per year in FY14-17 that modify engines to increase fuel efficiency. Additional efforts include KC-10 drag reduction efforts (\$0.2M FY 2013, \$26.1M FYDP) and the Automatic Dependent Surveillance -Broadcast (ADS-B) Technology Insertion Plan (TIP) program (\$7.5M FY 2013, \$7.5M FYDP) which will provide aircraft with ADS-B capability to operate more efficiently in the National Airspace System (NAS) through optimum flight routing.

These investments amount to an acceptable level of effort and investment in this budget submission. However, I have concerns with regard to the level of investment the Air Force is making in improving the energy efficiency of the legacy and future fixed-wing aircraft fleet. This fleet is the single largest consumer of fuel in the DoD inventory. Many opportunities for energy efficiency upgrades, with favorable returns on investments, are available, particularly for the C130 and C-17 fleets.

Target 3: Promote Operational Energy Innovation

The Air Force budgeted \$336.9M in FY 2013 and approximately \$1.2B across the FYDP for initiatives to address "Target 3: Promote Operational Energy Innovation." Efforts in this target include both demand reduction and supply expansion.

Funding for demand reduction efforts is \$303.9M FY 2013 and \$1.1B across the FYDP. These efforts include Aerospace Propulsion and Power Technologies and Aerospace Vehicle Technologies, Adaptive Engine Technology Development, Materials Technologies, and other efforts.

- **Aerospace Propulsion and Power Technologies and Aerospace Vehicle Technologies** (\$74.9M FY 2013, \$432.2M FYDP). These efforts include the development of the Adaptive Versatile Turbine Engine, Highly Efficient Embedded Turbine Engine (HEETE), and the Integrated Vehicle Energy Technology (INVENT) programs, along with the development of blended wing designs, lightweight composite structures, and aero-efficiency improvements.
- **Adaptive Engine Technology Development (AETD) Technology Maturation** (\$181.9M

FY 2013, \$294.7M FYDP). This initiative leverages ADVENT technologies to mature engine design and aircraft integration to enable lower risk, lower developmental cost, and quicker acquisition.

- **Materials Technologies** (\$14.7M FY 2013, \$63.0M FYDP). This program will develop high-temperature materials for turbine engines and directionally tailored thermal management materials.

Funding for supply expansion efforts is \$33.0M FY 2013 and \$157.1M across the FYDP. These efforts include research into energy harvesting and solar cells (\$10.8M FY 2013, \$52.9M FYDP) along with research and evaluation of alternative fuels (\$20.1M FY 2013, \$89.5M FYDP) and aircraft engine compatibility (\$2.1M FY 2013, \$14.7M FYDP).

More Options, Less Risk: Expand and Secure Energy Supplies for Military Operations

Target 5: Promote the Development of Alternative Fuels.

The Air Force has completed extensive testing and fuels qualification. There is currently no funding beyond FY 2011 other the funding noted under Target 3: Promote Operational Energy Innovation. The Air Force has set a target to procure up to 50% of its fuel from alternative sources by 2016, if the fuel is market priced.

More Capability, Less Cost: Build Energy Security into the Future Force.

Target 6: Incorporate Energy Security Considerations into Requirements and Acquisition.

The Air Force FY 2013 budget includes funding (\$3.8M FY 2013, \$13.7M FYDP) to staff the AF Petroleum Agency (AFPA) and Joint Oil Analysis Program. The Air Force Petroleum Agency is the service control point for all Defense Logistics Agency fuel-related support issues and as such provides input into fuel requirements and acquisition, to include developing, evaluating, and recommending new or improved technologies to enhance effectiveness and efficiency of fuel operational support capabilities, and developing fuel quality assurance/surveillance standards and fuel product specifications. The Joint Oil Analysis Program (JOAP) provides a number of services, to include the most cost-effective means of determining the condition of lubricants, fluids, and mechanical systems. Air Force's HAF Energy Assessment Tool (HEAT) is a modeling and simulation (M&S) effort, which models future energy consumption by major weapon system and provides feedback on research and development efforts.

These efforts amount to an acceptable level of effort and investment in this budget submission. However, I remain concerned as to whether the Air Force has planned adequate future investments for the development and implementation of tools and systems to incorporate energy security considerations into Requirements and Acquisition. The Air Force has no funding plans to develop the M&S tools to enable their force planning and requirements development community to simulate and assess the combat capability effects of enemy attacks

on U.S. logistics forces. While we understand the STORM M&S tool the Air Force has used over the past several years has some innate capability to perform such simulations, there are no funding plans to vet the capability or to employ it to inform requirements development, acquisition program performance criteria, or fully burdened cost of energy estimates.

Target 7: Adapt Policy, Doctrine, PME and CCMD Activities

The SAF/IEN office is updating the Air Force's energy policy and energy strategic plan to include Operational Energy. In order to support the overall AF energy governance and the strategic way forward, SAF/IEN invested \$1.8M through March 2012 to support six key areas with an operational energy impact:

1. Strategic energy planning, program and policy, and oversight human capital development: provided support and products to continuously improve the Air Force's energy program.
2. Strategic evolution of Air Force governance and policy development: supported Air Force energy governance structure data-driven decision processes.
3. Strategic policy development of emerging energy environments to include modeling and analysis, operational energy, energy security, critical asset risk management development: develop policy recommendations related to emerging energy areas
4. Acquisition management, requirements determination, business case analysis and energy procurement development: address energy in legacy upgrades and future platform acquisition.
5. Aviation fuel and coordination with operations development: conduct baseline assessment, followed by strategies to accomplish the Air Force energy goals.
6. Strategic communication, marketing and enterprise wide development: design and implement a multi-phased strategic communications campaign.

The Air Force has included specific energy language in each of the 12 Core Function Master Plans and the Annual Planning and Programming Guidance documents. The language addresses all aspects of energy to include operational energy. These documents instruct Headquarters Air Force and Major Commands in the development of their budgets. Additionally, the AF is conducting an energy-focused table top wargame, which will take place in FY 2012 as part of an ongoing effort to include energy in wargaming activities.

In addition to the seven key areas, SAF/IEN teamed with the Air Force Research Laboratory and provided \$400k of congressional funds for an effort to define and manage operational energy throughout the Air Force. Part of this effort is to identify actionable operational energy gaps and solutions to improve operational energy efficiency across the AF and to develop an operational energy technology development strategy with recommendations for immediate RDT&E programs and future S&T gaps. This effort will take place over 12 months, and was initiated in March 2012.

Summary

My assessment of the adequacy of the Air Force’s funding for the DoD Operational Energy Strategy is shown below:

US Air Force	
Operational Energy Targets	Rating
Target 1: Measure Operational Energy Consumption.	G
Target 2: Improve Energy Performance and Efficiency in Operations and Training.	Y
Target 3: Promote Operational Energy Innovation.	G
Target 5: Promote the Development of Alternative Fuels.	G
Target 6: Incorporate Energy Security Considerations into Requirements and Acquisition.	Y
Target 7: Adapt Policy, Doctrine, PME, and CCMD Activities.	G

I certify the Air Force's FY 2013 budget as being adequate for the implementation of the *DoD Operational Energy Strategy*. However, I have concerns in regards to the level of investment the AF is making in improving the energy efficiency of the legacy and future fixed-wing aircraft fleet, and the development and implementation of tools and systems required to incorporate energy security considerations into Requirements and Acquisition.

**Defense Agencies and Office of the Secretary of Defense
FY 2013 Operational Energy Budget Certification Report**

Defense Logistics Agency (DLA)

DLA procures fuel for DoD through a revolving fund. Therefore, DoD components, not DLA, budget for their fuel purchases. Nevertheless, DLA does have two RDT&E efforts with operational energy impacts: Energy Readiness Program (ERP) and Battery Network. ERP (\$4.0M FY 2013, \$13.3M FYDP) supports Alternate Energy Development (AED) to include test and certification to support the addition of synthetic and alternative fuels to mobility fuel specifications. Battery Network (\$2.0M FY 2013, \$10.1M FYDP) is a manufacturing technology program focused on improving the supply and reducing the costs of batteries used in fielded weapons systems.

I Certify DLA's FY 2013 budget is adequate for the implementation of the DoD Operational Energy Strategy.

Defense Advanced Research Projects Agency (DARPA)

DARPA did not fund any operational energy projects in the FY 2013 budget, focusing instead on other areas. During FY 2012, DARPA will close out or transition all remaining operational energy programs to include:

- **Biofuel Alternative Feedstock Program.** This initiative seeks to broaden the portfolio of non-food competitive feedstock to algal, cellulosic, and other materials suitable for affordable and highly efficient production of alternatives to petroleum derived JP-8.
- **Low-cost Lightweight Portable Photovoltaics (POP).** This program demonstrates man-portable, rugged, lightweight, and low-cost photovoltaics to address remote power supply requirements. I have concerns as to whether this project transitioned fully to other performers and will seek to address the concerns with DARPA.
- **Tactical Advanced Power (TAP).** This program seeks to eliminate the constraints batteries can impose on dismounted warfighters by enabling direct electrochemical conversion of energy dense fuels; developing hybrid systems to maximize runtime; and validating short-range wireless power transmission system to create a Wi-Fi like power distribution hub.
- **VULCAN.** This effort seeks to build and test Pressure Gain Combustion (PGC) technology that demonstrates a 20 percent reduction in specific fuel consumption for marine and aviation turbines

I recognize the challenges DARPA faces with a reduced FY 2013 budget and commend the Agency for its investment in prior efforts with operational energy impacts, which are being transitioned. Given the operational energy innovation being funded in other DoD Components, the lack of investment by DARPA is probably within the acceptable risk range. In addition, operational energy innovation is integral to other DARPA projects such as VULTURE UAS.

However, I encourage the DARPA leadership to reconsider future investments in operational energy initiatives given that some of their past investments in energy innovation such as POP have directly benefited operational effectiveness.

The Office of the Secretary of Defense (OSD)

Within OSD, the Assistant Secretary of Defense for Operational Energy Plans and Programs (ASD(OEPP)), the Assistant Secretary of Defense for Research and Engineering (ASD(R&E)), and the Deputy Assistant Secretary of Defense for Manufacturing and Industrial Base Policy (DASD(MIBP)) each execute programs with operational energy impacts.

The ASD(OEPP)'s Operational Energy Capability Improvement effort provides \$26.2M FY 2013 and \$162.8M across the FYDP to improve the Department's operational effectiveness via targeted science and technology investments that are intended to improve the energy performance of key elements of our forces. As defense-wide funding, it incentivizes long-term change in the science and technology portfolio of the Department to be more in line with the Department-wide Operational Energy Strategy and fosters generally needed innovations to improve operational energy performance. This effort was a new-start in FY 2012 and the initial efforts include:

- **Innovative Cooling Equipment (ICE) Development/Demonstration Program.** ICE is a joint program between Army's Communications Electronics Research Development and Engineering Center (CERDEC), Office of Naval Research (ONR) and Army Research Laboratory (ARL) to identify and implement improvements (TRL 5 to TRL 7) in HVAC, controls, thermodynamics, and waste heat recovery, which will result in a state-of-the-art fleet of Environmental Control Units (ECUs).
- **Navy Expeditionary Technology Transition Program (NETTP).** NETTP will leverage Advanced Research Project Agency-Energy (ARPA-E) research and development heating and cooling technology efforts to transition advanced systems from the pilot effort, to reduce fuel consumption for heating and cooling by 20–50 percent.
- **Advanced, Energy Efficient Shelter Systems (AEESS) for Contingency Basing and Other Applications.** AEESS is a joint Army/Air Force program to address energy inefficiencies associated with shelter systems, particularly tents. It will develop and demonstrate technologies for a new generation of energy efficient shelters.
- **Super Energy Efficient Containerized Living Unit (SuperCLU) Design and Development.** SuperCLU is a Navy Facilities Engineering Command led program with U.S. Africa Command (AFRICOM) participation. This program seeks to improve the energy efficiency of current Containerized Living Units (CLUs) and developing a highly energy efficient CLU, called a SuperCLU.
- **Transformative Reductions in Operational Energy Consumption (TROPEC).** TROPEC is a Pacific Command (PACOM) led program with participation of the Marine Forces Pacific Experimentation Center and DoE Laboratories that will build a wide-reaching,

Report on Operational Energy Budget Certification for Fiscal Year 2013

sustainable program to identify and assess new and existing technologies that would reduce the energy demand of expeditionary outposts.

- **Operation Enduring Freedom Energy Initiative Proving Ground (OEFEP).** OEFEP will establish a quantitative baseline for energy use in actual expeditionary operations in Afghanistan and evaluate the impact of energy efficient technology.
- **Waste to Energy (W2E) for Forward Operating Bases.** The Strategic Environmental Research and Development Program (SERDP) will develop innovative approaches to decrease the size and increase the efficiency of a battalion-scale waste-to-energy converter gasification system that can work with existing tactical generators.

The ASD(R&E) pursues initiatives across multiple RDT&E Program Elements with potential operational energy impacts. On-going or recently completed efforts include:

- **Joint Capability Technology Demonstration (JCTD)** PE 0603648D8Z: Net Zero Plus (FY11), SPIDERS (FY11-12), along with FY12 & FY13 COCOM priorities which may include energy efficiency projects.
- **Quick Reaction Special Projects** PE 0603826D8Z Project P826: S150 Fuel Charging System (FY11); Afghanistan Microgrid Project (AMP) (FY11); and Alternative Energy, and Energy Efficiency and Reduction Technologies (FY12-13).
- **Quick Reaction Special Projects** PE 0603826D8Z Project P828: Submerged Launch System for a Fuel Cell Powered Long Endurance Expendable UAS for ISR (FY11), and Aluminum Combustor (FY11).
- **Foreign Comparative Test** PE 0605130D8Z: Micro-smooth Coating System (Navy) (FY11-12), Multi-Fuel Submersible Outboard Engines (FY11), Pyrolysis Solid Waste Disposal with Energy Recovery (Army) (FY11), Ultra High Energy Rechargeable Battery (Army) (FY11) FCT FY12 and FY13 Plans.

I certify the ASD(R&E)'s FY 2013 budget is adequate for the implementation of the DoD Operational Energy Strategy. During FY 2012, ASD(R&E) and ASD(OEPP) will conduct an assessment of operational energy science and technology investments which will inform future budget certifications.

The DASD(MIBP) is responsible for the Defense Production Act Title III program. This program allocates up to \$70M in FY 2013 for Advanced Drop-In Biofuel Production. The Advanced Drop-In Biofuel Production project's principal objective is to meet a Navy requirement through a government-industry partnership for the construction or retrofit of multiple domestic commercial or pre-commercial scale advanced drop-in plants and refineries. These plants will have the capability to produce ready, drop-in replacement advanced biofuels meeting military specification at a price competitive with petroleum in geographically diverse locations for ready market access, while having no significant impact on the supply of agricultural commodities for the production of food. I certify the DASD(MIBP)'s FY 2013 budget is adequate for the implementation of the DoD Operational Energy Strategy.

Marines at remote Patrol Base Boldak, Helmand Province, southern Afghanistan install a solar hybrid energy generation and storage system to allow their base to become more self-sufficient.

Photo Credit: Gayle Von Eckartsberg, USMC



Prepared by:
Assistant Secretary of Defense
for Operational Energy Plans & Programs
3700 Defense Pentagon
Washington, DC 20301-3700
<http://energy.defense.gov>