



# **American Recovery and Reinvestment Act of 2009**

## **Department of Defense Near Term Energy-Efficient Technologies Program Plan**

May 15, 2009

# 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 <b>15 MAY 2009</b>	2. REPORT TYPE	3. DATES COVERED <b>00-00-2009 to 00-00-2009</b>			
4. TITLE AND SUBTITLE <b>Department of Defense Near Term Energy-Efficient Technologies Program Plan</b>		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) <b>Department of Defense, Washington, DC, 20301</b>		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 <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>24</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

**NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN****A. Funding Table**

<b>Appropriation</b>	<b>Amount (\$000s)</b>
Research, Development, Test and Evaluation - Army	\$75,000
Research, Development, Test and Evaluation - Navy	\$75,000
Research, Development, Test and Evaluation – Air Force	\$75,000
Research, Development, Test and Evaluation - Defense-Wide	\$75,000
<b>Total</b>	<b>\$300,000</b>

Additional details on funding, allocated by project and activity for the Near Term Energy Efficiency Technology Program, are found in Attachment A.

**B. Objectives****Program Purpose**

The American Recovery and Reinvestment Act of 2009 (Recovery Act) provides \$300 million in funding for the Department of Defense Research, Development, Test, and Evaluation (RDT&E). This program investigates technologies that can satisfy capability gaps, present opportunities for military applications, or spur initiatives within industry. Efforts focus on engine efficiencies; cost-effective solar energy photovoltaics; fuel cells; alternative fuel testing; mobile waste-to-energy; and tactical micro-grids.

**Public Benefits**

RDT&E provides significant benefits to the general public with emphasis on transitioning military relevant technology from the laboratory to fielded capability. Transition shall occur either directly, through development of capability in industry, or through formal acquisition programs of record.

While looking at the bigger picture, we know Department of Defense energy issues cannot be viewed in isolation - they are a subset of the larger national challenge. Reducing dependence on imported energy is a critical national issue that must be addressed. Energy is essential to military operations. Important missions and programs are at risk today from interruption of energy supplies and increasing cost. Therefore, with these near term efficient energy technologies, the Department of Defense will seek to bridge some of the capability gaps and look to proactively respond to the energy

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN

---

challenge. In addition to facility improvements described separately, the Recovery Act funds \$300 million for 51 energy research programs by the Military Services to reduce the Department's energy demand via increasing fuel efficiency or advancing new technologies related to alternative energy sources. This research could directly benefit the Department and the nation by reducing the cost (anticipated range from 5-25%) and security burden (uninterrupted operations, while putting fewer service members in harm's way) of fueling operational forces.

### C. Activities:

The Near Term Energy Efficient Technologies Program will conduct 51 research and development projects. Project titles, locations, and estimated costs were provided in the Reports to Congress submitted on March 20, 2009 and April 28, 2009. These projects cover these five topics:

- Fuel Optimization for Mobility Platforms:
  - Testing various materials, like ceramics, in engine and equipment design to lower thermal loads and decrease the need for cooling of component parts that require additional energy to perform the cooling tasks
  - Demonstrations on the fuel efficiency of Low Observable subsonic propulsion systems in aircraft and small-scale propulsion systems for Unmanned Aerial Vehicles (UAVs)
  - Engine improvements to improve fuel efficiency
  - Airframe modifications to demonstrate drag reduction and better aerodynamics
- Facility Energy Initiatives:
  - Developing or reviewing off-the-shelf enterprise energy auditing programs and software that can couple energy security with energy efficiency
  - Reducing power consumption in tactical heating and air conditioning systems and environmental control units
  - Whole-building energy modeling and monitoring systems
- Operational Efficiencies/Commercial Practices:
  - Developing or reviewing off-the-shelf enterprise energy auditing and water management programs and software that can couple energy security with energy efficiency
  - Whole-building energy modeling, monitoring systems capable of identifying, classifying, and quantifying energy and water consumption deviations from design intent or optimal; recommend, prioritize, and implement corrective actions.
- Domestic Energy Supply/Distribution:

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN

---

- These include waste-to-energy and waste-to-fuel technology research and demonstrations; landfill gas use; biomass and algae fuel oil production; multi-junction solar photovoltaics for cells and sensors; wave and thermal energy from oceans; wind power and analyzing radar cross sections and noise control on wind turbines.
- Tactical power Systems /Generators:
  - Develop and demonstrate methanol-based portable fuel cells with improved energy densities
  - Long-duration multi-junction photovoltaics for UAVs
  - Fuel cells
  - Scalable micro-grid electrical distribution systems for fixed and tactical installation use

### D. Characteristics

#### Type of Award

Unlike contracts for other services and supplies, most Research and Development (R&D) contracts are directed toward objectives for which the work or method cannot be precisely described in advance. It is difficult to judge the probabilities of success or required effort for technical approaches. Although the Government ordinarily prefers fixed-price arrangements in contracting, this preference applies in R&D contracting only to the extent that goals, objectives, specifications, and cost estimates are sufficient to permit this preference.

Given this disposition, the Department forecasts a smaller percentage of Fixed Price contracts for anticipated Recovery Act Near Term Energy-Efficient Technologies Program projects. Department of Defense total awards will total \$0.3B.

At this time, 49 out of the 51 projects will utilize some type of contract, and 2 projects will utilize a competitive grant. The contract types include: Cost-Plus-Fixed-Fee; Task Order; Small-Business Innovative Research Phase II; Small Business Technology Transfer; Sole Source; and Indefinite Delivery/Indefinite Quantity. There is also one effort utilizing an Alaskan Native Corporation Contract. At least 56% of planned contract dollars for the Recovery Act are anticipated to be awarded on a fixed-price basis; 5.8% for competitive grants; 8.5% for Task Order; 2.8% to Small Business Innovative Research/Small Business Technology Transfer; 7.6% for Cost-Plus-Fixed-Fee; 12% for Sole Source efforts; and 4.5% for Indefinite Delivery/Indefinite Quantity. This projection is based on acquisition plans that have been developed by the Military Services and the Defense Logistics Agency.

#### Targeted Recipients

In order to obtain a broad base of the best contractor sources from the scientific and industrial community, the Department researches to find sources competent to perform

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN

---

R&D work. The targeted type of recipients for the program includes federal agencies, small businesses, and profit organizations. The Department is committed to maximizing small business opportunities within Department of Defense acquisitions and recognizes that small businesses play a critical role in stimulating economic growth and creating jobs, which is one of the primary goals of the Recovery Act. The Department adheres to the Federal Acquisition Regulations Part 19, Small Business Programs, which allows agencies to make awards both competitively and noncompetitively to various types of small businesses. The use of these socio-economic programs enables contracting activities to maximize small business participation in Federal contracting. The Department will make every effort to provide maximum practicable opportunities for small businesses to compete for agency contracts and to participate as subcontractors in contracts that are awarded using Recovery Act funds. Department of Defense contracting activities will work with their small business offices and coordinate with the Department's Office of Small Business Programs to maximize small business opportunities that use Recovery Act funds.

Similarly, the targeted beneficiaries include local governments (city/county), minority groups, small businesses, engineer/architect, builder/contractor/developer, and for-profit organizations (other than small businesses).

### **Methodology for Award Selection**

Competition is the preferred methodology for award selection. The Department of Defense continues to promote full and open competition in its acquisition processes and to provide for full and open competition after exclusion of sources (such as excluding large businesses from a small business competition). This facilitates awarding the best value to benefit the warfighters and the taxpayers. Given the importance of the Recovery Act dollars in stimulating the economy, the Department has taken extra steps, including frequent communications with Senior Procurement Executives (SPEs), regarding the expectations for contract implementation. SPEs in the Department are communicating more frequently with their respective acquisition workforce, including flash notices and reminders of Recovery Act regulations, specifically the importance of competition.

Consistent with law and OMB guidance, exclusions to full and open competition are allowable. However, competition will be used to the maximum extent practical for Recovery Act funds. When other than full and open competition is utilized the appropriate documentation and reporting will occur to meet the requirements of the Federal Acquisition Regulation and the Recovery Act.

At this time, Department of Defense expects to award at least 80%, or \$0.24B, of Near Term Energy-Efficient Technologies Program contract dollars on a competitive basis. This projection is based on acquisition plans that the Military Departments developed.

### **E. Delivery Schedule:**

While each project within the Near Term Energy-Efficient Technologies Program is unique in its schedule and size, all of the schedules can be broadly divided into four

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN

---

delivery phases. Completion of individual phases will represent the project milestones from a portfolio delivery perspective.

**Planning Phase:** The portfolio planning phase commenced when requirements were identified by the Services. Within the construct of the Energy Security Task Force, and more specifically the Energy Security Strategic Plan, each Service and Defense-Wide agencies submitted multiple energy-related RDT&E candidate projects, studies and proposals for review in five broad areas listed above. Candidate projects were submitted to the ESTF, which reviewed and de-conflicted funding to be spent on the same kinds of research. Programs were also assigned a priority based upon near-term demonstration ability. This effort focused on “shovel ready” projects that were included in the Department’s Expenditure Plan on March 20, 2009. The designation “shovel ready” meant that planning was already complete on a project level. One hundred percent (100%) of the projects have completed the planning phase.

**Procurement Phase:** The procurement phase is currently ongoing as Military services are working to obligate Recovery Act funds in a prompt manner. For projects that may be using existing competitively awarded contracts, this phase will include negotiating a nature/price for the work, finalizing the statement of work, and then developing deliverables. For projects completed by competitive bid, the procurement phase will involve advertising for a statement of work, identification of the best offer and award of the work. The bottom line is that Department of Defense will seek to obtain the best value for the funds expended. Contracts are estimated to be awarded starting in May 2009, with completion of the last portions in Feb 2010.

**Project Execution Phase:** Once the procurement phase is complete, the selected team will start work on the project. The execution phase will vary on a project-by-project basis due to the scope and complexity of each individual project. Obligations are estimated to begin thirty to sixty days after contract award and continue until expended.

**Project Completion Phase:** DoD officials will review and approve each project upon completion of the various research and demonstration phases. The project completion phase will vary on a project-by-project basis due to the scope and complexity of each individual project. RDT&E projects are estimated to begin in May 2009, with estimated completion twenty-four months after project award.

### F. Environmental Review

The American Recovery and Reinvestment Act (Recovery Act) funds 51 Near Term Energy Efficiency Research, Development, Testing and Evaluation projects valued at \$ 300 million. In each case, the Department follows the rigorous requirements outlined in the National Environmental Policy Act of 1969 (NEPA), the National Historic Preservation Act of 1966 (NHPA), and all other statutes that involve protecting vital land resources under Department of Defense stewardship.

While the National Historic Preservation Act does not apply to research projects within the Near Term Energy Efficient Technologies Program, the Department of Defense has a long and successful program to comply with NEPA. Department of Defense’s policy is in Department of Defense Instruction 4715.9, Environmental Planning and Analysis, which can be found on the internet at <http://www.dtic.mil/whs/directives/corres/pdf/471509p.pdf>. Each

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN

---

of the Military Departments and Defense Agencies was required to demonstrate how they would comply with NEPA prior to selection of each military construction project using ARRA funds.

In addition, the Department is tracking the compliance with NEPA for every project and reporting status, as required, to the Council on Environmental Quality. The Department is using the full range of actions available under NEPA:

- An Environmental Impact Statement when projects are known to have a significant effect on the environment.
- An Environmental Assessment (EA) for actions in which the significance of the environmental impact is not clearly established. Should environmental analysis and interagency review during the EA process find a project to have no significant impacts on the quality of the environment, a Finding of No Significant Impact is issued.
- Categorical Exclusions for actions that do not individually or cumulatively have a significant effect on the environment.

It was determined that within the Near Term Energy Efficient Technologies Program, over ninety-five percent (95%) of the projects are expected to be classified as categorical exemption from NEPA. No other environmental compliance issues are expected.

The remaining projects have either had an Environmental Assessment conducted or will be conducted in the near future.

Examples of some programs complying with other existing statutes are as follows: Army: Phase I and Phase II assessments by the Detroit Arsenal Department of Public Works; Montreal Protocol on Substances That Deplete the Ozone Layer and 1990 Amendments to the Clean Air Act; and Defense-Wide: a lifecycle greenhouse gas analysis has been performed regarding fuel derived from this technology in comparison with the Greenhouse gases, Regulated Emissions, and Energy use in Transportation (GREET) Model and the results are well below the established conventional petroleum baseline; and fuel canisters will be designed for reuse or recycling to minimize environmental impact.

Finally, the Military Departments and Defense Agencies selected projects for Recovery Act funding based, partly, on the ability to comply with NEPA, NHPA, and environmental statutes within the timeframes, including permits for Clean Water Act and Clean Air Act. The Department recognizes that if projects that have a higher risk of affecting these critical environmental laws, they would take longer to execute and not provide the rapid economic stimulus envisioned by the Recovery Act.

### G. Performance Measures

In meeting the requirements of the Recovery Act, the Department has established performance measures for the Near Term Energy Efficiency Technology Program consistent with the intent and goals of the Recovery Act and OMB Program Assessment Rating Tool. These performance measures are supported by quantifiable outputs and have designated measurement frequencies. The outcomes of the performance measurements will be readily accessible to the public on the website



## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN

---

www.Recovery.gov, and the data will be updated based on the established Measure Frequency.

The following performance goals will be used to measure progress in meeting the requirements of the Recovery Act:

- Jobs Created and Retained with the Recovery Act  
This output measure will identify contractor-reported number of jobs created and retained by Recovery Act funded work. This output measurement will be collected from recipients at [www.federalreporting.gov](http://www.federalreporting.gov).
- Percent of Total Dollar Value of Recovery Act Projects Awarded  
This output measurement will measure the total dollar value of Recovery Act projects awarded divided by total dollar value of Recovery Act projects. This output measurement will be sampled monthly and tracks the status of total funding for awards made with the Recovery Act.
- Percent of Total Dollar Value of Recovery Act Research executed at Universities  
This output measurement will measure the percentage of total R&D dollars executed at Universities. This output measurement will be sampled monthly and tracks the status of projects executed at Universities made with the Recovery Act.
- Number of New Products entering Commercial Market  
This output measurement will measure the numbers of products that will provide usefulness/employment of new products within Department of Defense and/or industry. This output measurement will be sampled yearly and tracks the status of technologies that may be transitioned further within the Government and/or industry.

### H. Monitoring and Evaluation

Review of the progress and performance of major programs, including risk-mitigation and corrective actions, is guided by the Risk Management Plan developed by the Department in accordance with the Office of Management and Budget (OMB) Circular A-123, Management's Responsibility for Internal Control. The Department's current Management's Responsibility for Internal Control process has a Senior Assessment Team that is lead by Principal Deputy Under Secretary (Comptroller), who is also the Responsible Officer for the Department's Recovery Act funding. As part of the Risk Management Plan, each program will be evaluated on a quarterly basis, with a Risk Profile being submitted to the Office of the Under Secretary of Defense, Comptroller and Chief Financial Officer.

Identifying areas of high risk and high and low performance will be conducted through the Department's Recovery Act Risk Management Plan, which is initiated with a Risk Assessment and Gap Analysis. This initial evaluation will be a one-time occurrence that will provide an overview of management capabilities and assist senior leadership with assessing their people, processes and technology to determine and coordinate

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN

---

resources necessary to meet the initial demands of obligating funds and public reporting. The risk assessment will review internal controls on human capital, performance, and measurement tools. This risk assessment will also evaluate the potential for financial, reporting and procurement risks; analyze Information Technology (IT) systems; and review results from any audits and investigations. Upon completion of the risk assessment, a gap analysis will be conducted.

The periodic review of each program's progress to monitor and evaluate risk management will require the completion of a Risk Profile, the second step in the Department's Risk Management Plan. This evaluation will be conducted on a quarterly basis and will be submitted to the Office of the Under Secretary of Defense, Comptroller and Chief Financial Officer. The completion of the Risk Profile will be a process wherein the programs will build upon each prior deliverable. This process will identify any significant uncorrected weaknesses of each program and provide more detailed information related to the questions identified in the Risk Assessment and Gap Analysis. Any program areas that require mitigation will be required to submit a Risk Management Strategy. This action strategy report will include a description of the issue, the pace of corrective action, the methodology to ensure the effectiveness of the correction action(s), the performance measures that will be achieved, and major milestones that have been taken and are planned for the future. Each program will continue to validate and test the effectiveness of mitigation strategies for the Recovery Act funds.

Additionally, the remainder of the monitoring will be done at the Project level, led by the individual Program Managers. Some examples of other techniques that will be used to aid the monitoring and evaluate any issues include: presentations, design reviews - both preliminary and critical design; monthly face-to-face status reviews; monthly VTC/Conference calls and quarterly program management review meetings; development of Integrated Master Schedules, Contract Progress Status Reports, and Contractor Funds Status Reports; and development of various contract deliverable line items such as, Monthly Funds & Man-Hour Expenditure Reports, cost vouchers, and Status Report & Project Planning Chart.

### **I. Transparency:**

The Office of Management and Budget (OMB) has established the Recovery.gov website to provide the public with unprecedented visibility. The Department of Defense will be providing financial and contractual information to the Recovery.gov site using existing information systems. DoD will eventually be required to report performance information collected through the Department's Recovery Act Risk Management Plan to OMB; however, initially this information will only be collected for internal agency use.

Due to the magnitude of normal budgeting for national defense, the Office of the Under Secretary of Defense (Comptroller) has established a centralized Business Enterprise Integration System (BEIS) for financial review and internal control. The Department will use BEIS to handle financial tracking, particularly obligation and execution data, at a project-level. This ensures compliance with general financial management policies pertaining to the Recovery Act.

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN

---

The Department will capture contract award information using the Federal Procurement Data System (FPDS), identifying Recovery Act procurement actions in accordance with the guidance provided by the Office of Management and Budget.

### J. Accountability:

Accountability for the execution of Recovery Act programs is enforced in all Department of Defense components receiving Recovery Act funds. The Department of Defense will use the existing civilian and military service performance regulations and policies (such as Career and Non-Career Senior Executive Service (SES), National Security Personnel System (NSPS), General Schedule (GS)) to assess, review, reward and penalize results in carrying out the American Recovery and Reinvestment Act. Recovery Act activities are considered a part of a manager, employee, and Service member's duties; and performance will be reviewed within existing assessment cycles.

Performance success and failures will also be rewarded and enforced respectively for the execution of Recovery Act funds through the Department's Risk Management Plan. This management plan includes setting priorities and performance measures and encourages the workforce to improve the overall performance of the Department for the Recovery Act and beyond. As part of the Risk Management Plan, each program is directed to identify the roles and responsibilities of management and upper level management and the processes that management follows to ensure that program and projects are reviewed on a frequent basis.

Additionally, at the project level, various other techniques will be used. One example is as follows: the Air Force, within AFRL management, will regularly review projects as part of the standard Program Management Review process which includes an in-depth review of financial and technical progress. In addition, major technical milestones will be presented to the Technical Review Boards of both the Propulsion Directorate and Materials & Manufacturing Directorate for review and comment.

### K. Barriers to Effective Implementation:

The Department's mission to provide technologies and services necessary to support our military forces in a cost effective, safe, sustainable, and environmentally sound manner is what we attempt to accomplish on a daily basis. It is a complex and costly mission. In addition to facility improvements, the Recovery Act funds \$300 million for 51 energy research programs by the Military Services to reduce the Department's energy demand via increasing fuel efficiency or advancing new technologies related to alternative energy sources. This research could directly benefit the Department and the nation by reducing the cost and security burden of fueling operational forces. Improvements will also result in advancement of military readiness necessary to meet national security challenges of the 21<sup>st</sup> century.

Barriers to implementation cannot be identified as across-the-board concerns. They must be identified as pertaining to each individual Military Service and well as with Defense-Wide projects. Not every project has identified barriers, but those that have can be summarized as follows:

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN

---

### **ARMY:**

- Success of efforts depends on availability of silicon carbide components. Reliable, high temperature silicon carbide devices have been demonstrated at high current levels, but full power operation for military applications requires some increase in silicon carbide power module current ratings.
- Although overhead funding is available for Contracting and Program Management duties, no funds are available to researchers to contribute to the research and assist in project planning. This will limit the intellectual gain for use in future research.
- Projects will require a significant amount travel by contractors. Some of this travel should be done in the company of Government employees (for coordination and QA/QC) which is a burden on overhead.
- There are no current Army requirements for photovoltaics. Need to develop applications and users.

### **NAVY:**

- Despite technological advances in electric machine technology, system integration challenges remain within the constraints of the existing DDG-51 Class design.
- Final designs may not ensure that contractor can execute installation and operational phases as currently planned.
- Final system economics and energy savings will be based on energy and construction costs at time of final installation.
- Final system design may not ensure that contractor can execute installation and operational phases to meet projected cost savings as currently planned.
- Bio-JP-5 fuel procurement delivery schedules.

### **AIR FORCE:**

- Some executing agencies will require at least 30 to 60 days from receipt of funds to ensure proper procurement of the previously described research and development tasks
- Availability of mission ready, military specification equipment to meet the project requirement is limited. This demonstration may require a combination of commercial and deployable product to meet the statement of work. Advanced development of proven alternative power technologies could be required posing a schedule slip requiring a longer period of performance
- Intellectual property agreements will be worked out prior to issuing the research grant to ensure that IP concerns do not slow research progress
- Any proposed contracting actions in response to Broad Area Announcements, to include any administrative process or by a protest received from a non-successful prospective contractor may delay schedules
- As with any Small Business Innovation Research / Small Business Technology Transfer awards, effective implementation will rely heavily on the

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN

---

success of the contractor, as well as the technology readiness level of the technology at the end of the effort.

### **DEFENSE-WIDE:**

- The only uncertainty is within the long term plans of domestic automakers for their modern diesel engines. This may create risks that will need to be addressed.

The Department of Defense is prepared to work through any barriers that may occur during the implementation of the Recovery Act and does not anticipate any major setbacks in achieving the goals and requirements outlined. The Department will also be continuously reviewing execution of its projects to be better prepared to react should resource competition affect implementation of projects funded through the Recovery Act.

### **L. Federal Infrastructure Investments:**

The Department of Defense has issued policy guidance for implementing energy and water efficiency and other sustainability requirements included in the Energy Policy Act of 2005, Executive Order 13423, and Energy Independence and Security Act of 2007. Department of Defense Components have developed subordinate policies for implementing the legislative and Executive Order requirements as well. For example, each of the three (3) Military Departments (i.e. Navy/Marine Corps, Air Force, Army) has a policy that includes using Leadership Energy and Environmental Design (LEED) Silver Certification as a basis for new construction sustainability; a metering implementation plan; an energy professional training program; and awareness and award programs. The Department has developed and implemented Unified Facilities Criteria to ensure new construction and major renovation projects comply with applicable requirements and goals. The Department of Defense Energy Program also includes initiatives for audit programs

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN – ATTACHMENT A

## Funding Table with Major Milestones

Category	Project Title	Description	(\$ M)
<b>Fuel Optimization for Mobility Platforms</b>	<b>PROPULSION / ELECTRIC DRIVE / ENGINE EFFICIENCY</b>		
	Advanced Power Electronics Ground Systems Testbed Equipment	Enhanced laboratory facilities and instrumentation to perform integrated power and thermal management across a spectrum of power regimes (micro power to 100s of kW). Leverages a baseline of advanced high power, high temperature electronics efforts for high density conversion on future Army platforms. State-of-the-art research and development (R&D) for enhanced modeling, simulation, and testing of all military ground vehicles from sub-system components to systems of systems, with focus on hybrid and electric power subsystems.	14.580
	High Temperature Silicon Carbide (SiC) Power Semiconductors (Applied Research)	This will enable more electric Army vehicles, heavy commercial vehicles, and mobile, exportable power systems. SiC is currently produced in limited quantity because of material impurities. Significant material advances have been achieved by several companies in the U.S.	12.150
	High Temperature Silicon Carbide (SiC) Power Semiconductors (Applied Development)	This will enable more electric Army vehicles, heavy commercial vehicles, and mobile, exportable power systems. SiC is currently produced in limited quantity because of material impurities. Significant material advances have been achieved by several companies in the U.S.	12.150
<b>FUEL OPTIMIZATION FOR MOBILITY PLATFORMS TOTAL:</b>			<b>38.880</b>

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN – ATTACHMENT A

Category	Project Title	Description	(\$ M)
Facility Energy Initiatives	Ultra Low Energy Community Systems	Develop concept, methodology, technology integrations, and master planning for a specific Army campus to achieve ultra low energy community systems. Most promising concepts will be demonstrated at candidate installations such as Ft Irwin and Ft Carson. The outcome of the work will be readily implementable for all Army ultra low energy applications from installations to deployed bases.	2.916
	Energy Security Audit & Islanding Methodology	Develop energy security self audit model to include the development of metrics to describe the energy security state of critical missions, and utilize this with existing Anti Terrorism/Force Protection (AT/FP) processes at the 16 force projection installations. Identify actionable projects for each installation to achieve energy security.	6.804
	<b>FACILITY ENERGY INITIATIVES TOTAL:</b>		<b>9.720</b>
<b>RENEWABLE DEVELOPMENT AND TESTING</b>			
Domestic Energy Supply/Distribution	Lightweight, Flexible, Cost Effective Solar Energy Photovoltaics	Develop flexible photovoltaic devices and cells for sensor, Soldier, and autonomous systems. Investigate novel approaches, highly integrated advanced materials, electronic devices and structures to enhance weight, space reduction and self powering for emerging flexible and specialized electronics. Program will leverage and accelerate development and demonstration of integrated flexible solar cells, and high-efficiency solar cell film technology for renewable energy sources for the Army which will also have commercial applicability.	14.580
	<b>DOMESTIC ENERGY/SUPPLY DISTRIBUTION TOTAL:</b>		<b>14.580</b>

**NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN – ATTACHMENT A**

Category	Project Title	Description	(\$ M)	
<b>SMALL SCALE CO-GENERATION</b>				
<b>Tactical Power Systems/ Generators</b>	Develop smaller, lighter cogeneration and absorption environmental control systems	The ammonia-water and lithium-bromide absorption cycles hold significant promise for direct waste-heat to cooling cogeneration applications. Both technologies are expensive and require minimization of components to be viable for mobile applications.	6.318	
	<b>MICRO-GRIDS</b>			
	Micro-Grid Field Scaled Demonstration	We propose a demonstration of a full power architecture suite. Successful completion of this demonstration is a major step toward enabling Army to implement microgrid power architecture for deployed bases too. Will develop software and hardware required for a mini or micro-grid arrangement to support an installation and the NetZero initiative. It needs the capability to handle input energy supplies from Solar, Wind, Biomass, and other.	3.402	
<b>TACTICAL POWER SYSTEMS/GENERATORS TOTAL:</b>			<b>9.720</b>	
<b>SBIR/STTR SMALL BUSINESS INNOVATIVE RESEARCH</b>				
SBIR/STTR	SBIR/STTR	The overall objective of this effort is to identify 3 – 4 projects coming out of the Army SBIR program that address energy issues, meet Army requirements, and broaden the small business base. These may be new efforts (Phase I or Phase II) or additional work put on existing efforts to speed transition and/or expand usability of small business products (Enhancements or Commercialization Pilot Program efforts). Augment the Army STTR investment and level of effort in soldier and soldier equipment electric power sources of higher efficiency and higher reliability.	2.100	

ARMY TOTAL: 75.000



## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN – ATTACHMENT A

Category	Project Title	Description	(\$ M)
Fuel Optimization for Mobility Platforms	<b>PROPULSION / ELECTRIC DRIVE / ENGINE EFFICIENCY</b>		
	On-Board Vehicle Power	Diesel electric drive train for efficiency improvement and export power generation.	3.888
	<b>AIRCRAFT FUEL EFFICIENCY</b>		
	F18 Engine Efficiency Improvements	Develop and test technologies to improve fuel efficiency of F 414 engine used in F18 E/F/G (DON Unique); Attacks highest fuel burner.	15.552
	Aircraft Energy Conservation RDTE Program	Institute aircraft energy conservation program; Upgrade air flight performance modules and performance navigation. T56 engines (C130, C2 & E2) and mission planning	1.458
	<b>SHIP FUEL EFFICIENCY</b>		
	Hybrid Electric Drive System Development for Surface Combatants	Develop & test (land-based and at-sea) electrical rotating machine, converter power electronics, supervisory control system, and ship integration for hybrid electric drive system. Reduce DDG-51 fuel consumption and increase mission effectiveness through longer time on station. Supports cruising speeds (< 12 kts) without the use of main propulsion. Provides the foundation towards propulsion derived ship service and ultimately energy storage.	26.244
	Advanced High Energy HVAC System	Develop and test advanced high efficient shipboard HVAC system to reduce fuel used to provide shipboard cooling.	2.624
	Navy Shipboard Energy Program	Accelerate Ship Energy Conservation Program (e.g., LED lighting, steering on amphibs); Immediate impact (existing program), and funding will accelerate program.	1.652
<b>FUEL OPTIMIZATION FOR MOBILITY PLATFORMS TOTAL:</b>			<b>51.418</b>
Facility Energy Initiatives	<b>OPERATIONAL CHANGES</b>		
	Improved Environmental Control Equipment	Reduced Power Consumption in Tactical HVAC; Reduces convoy needs.	3.402
	<b>FACILITY ENERGY INITIATIVES TOTAL:</b>		<b>3.402</b>

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN – ATTACHMENT A

Category	Project Title	Description	(\$ M)
Domestic Energy Supply/Distribution	<b>RENEWABLE DEVELOPMENT AND TESTING</b>		
	Ocean and Wave Energy Utilization - OTEC	Demonstrate feasibility to utilize wave and thermal energy from oceans to provide renewable energy for shore installations. This will demonstrate feasibility of full scale project for Diego Garcia. Advances technology.	8.554
	<b>ALTERNATIVE FUELS</b>		
	Alternative Test Fuel and Cert Protocol Acceleration	Accelerate testing of alternative fuels for use in Naval tactical vehicles - ships, aircraft, and USMC combat vehicles to finish by 2010. Applicable for F18 and other airframes and maritime	5.152
	<b>ALTERNATIVE ENERGY SOURCES</b>		
	Plasma Fusion (Polywell)	Demonstrate fusion plasma confinement system for shore and shipboard applications; Joint OSD/USN project.	1.944
<b>DOMESTIC ENERGY SUPPLY/DISTRIBUTION TOTAL:</b>			<b>15.650</b>
Tactical Power Systems/Generators	<b>SMALL SCALE CO-GENERATION</b>		
	Integrated Generator / Environmental Control	Integrated COGEN for fuel savings / improved power generation for tactical system	2.430
	<b>TACTICAL POWER SYSTEMS/GENERATORS TOTAL:</b>		<b>2.430</b>
SBIR/STTR	<b>SBIR/STTR SMALL BUSINESS INNOVATIVE RESEARCH</b>		
	SBIR/STTR	The overall objective of this effort is to identify 3 – 4 projects coming out of the Navy SBIR program that address energy issues, meet Navy requirements, and broaden the small business base. These may be new efforts (Phase I or Phase II) or additional work put on existing efforts to speed transition and/or expand usability of small business products (Enhancements or Commercialization Pilot Program efforts). Augment the Navy STTR investment and level of effort in soldier and soldier equipment electric power sources of higher efficiency and higher reliability.	2.100

**NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN – ATTACHMENT A**

Category	Project Title	Description	(\$ M)
----------	---------------	-------------	--------

NAVY TOTAL: 75.000

PROPULSION / ELECTRIC DRIVE / ENGINE EFFICIENCY				
<b>Fuel Optimization for Mobility Platforms</b>	HEETE	Conduct demonstrations of fuel efficient, LO compatible subsonic propulsion system core engines that support future ISR, UAVs, tankers and mobility extreme endurance and range requirements.	4.860	
	ADVENT	Conduct demonstrations of multi-design point adaptive turbine engines that automatically adjust fan and core airflow and pressures for optimized performance and fuel efficiency at all flight conditions.	5.832	
	ESSP	Conduct demonstrations of small scale propulsion systems to reduce fuel consumption for Unmanned Air Vehicles (UAV) and power generators; using unconventional configuration that enables high pressure ratios, high bypass ratios, mission adaptive technology features, and distributed vehicle power integration improvements.	4.860	
	Materials for Green Propulsion	Define risk reduction projects for advanced materials and manufacturing technologies that will deliver improvement in fuel burn and a reduction in greenhouse gas emissions for both fielded and next generation commercial and military turbine engines.	5.832	
	AIRCRAFT FUEL EFFICIENCY			
	Aft-Body Drag Reduction	Design and demonstrate drag reduction of finlets mounted on the sides of the aft fuselage of cargo type aircraft. The finlets would be 12-18 inches wide and approximately 6 foot long. They create a vortex flow which induces upwash to eliminate the separated flow behind the cargo ramp.	6.804	
	<b>FUEL OPTIMIZATION FOR MOBILITY PLATFORMS TOTAL:</b>			<b>28.188</b>

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN – ATTACHMENT A

Category	Project Title	Description	(\$ M)
Operational Efficiencies/ Commercial Practices	<b>MODELING AND SIMULATION</b>		
	Global Solar Prediction Model	Develop comprehensive object-oriented framework and database management software for Airbase solar power systems design and simulation.	0.972
	<b>OPERATIONAL EFFICIENCIES/COMMERCIAL PRACTICES TOTAL:</b>		<b>0.972</b>
Domestic Energy Supply/ Distribution	<b>RENEWABLE DEVELOPMENT AND TESTING</b>		
	Ult-Hi Eff Multijunction Solar Cells	Evaluate advanced multijunction solar cells based on 4 and 5 junction inverted metamorphic structures with promise of reaching greater efficiency for space applications, and greater concentration for terrestrial applications.	17.496
	Solar Cell Transparent Conductor	Develop and test alternatives to Indium Tin Oxide for the transparent electrodes in solar cells. Alternatives include, but are not limited to, non indium containing conductive oxides, conductive polymer, and carbon nanotube based electrodes.	0.972
	Self Sustain Energy Tech for BEAR	Develop and demonstrate a prototype for Basic Expeditionary Airfield Resources (BEAR) support to include a sustainable power generation system, a system that is completely dependent on renewable sources to produce electricity on demand.	4.860
	<b>ALTERNATIVE FUELS</b>		
	Nanoscale Additives for Novel Fuels	Investigate the ability to dissolve or suspend nanoparticles in fuels and ionic liquids to create new sets of desirable properties for alternative fuels.	2.916
	Greenhouse Gas Lifecycle Analysis	Expand and expedite the assessment of alternate fuels on the effect of greenhouse gas life cycle.	1.944
	Toxicology Assess - Biomass Av Fuel	Initiate the assessment of the toxicology of biomass-derived alternative aviation fuels.	0.972
	<b>ALTERNATIVE ENERGY SOURCES</b>		

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN – ATTACHMENT A

Category	Project Title	Description	(\$ M)
	Anaerobic Bioreactor	Design and demonstrate a novel approach of converting organic waste in landfills to affordable renewable power.	5.832
	<b>DOMESTIC ENERGY SUPPLY/DISTRIBUTION TOTAL:</b>		<b>34.992</b>
Tactical Power Systems/Generators	<b>FUEL CELLS</b>		
	High Eff Portable Fuel Cells	Develop and demonstrate methanol-based portable fuel cells with improved energy densities. Funding will be used to address materials related issues and would result in the demonstration of 20 units of a portable power fuel cell.	1.944
	Hybrid UAV Renew Prop & Power Sys	Develop a renewable long-endurance (months on station) Unmanned Air Vehicle using four-junction photovoltaic power to renew a fuel cell-based power system and high efficient electric propulsion.	4.860
	<b>GENERATORS</b>		
	Deployable Multi-Fuels Elec Gen	Design and demonstrate a 10kW compact and efficient fuel cell electric generator running on multi-fuels including logistic fuels using the compact reformer technology	1.944
	<b>TACTICAL POWER SYSTEMS/GENERATORS TOTAL:</b>		<b>8.748</b>
SBIR/STTR	<b>SBIR/STTR SMALL BUSINESS INNOVATIVE RESEARCH</b>		
	SBIR/STTR	The overall objective of this effort is to identify 3 – 4 projects coming out of the Air Force SBIR program that address energy issues, meet Air Force requirements, and broaden the small business base. These may be new efforts (Phase I or Phase II) or additional work put on existing efforts to speed transition and/or expand usability of small business products (Enhancements or Commercialization Pilot Program efforts). Augment the Air Force STTR investment and level of effort in soldier and soldier equipment electric power sources of higher efficiency and higher reliability.	2.100

**NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN – ATTACHMENT A**

Category	Project Title	Description	(\$ M)
AIR FORCE TOTAL:			75.000
<b>Fuel Optimization for Mobility Platforms</b>	<b>PROPULSION / ELECTRIC DRIVE / ENGINE EFFICIENCY</b>		
	Materials - Ceramic matrix composites	Ceramic matrix composites for turbine engines/lightweight composite to metal joining; CMCs will replace metal coated components resulting in a decrease in specific fuel consumption (SFC) for turbine engines. Some estimate savings for engines with CMCs components vs. metal coated components. Legacy engines will be able to integrate technology downstream in depot.	4.860
	Fuel Efficient Ground Vehicle Demonstrator	This program will design, integrate & build 2 system level demonstrator vehicles, with the system being designed to perform capabilities of a light tactical vehicle while demonstrating a reduction of overall fuel consumption by more than 30%. This program will also leverage the expertise of the Detroit area's automotive industry and demonstrate the art of the possible in fuel efficiency in a light tactical vehicle when approaching problem from the system level.	8.748
	<b>MODELING AND SIMULATION</b>		
	Energy Modeling	Current DoD Energy analytical tools do not provide a mechanism to value energy technology investment relative to operational capability, force structure balance or cost; the basis on which key decisions are made. Effort will develop analytical tool sets to value energy technology investment to enable approaches to reduce warfighter energy demand and improve combat capability.	1.458
<b>FUEL OPTIMIZATION FOR MOBILITY PLATFORMS TOTAL:</b>			<b>15.066</b>

## NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN – ATTACHMENT A

Category	Project Title	Description	(\$ M)
Operational Efficiencies/ Commercial Practices	<b>OPERATIONAL CHANGES</b>		
	Continuous Building Commissioning	Demonstrate whole-building modeling and monitoring systems capable of 1) identifying, classifying, and quantifying energy and water consumption deviations from design intent or optimal, 2) identify the causes of those deviations, and 3) recommend, prioritize, and implement corrective actions	6.804
	Energy Enterprise Management	Assess, evaluate and prototype an energy enterprise management application that can be used from the building level, all the way up to the OSD level to manage and aggregate energy data	1.944
	<b>OPERATIONAL EFFICIENCIES/COMMERCIAL PRACTICES TOTAL:</b>		<b>8.748</b>
Domestic Energy Supply/ Distribution	<b>RENEWABLE DEVELOPMENT AND TESTING</b>		
	Solid Waste Gasification	Expand ongoing effort to systematically evaluate multiple designs for preprocessing, gasification, and energy generation	2.916
	Anaerobic Digester Technology	Demonstrate anaerobic digestion of food and associated wastes for generating renewable energy	1.944
	Landfill Gas Energy Capture	Expand demonstration to multiple sites	2.430
	Wind Lift Power Generator	Wind power generator for use in remote villages with no electricity.	0.972
	Mobile Waste to Energy	Partner with Army. Mobile units capable of producing fuel from waste products at Fort Stewart + additional sites. Funding used to support the additional units for testing and fuel production for certification.	7.311

**NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN – ATTACHMENT A**

Category	Project Title	Description	(\$ M)
	HPCM Maui Energy Improvement Initiative	This effort will make solar power more efficient, affordable, and applicable to military installations. This project provides the key demonstration steps to bring improvement to the Maui High Performance Computing Center (MHPCC) - a DoD Supercomputing Resource Center as a showcase for an energy independent future. While this effort will not leave in place a 2 MW Facility, it will leave in place a significant power generation capability.	3.888
	<b>ALTERNATIVE FUELS</b>		
	Algal Derived Biofuel Program	Upscaling of algae oil production to meet Navy and AF contract requirements	5.851
	<b>ALTERNATIVE ENERGY SOURCES</b>		
	Plasma Fusion (Polywell)	Combined effort with the Navy; Demonstrate fusion plasma confinement system for shore and shipboard applications	1.944
	<b>FUEL CELLS</b>		
	Fuel Cells	Auxiliary power unit - 25-50 250W - 2KW units; leverage anticipated DOE investment; purchasing larger quantities to obtain economies of scale	18.468
<b>DOMESTIC ENERGY SUPPLY/DISTRIBUTION TOTAL:</b>			<b>45.724</b>
<b>Tactical Power Systems/Generators</b>	<b>MICRO-GRIDS</b>		
	Tactical, Deployable Micro-Grid	Plan is to put this on the ground at NTC after funding. Use competitive designs from organizations in addition to Sandia; Further develop multiple control architectures for managing microgrids in coordination with Army and Air Force installation based micro-grid demonstrations.	3.402
	<b>TACTICAL POWER SYSTEMS/GENERATORS TOTAL:</b>		<b>3.402</b>
<b>SBIR/STTR</b>	<b>SBIR/STTR SMALL BUSINESS INNOVATIVE RESEARCH</b>		



**NEAR TERM ENERGY-EFFICIENT TECHNOLOGIES PROGRAM PLAN – ATTACHMENT A**

Category	Project Title	Description	(\$ M)
	SBIR/STTR (DW)	The overall objective of this effort is to identify 3 – 4 projects coming out of the DW SBIR program that address energy issues, meet DW requirements, and broaden the small business base. These may be new efforts (Phase I or Phase II) or additional work put on existing efforts to speed transition and/or expand usability of small business products (Enhancements or Commercialization Pilot Program efforts). Augment the DW STTR investment and level of effort in soldier and soldier equipment electric power sources of higher efficiency and higher reliability.	1.722
	<b>SBIR/STTR SMALL BUSINESS INNOVATIVE RESEARCH</b>		
	SBIR (DLA)	The overall objective of this effort is to identify 1 project coming out of the DLA SBIR program that address energy issues, meet DLA requirements, and broaden the small business base. These may be new efforts (Phase I or Phase II) or additional work put on existing efforts to speed transition and/or expand usability of small business products (Enhancements or Commercialization Pilot Program efforts).	0.338

DEFENSE-WIDE TOTAL: 75.000