

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching 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 Service, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE (DD-MM-YYYY) 03-22-2010		2. REPORT TYPE Master of Military Studies Research Paper		3. DATES COVERED (From - To) September 2009 - April 2010	
4. TITLE AND SUBTITLE Incentivizing Sustained Department of Defense Energy Efficiency through a Modified Appropriations Framework				5a. CONTRACT NUMBER N/A	
				5b. GRANT NUMBER N/A	
				5c. PROGRAM ELEMENT NUMBER N/A	
6. AUTHOR(S) Maj Brian T. Grana, USMC				5d. PROJECT NUMBER N/A	
				5e. TASK NUMBER N/A	
				5f. WORK UNIT NUMBER N/A	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) USMC Command and Staff College Marine Corps University 2076 South Street Quantico, VA 22134-5068				8. PERFORMING ORGANIZATION REPORT NUMBER N/A	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A				10. SPONSOR/MONITOR'S ACRONYM(S) N/A	
				11. SPONSORING/MONITORING AGENCY REPORT NUMBER N/A	
12. DISTRIBUTION AVAILABILITY STATEMENT Unlimited					
13. SUPPLEMENTARY NOTES N/A					
14. ABSTRACT Within the Department of Defense (DoD), funding that supports a clearly defined concept and intent is the ultimate discriminator for action. The NDAA for 2009 and the 2010 QDR are two recent documents providing clear direction for improvements; however, the current construct of DoD appropriations does not fully incentivize energy efficiency within all levels of leadership. Nevertheless, the Marine Energy Assessment Team's study and General McChrystal's recent actions in Afghanistan indicate DoD is learning and actively working towards increasing energy efficiency throughout the deployed forces. The unfortunate reality is the amount of funding in DoD's budget is what limits energy efficiency efforts. Leveraging the framework of an Energy & Energy Efficiency (E2E) appropriations will assist in the increase and sustainment of such efforts.					
15. SUBJECT TERMS Incentives, Energy efficiency, Operational Energy, Authorizations, Appropriations, Leadership, Culture, and Sustainment					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 50	19a. NAME OF RESPONSIBLE PERSON Marine Corps University / Command and Staff College
a. REPORT Unclass	b. ABSTRACT Unclass	c. THIS PAGE Unclass			19b. TELEPHONE NUMBER (Include area code) (703) 784-3330 (Admin Office)

United States Marine Corps
Command and Staff College
Marine Corps University
2076 South Street
Marine Corps Combat Development Command
Quantico, Virginia 22134-5068

MASTER OF MILITARY STUDIES

TITLE:

Incentivizing Sustained Department of Defense Energy Efficiency through a Modified
Appropriations Framework

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF MILITARY STUDIES.

AUTHOR:

Major Brian T. Grana, USMC

AY 09-10

Mentor and Oral Defense Committee Member: Jr ADMM Corps
Approved: _____
Date: 3/12/2010

Oral Defense Committee Member: JW Gordon
Approved: _____
Date: 3/12/10

DISCLAIMER

THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENT AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

QUOTATION FROM, ABSTRACTION FROM, OR REPRODUCTION OF ALL OR ANY PART OF THIS DOCUMENT IS PERMITTED PROVIDED PROPER ACKNOWLEDGEMENT IS MADE.

TABLES

	Page
Table 1. DoD Appropriation Categories and Obligation Periods.....	14
Table 2. Two-year E2E appropriations with reprogrammed funding obligation periods.....	26

TABLE OF CONTENTS

	Page
DISCLAIMER.....	i
LIST OF TABLES.....	ii
TABLE OF CONTENTS.....	iii
PREFACE AND ACKNOWLEDGEMENTS	iv
EXECUTIVE SUMMARY.....	v
INTRODUCTION.....	1
<hr/>	
SECTION 1: BACKGROUND.....	1
SECTION 2: DEPARTMENT OF DEFENSE ENERGY LEADERSHIP & CURRENT ENERGY EFFICIENCY INCENTIVE PROGRAMS.....	10
SECTION 3: THE AUTHORIZATIONS-APPROPRIATIONS ENIGMA.....	13
SECTION 4: A FRAMEWORK FOR AN ENERGY & ENERGY EFFICIENCY (E2E) LINE OF APPROPRIATIONS.....	16
SECTION 5: CONCLUSIONS AND RECOMMENDATIONS.....	28
ENDNOTES.....	31
APPENDIX A: FUEL PLANNING, DISTRIBUTION, AND SUPPORT FOR THE FBCF.....	35
APPENDIX B: DOD APPROPRIATIONS DEFINITIONS.....	38
APPENDIX C: CHARTS OF DEPLOYED FUEL DEMAND IN JUNE 2008.....	39
APPENDIX D: SUMMARY MATRIX.....	41
BIBLIOGRAPHY	42

PREFACE AND ACKNOWLEDGEMENTS

I assumed this topic for personal and professional reasons. Although a discussion on DoD energy efficiency, I believe our personal responsibility is to avoid passing mounting energy concerns on to our children. This issue requires a multi-generational solution starting now. Professionally, as a Marine logistician, I can definitely attest to the multiple ways energy inefficiency hampers the warfighter and places lives in unnecessary danger. I am convinced DoD leaders are positively working towards solving the mounting energy efficiency issues; nevertheless, resource limitations in the form of legislated spending generate decisions based on priority. I am under no illusions what I propose in this paper is easy to implement; quite the opposite. It is the actions of implementing such a proposition, however, that will incentivize DoD leaders to sustain recent educational, cultural, and operational energy lessons learned.

In this same regard, my personal advancement on this subject was significantly assisted by an array of individuals who provided me with their most important resource, their time. I would like to express my appreciation to the newly minted American Citizen, Dr. Adam Cobb, who provided me humor, motivation, and energy wisdom. Drs. Rebecca Johnson and John Gordon; Lieutenant Colonel's Kevin Arthur, Ossen Dhaiti, and Paul Schimpf; as well as Major David Moore and Lieutenant Commander Mike Dysart were more than gracious with their time and insight. Dr. Patrice Scanlon, Rachel Kingcaid, and Andrea Hamlin from the Gray Research Center provided invaluable research and editorial assistance. Once again, my friend, mentor, and former boss Major Joe Morris, USMC (ret.) was there to impart positive feedback and encouragement. For some, and they know who they are, it is best to leave their names incognito.

To my wife, Carey, and our entertaining children, Jacob and Lucas: words alone cannot describe your importance. Everything stops and starts for me, with the three of you.

EXECUTIVE SUMMARY

Title: Incentivizing Sustained Department of Defense Energy Efficiency through a Modified Appropriations Framework

Thesis: This paper proposes a framework modifying Government appropriations in order to support a permanent DoD energy efficiency incentive at every level of leadership within in the deployed and non-deployed environments.

Discussion: Within DoD, funding that supports a clearly defined concept and intent is the ultimate discriminator for action. The NDAA for 2009 and the 2010 QDR are two recent documents providing clear direction for improvements; however, the current construct of DoD appropriations does not fully incentivize energy efficiency within all levels of leadership. Nevertheless, the Marine Energy Assessment Team's study and General McChrystal's recent actions in Afghanistan indicate DoD is learning and actively working towards increasing energy efficiency throughout the deployed forces. The American Recovery and Reinvestment Act of 2009, President Obama's Executive Order (EO) 13514; President Bush's EO 13423, every NDAA from the past decade; the Energy Independence and Security Act (EISA) of 2007, and the Energy Policy Acts of 1992 and 2005 all provide direction on energy efficiency improvements expected from the DoD. The DoD even convened Defense Science Boards in 2001 and 2008 that provided detailed recommendations for policy, technology, and leadership changes. The 2010 QDR further recognizes the "DoD must incorporate geostrategic and operational energy consideration into force planning, requirements development, and acquisition processes." The unfortunate reality is the amount of funding in DoD's budget is what limits energy efficiency efforts.

Conclusion: Leveraging the framework of the E2E appropriations will assist in the increase and sustainment of such efforts. The E2E framework is designed to be: backed by law and tangible funding; established with a guaranteed minimum funding baseline; strictly spent on energy bills and efficiency projects and programs; a metric for monitoring energy funds; established with a two year obligation period; capable of reprogramming savings after the first year to any funding category with a priority on deployed energy concerns; and capable of having extended obligation periods for reprogrammed funds. The magnitude of enacting such an appropriation is on par with Secretary of Defense Robert McNamara's implementation of the Planning Programming and Budgeting System (PPBS) during the 1960s, or the required changes legislated in the 1986 Goldwater-Nichols Act. More importantly, and from a warfighters perspective, an E2E appropriation line is not just about incentivizing leadership to save money or energy; it is about saving lives. Preventing warfighters from protecting unnecessary fuel deliveries, on hazardous roads, strewn across foreign battlefields actually supports leadership in the conduct of their operational job requirements. The fact that DoD can incentivize energy efficiency and properly spend Government funds in this process are merely beneficial secondary and tertiary outcomes.

INTRODUCTION

"Unleash us from the tether of fuel" – Lieutenant General James N. Mattis¹

"Energy efficiency can serve as a force multiplier, because it increases the range and endurance of forces in the field and can reduce the number of combat forces diverted to protect energy supply lines, which are vulnerable to both asymmetric and conventional attacks and disruptions." – 2010 Quadrennial Defense Review²

Government appropriations do not incentivize Department of Defense (DoD) leadership's complete commitment to energy efficiency. DoD leaders have numerous alternative energy guidance, technological ideas, and federal direction to incorporate energy efficiency concerns into all facets of military operations. Moreover, the approaches outlined in the DoD's recent 2010 Quadrennial Defense Review (QDR) demonstrate a vision for a sustained commitment to energy efficiency.³ The DoD nevertheless, is lacking the complete financial incentives to conquer the challenge. This paper proposes a framework modifying Government appropriations in order to support a permanent DoD energy efficiency incentive at every level of leadership within in the deployed and non-deployed environments.

This paper is comprised of six sections. The Background Section discusses the increases in DoD fuel and energy costs since fiscal year 2000, the Fully Burdened Costs of Fuel in a combat environment, the importance of energy efficiency Key Performance Parameters in defense acquisition programs, and the recommendations from the 2001 and 2008 Defense Science Boards. Section Two discusses the new DoD Operational Energy Policy and Programs Office as well as service level energy efficiency, management, and incentive programs. Sections Three and Four discuss the Government Authorizations-Appropriations enigma and culminate in a conceptual appropriations framework designed to incentivize sustained energy efficiency from the lowest to the highest levels of DoD leadership. Section Five provides conclusions and recommendations.

SECTION 1: BACKGROUND

“Efficiency, or the achievement of maximum lethality for minimum logistics, is a strong indicator of agility. Better fuel efficiency improves warfighting capability, reduces deployment times and increases sustainability. However, the analytical tools available for quantifying the contribution of fuel efficiency to these outcomes is weak.” – 2001 Defense Science Board Final Report⁴

Executive Order 12919, National Defense Industrial Resource Preparedness, defines energy as “all forms of energy including petroleum, gas (both natural and manufactured), electricity, solid fuels (including all forms of coal, coke, coal chemicals, coal liquification [liquefaction], and coal gasification), and atomic energy, and the production, conservation, use, control, and distribution (including pipelines) of all of these forms of energy.”⁵ Although noticeably lacking any mention of the term “energy,” DoD 4140.1-R regulation on Supply Chain Material Management, defines DoD Class III as “Petroleum fuels, lubricants, hydraulic and insulating oils, preservatives, liquid and compressed gases, bulk chemical products, coolants, de-icing and antifreeze compounds, together with components and additives of such products, and coal.”⁶ DoD Directive 4140.25, DoD Management Policy for Energy Commodities and Related Services, further defines energy as consisting of “petroleum, natural gas, coal, propellants, chemicals, pure gases, and cryogenic fluids.”⁷ The 2009 Defense Authorization Act, however, states “the term ‘operational energy’ means the energy required for training, moving, and sustaining military forces and weapons platforms for military operations. The term includes energy used by tactical power systems and generators and weapons platforms.”⁸ In the aggregate these definitions provide the magnitude of the DoD’s energy efficiency concerns.

The National Intelligence Council (NIC) 2020 Project and Marine Corps Vision (MCV) 2025 are two among numerous reports addressing the myriad future concerns in our changing world. The NIC discusses the impacts of population growth, new global players, the

contradictions of globalization, new challenges to governance, and pervasive insecurity as contributing factors towards uncertainty. Of note, the NIC 2020 Project points out that “sharper demand-driven competition for resources, perhaps accompanied by a major disruption of oil supplies, is among the key uncertainties.”⁹ Likewise, the MCV 2025 discusses the uncertainties of the world through the lens of the “ever-changing character and conduct of warfare.”¹⁰ The Marine Corps, in the coming years, will continue its efforts to become more “organized, optimized, modernized, and postured” in order to “provide the Nation unmatched strategic freedom of maneuver and operational flexibility throughout the 21st century.”¹¹ The Marine Corps’ ability to successfully achieve these goals “requires a logistics capability that is leaner, lighter, and less energy-intensive than the past.”¹² Both the NIC Report 2020 and MCV 2025 illustrate how energy and energy efficiency play a key role for DoD’s conduct within an uncertain world.

The American Recovery and Reinvestment Act of 2009, President Obama’s Executive Order (EO) 13514; President Bush’s EO 13423, every NDAA from the past decade; the Energy Independence and Security Act (EISA) of 2007, and the Energy Policy Acts of 1992 and 2005 all provide direction on energy efficiency improvements expected from the DoD.¹³ The DoD even convened Defense Science Boards in 2001 and 2008 that provided detailed recommendations for policy, technology, and leadership changes. The 2010 QDR further recognizes the “DoD must incorporate geostrategic and operational energy consideration into force planning, requirements development, and acquisition processes.”¹⁴ The unfortunate reality is the amount of funding in DoD’s budget is what limits energy efficiency efforts.

Budgetary concerns become more acute when reviewing the 2009 Congressional Research Service (CRS) Report, *Department of Defense Facilities Energy Conservation Policies*

and Spending. Even with a proven reduction in consumption for DoD installations, the CRS report documents significant increases in DoD facility energy costs from fiscal years (FY) 1999 through 2007 because of an increase in energy prices.¹⁵ Costs on posts, bases, and stations rose from \$2.25 billion to \$3.44 billion, for a total increase of \$1.19 billion. Energy was consumed in the following manner: 45% electricity, 33% natural gas, 11% fuel oil, and 11% liquefied petroleum gas (LPG); renewable energy represented 8.7% total facility electricity use.¹⁶ The preponderance of transportation fuel costs are not included in these numbers; they will be discussed later in this section.¹⁷ Although DoD facilities energy consumption has noticeably decreased, the Office of the Deputy Under Secretary of Defense Installations and Environment reports “the Department must make greater strides in energy efficiency and consumption in order to meet the Departmental vision of providing reliable and cost effective utility services to the warfighter.”¹⁸

The additional 2009 CRS Report, *Department of Defense Fuel Spending, Supply, Acquisition, and Policy*, documents significant increases in DoD fuel expenditures from FYs 2000 through 2008. These costs include transportation numbers for jet fuels, alternative jet fuels, diesel, lube oils, mogas (motor gasoline), and residual Class III. The paradox for DoD is aggregate barrel purchases have steadily decreased from a peak of 145.1 million barrels in FY 2003 to 134.9 million barrels in FY 2008. A more detailed analysis reveals DoD’s overall Jet Propulsion (JP)-8 purchases decreased from an FY 2004 peak of 74.7 million barrels to 62.5 million in FY 2008; however, diesel for combat vehicles peaked in FY 2004 at 25.2 million barrels, dropped to 21.0 million barrels in FY 2005, and then increased back to 24.5 million barrels in FY 2008.¹⁹ Even with DoD’s best efforts to control energy consumption, rising costs and thus, budgetary concerns are critical drivers toward overcoming energy efficiency concerns.

The Defense Logistics Agency (DLA), Defense Energy Support Center (DESC) is the organization tasked with providing fuel support as well as dealing with the fluctuating prices and variation in purchase quantities made by the DoD. Even with the fluctuations described above, DESC and DoD have had to contend with a near 500% increase in fuel expenditures. The total costs increased from \$3.6 billion to \$11.5 billion between FY 2000 through 2007; in FY 2008, the price jumped to \$17.9 billion because of continued escalating crude oil prices²⁰ These increases represent 7% of DoD's Operations and Maintenance spending; however, the telling statistic is "fuel costs represented 1.2% of DoD's spending in FY2000, and more than doubled to 3% by FY2008."²¹

Britain's Royal United Services Institute further estimates that when DoD's numbers are coupled with infrastructure costs and requisite logistic requirements, costs can rise up to 10 to 15% in the non-deployed environment. In a deployed environment however, these costs can increase to between 20 to 30% of the Fully Burdened Cost of Fuel (FBCF).²² The NDAA for 2009 defines the FBCF "as the commodity price for fuel plus the total cost of all personnel and assets required to move and, when necessary, protect the fuel from the point at which the fuel is received from the commercial supplier to the point of use."²³

The 2008 DSB estimates these rising fuel prices greatly affected the DoD budgeting processes while ultimately creating the need to move, or in DoD vernacular, re-program money between appropriation areas in order to guarantee energy demands are met.²⁴ In cases where re-programming alone has not worked, DoD requested and received supplemental funding from Congress to pay for these unexpected increases.²⁵ As a result, the DoD is not necessarily bankrupting itself nor feeling the effects of energy inefficiency in its budget; however, re-

programming demonstrates there are energy efficiency actions still requiring significant improvement.

The February 2009 Government Accountability Office (GAO) Report, *DoD Needs to Increase Attention on Fuel Demand Management at Forward-Deployed Locations*, presents supplemental funding as a disincentive towards reducing energy costs. According to the GAO report, one senior Air Official's stated, "from his perspective, forward-deployed locations dependent on this type of emergency funding do not have to worry about reducing energy costs as DoD's permanent installations do because the commanders of forward-deployed locations know they will receive supplemental appropriations to cover their cost."²⁶ According to the House Committee on Appropriations, supplemental funds were first included in the baseline budget when the *2010 Defense Appropriations Bill* was introduced.²⁷

Reports from both the Center for Naval Analysis in 2009 and the 2008 DSB show DoD's estimated energy use in FY 2007 dollars as 25% in the non-deployed environments, whereas the remaining 75% is attributed to its combat or "operational energy demands."²⁸ In general, the refining, infrastructure, and distribution efficiency concerns necessary to conduct sustained non-deployed operations do not correlate to the full costs of fuel in combat environments. In non-deployed environments the commodity price of fuel, as well as local utility rates for posts, bases, and stations, are the standards of measurement.²⁹ In combat environments however, the 2008 DSB determined the FBCF as the "total ownership cost of buying, moving, and protecting fuel systems in combat."³⁰ Further complicating the discussion and as demonstrated in Appendix A, the maturity of the environments where warfighters are performing drives the determination of the FBCF and energy efficiency of combat systems.³¹

The pace of operations, extended supply lines, and absolute hazards to the warfighter, raised the issue of FBCF and energy efficiency in dramatic fashion. Unfortunately, as the 2009 CRS report demonstrates, it was only after seven years of combat operations had passed that the direction provided in the NDAA for 2009 (discussed in Section 2), and the “realities facing all energy consumers” that DoD fully embraced the need for energy efficiency.³² The findings and recommendations outlined in the 2001 and 2008 DSB reports highlight DoD’s delayed actions.

The 2001 and 2008 DSB reports are closely related in their tasks and purposes. The 2001 DSB was “asked to identify technologies that improve fuel efficiency of the full range of weapons platforms (land, sea, and air) and assess their operational, logistics, cost, and environmental impacts for a range of practical implementation scenarios.”³³ The following recommendations from the 2001 DSB are quoted directly from the Memorandum for the Chairman and represent foundational actions resident throughout Section Four of this paper:

- Base investment decisions on the true cost of delivered fuel [FBCF] and on warfighting and environment benefits.
- Strengthen linkage between warfighting capability and fuel logistics requirements through wargaming and new analytical tools.
- Provide leadership that incentivizes fuel efficiency throughout the DoD.
- Specifically target fuel efficiency improvements through investments in Science and Technology and systems design.
- Explicitly include fuel efficiency [KPP] in requirements and acquisition processes.³⁴

Calculating the FBCF became a mandatory requirement as of the April 10, 2007, Under Secretary of Defense for Acquisition, Technology, and Logistics memo. This memo states “effective immediately, it is DoD policy to include the fully burdened cost of delivered energy in trade-off analyses conducted for all tactical systems with end items that create a demand for energy and to improve the energy efficiency of those systems, consistent with mission requirements and cost effectiveness.”³⁵ The 2008 DSB results show that although recommended in the 2001 DSB and required in the aforementioned memo, the application of FBCF in

developing program requirements is far from meeting its goals. Congress, thus, directed in Section 332 of the NDAA for 2009 that “all life-cycle cost analysis for new capabilities include the fully burdened cost of fuel during analysis of alternatives and evaluation of alternatives and acquisition program design trades.”³⁶

Properly applying energy efficiency KPPs has taken on similar importance to determining the FBCF. DoD’s Joint Requirements Oversight Council on August 17, 2006, recognized and “endorsed selectively applying an Energy Efficiency KPP and a System Training KPP, *as appropriate*.”³⁷ The President’s 2009 Executive Order 13514, reinforced the non-mandatory requirement for DoD energy efficiency: “advance sustainable acquisition to ensure that 95 percent of new contract actions including task and delivery orders, for products and services *with the exception* of acquisition of weapon systems, are energy-efficient...”³⁸ Presidential and Congressional efforts for DoD energy efficiency nonetheless were still clearly resident in the appropriations provided in the non-recurring American Recovery and Reinvestment Act of 2009. Of the \$4.24 billion provided to DoD for facilities maintenance, the CRS estimates between \$3.68 to \$3.84 billion was available for energy efficiency projects.³⁹ These are not energy efficiency incentives, but, directions for improvements with funding provided.

Further direction in Section 332 of the NDAA for 2009, now requires DoD “to develop and implement a methodology to enable the implementation of a fuel efficiency key performance parameter in the requirements development process for the modification of existing or development of new fuel consuming systems.”⁴⁰ This is required for implementation by October of 2011. The 2010 QDR recognizes and will fully implement the requirements of the FBCF and KPP parameters. Nevertheless, until the nuances of these requirements can be implemented, the

FBCF and energy efficiency KPP's in major defense acquisition programs are currently not mandatory for use.⁴¹

The 2008 DSB was directed to form a Task Force to study DoD's energy strategy by examining "a range of issues that map into four broad areas."⁴² These four broad areas are quoted directly from the January 14, 2008 Memorandum for the Chairman, DSB:

1. Identify opportunities to reduce fuel demand by deployed forces and assess the effects on cost, operations and force structure.
2. Identify opportunities to deploy renewable and alternative energy sources for facilities and deployed forces.
3. Identify institutional barriers to making the transitions recommended by the Task Force, and recommend programs reduce energy use.
4. Identify the potential national benefits from DoD deployment of new energy technologies.⁴³

The 2008 DSB generated the following findings and recommendations from their four broad requirements. They are quoted directly and in their entirety:

- The Department has no consistent methodology to simulate the battlespace conditions created by high fuel re-supply requirements during campaign analyses, war gaming or staff training exercises. This makes fuel supply consequences invisible.
- DoD has not yet fully implemented two key recommendations from a 2001 DSB Task Force on energy – establish a Key Performance Parameter (KPP) to constrain battlespace fuel demand; and establish the fully burdened cost of fuel (FBCF) to guide acquisition investments for deployed systems. This Task Force recommends the Department accelerate the implementation of these, and that the Deputy Secretary exercise oversight.
- Non-Developmental items such as air conditioners and field kitchens create high demand for fuel in the battlespace, sometimes exceeding that from combat systems. The Task Force recommends investing to make them efficient to a level commensurate with the value of reducing demand for fuel in the battlespace.
- Competitive prototyping during the '70s and '80s produced rapid improvement in the capability and reliability of key combat systems. Today it could do the same to improve capability through greater endurance and reduced battlespace fuel demand.
- The Task Force identified several disruptive technologies with the potential to significantly increase operational capability and reduce the burden of battlespace fuel demand, and recommends specific actions to accelerate their development and acquisition.⁴⁴

In the aggregate, these findings and recommendations further demonstrate the associated complexities when framing the myriad solutions for DoD energy efficiency. The Task Force, however, conveyed that progress would take considerably more than these recommendations in order to fully achieve energy efficiency success. The board concluded DoD heavily depended on the “leadership’s willingness to provide oversight to ensure they are effective.”⁴⁵ The report continued by recommending oversight for more than just the 25% of non-deployed installations. The benefit of accountability and oversight for the 75% of deployed energy use is absolutely necessary.

Section One of this paper demonstrated that although DoD energy consumption has recently dropped in certain areas, costs continue to increase, and the total fully burdened costs of energy is still yet unrealized. Successfully applying the concept of the FBCF allows DoD leaders at all levels to leverage another resource to overcome energy inefficiencies within combat environments. Concurrently, DoD is still trying to determine how to properly apply energy efficiency KPPs to current acquisition technology programs and purchases without affecting operational capabilities. Finally, the 2001 and 2008 DSBs adeptly demonstrated that a sustained commitment to calculating the FBCF and proper applications of energy efficiency KPPs are extremely difficult without committed leadership’s support.

SECTION 2: DEPARTMENT OF DEFENSE ENERGY LEADERSHIP & CURRENT ENERGY EFFICIENCY INCENTIVE PROGRAMS

“The Department (DoD) will also investigate alternative concepts for improving operational energy use, including the creation of an innovation fund administered by the new Director of Operational Energy to enable components to compete for funding on projects that advance integrated energy solutions”
– 2010 Quadrennial Defense Review⁴⁶

Section 902 of the NDAA for 2009, directed the Department of Defense to establish a Director for Operational Energy Plans & Programs (DOEPP) within the Office of the Secretary

of Defense (OSD) “for oversight of energy required for training, moving, and sustaining military forces and weapons platforms for military operations.”⁴⁷ The rationale behind this new law is traceable to the 2008 DSB that recommended the need for a senior energy official “responsible for development of policies and procedures and oversight of their implementation.”⁴⁸ Due to different missions, these requirements were best placed outside the purview of the Office of the Deputy Undersecretary of Defense for Installations and Environment (I&E) who performs as the “guardians of the defense installations portfolio.”⁴⁹ The DOEPP thus, handles the multiple tasks associated with energy accountability, communication, and execution of operational energy plans and programs.

Although the NDAA for 2009 directed the DOEPP to make recommendations on budgetary and financial matters, there was no additional funding authorized to support deployed energy efficiency incentive programs.⁵⁰ The DOEPP’s situation, however, is significantly assisted by the 2010 QDRs announcement of an operational energy innovation fund derived from the DoD budget. Nevertheless, properly authorized and recurring incentives built into DoD appropriations, or the creation of a standalone energy appropriations category would also provide significant benefit.⁵¹ Although influence over additional appropriations greatly increases the importance of the DOEPP, the consideration for more diversified DoD appropriations further complicates matters since energy concerns affect nearly every aspect of DoD operations.

The DoD, however, is not lacking in awards programs to encourage energy efficiency. DOD Instruction 4170.11, *Installation Security Management*, “Pertains to all phases of administration, planning, programming, budgeting, operations, maintenance, training, and materiel acquisition activities that affect the supply, reliability and consumption of facilities energy requires.”⁵² DoD’s FY 2008 *Annual Energy Report* highlights the positive effects and

multiple efficiency awards desired by the 4170.11, the White House, State Governors, adjacent Federal Agencies, Department Secretaries, and Chiefs of Staff.⁵³ DoD further increases energy efficiency through the Energy Conservation Investment Program (ECIP), Energy Savings Performance Contracts (ESPC), and Utility Energy Savings Contracts (UESC).⁵⁴ The awards and savings generated, however, are geared exclusively toward the 25% of non-deployed installations and offer monetary incentives to the units that are not directed towards even further energy efficiency savings.

The Department of the Navy's Incentivized Energy Conservation (i-ENCON) program is one of the few DoD programs geared towards the 75% of energy consumed by deployed forces. The i-ENCON program was created to incentivize ships throughout the fleet to reduce their energy consumption. Ships leading in the conservation efforts can receive cash awards *up to* \$67,000 for their discretionary accounts. These accounts can augment the ship's morale programs or pay for approved gear and equipment. In FY 2008, 148 ships received various levels of incentive awards. In FY2009, through the i-ENCON program the Navy saved nearly 1.38 million barrels of oil valued at \$123 million.⁵⁵

Section Two of this paper demonstrated Congressional and DoD's attempts to provide leadership and incentives geared toward energy efficiency. Unfortunately, DoD's top-level operational energy leadership office is still very new and under-resourced to provide the incentives necessary to fully support energy efficiency efforts. Furthermore, the few incentives that are available are only aimed at 25% of the overall concern. Through the power of Government appropriations Congress has an opportunity to equip the DOEPP and all DoD leadership to effectively impact the other 75%.

SECTION 3: THE AUTHORIZATION-APPROPRIATIONS ENIGMA

"The imperative is to properly fund (not just mandate), scale fast across the force, and plow the savings back into completing the change-over. It's important that the people making the hard choices and working the shortages see some benefit from their work to save costs... and that benefit has to be efficient mission effectiveness." - General Ronald E. Keys, USAF (ret)⁵⁶

Each year DoD submits a budget request to the President through the Office of Management and Budget (OMB). The President in turn, submits the Government's overall budget request to Congress. In simplest terms Congress' "power of the purse" is derived from two tangible products: authorizations acts and their corresponding appropriations acts. Per Article I, Section 9, of the Constitution, "No money can be drawn from the United States Treasury without an act of Congress stating how it is to be used. All money collected and spent by the government must be reported in a published account from time to time."⁵⁷ This appropriations capability is part of the Authorization-Appropriation process guided by House and Senate rules that provides the DoD budget.

The formal Authorization-Appropriation process consists of two sequential steps: "(1) enactment of an authorization measure that may create or continue an agency or program as well as authorize the subsequent enactment of appropriations; and (2) enactment of appropriations to provide funds for authorized agency or program."⁵⁸ Through authorizing legislation, an appropriations measure is derived providing budgetary authority and regular appropriations acts. The President signs these acts into law. DoD funding found within the regular appropriations acts, is discretionary in nature, and differs from direct spending. Direct spending, also known as mandatory spending is exemplified by Medicare and Social Security entitlement programs; similarly, other mandatory spending programs referred to as appropriated entitlements are demonstrated by Medicaid.⁵⁹ Mandatory spending incorporates nearly two-thirds of overall

Government spending and continues to rise; thus, effectively reducing the amount of funding available for discretionary appropriations that constitutes DoD’s lifeblood for operations.⁶⁰ In simpler terms, the more mandatory requirements Congress must fund, the less discretionary funding is available to support the DoD’s budget; as such, discretionary funding could get reduced or eliminated in order to pay for the requirements of mandatory programs.

The yearly appropriations act presents the DoD budget authority in six categories with their respective obligation periods, or the time period to “sign contracts and place orders.”⁶¹ The six appropriation categories are Research, Development, Test, & Evaluation (RDT&E); Procurement, that includes a specific obligation for Procurement of Navy shipbuilding (PCN); Military Construction (MILCON); Military Personnel (MILPERS); Operations & Maintenance (O&M); and Other. As demonstrated in Appendix B, each category has separate and distinct functions. Fuel costs are specifically identified under the O&M category of DoD Financial Management regulations as an operating expense. Fuel however, may still be required in cases where RDT&E, Procurement, or MILCON is the primary funding category; in this instance the fuel is considered as an investment cost.⁶²

Appropriation Category	Obligation Period
Research, Development, Test & Evaluation (RDT&E)	2 years
Procurement	3 years
Procurement Shipbuilding and Conversion, Navy (PCN)	5 years
Operations and Maintenance (O&M)	1 year
Military Construction (MILCON)	5 years
Military Personnel	1 year

Table 1. DoD Appropriation Categories and Obligation Periods.⁶³

Along with providing funding for specific research, programs, initiatives, training, and combat operations, the appropriation acts provide bulk sums of budget authority to DoD in the

aforementioned categories. DoD is ultimately responsible for ensuring the appropriations are spent within the complete framework of the law. The services within DoD will then exercise their respective budget authority and move money within the given appropriations in order to pay for their required bills; assuming the money is spent for the appropriated purpose. There are instances, however, when DoD must request Congress reprogram or switch the funds from one category to another in order to cover budget shortfalls or emerging requirements. This course of action is rarely preferred due to the detailed nature of justifying requirements of high profile programs to Congress.

An increase in federal mandatory spending and the loss of supplemental appropriations relative to the incremental draw downs of OIF/OEF indicate current appropriations provided to DoD will lessen in the coming years, while energy requirements will likely grow.⁶⁴ This could mean future baseline budgets will decline, with training and maintenance costs paid from O&M funds, while appropriations currently covered with supplemental funds will migrate “back into the baseline budget at the expense of other programs.”⁶⁵ In plainer terms, energy efficiency investments requiring additional up-front expenditures could end up taking a backseat to more important funding priorities.

While the Department of Energy’s Federal Emergency Management Program estimates “that O&M programs targeting energy efficiency can save 5% to 20% on energy bills without a significant capital investment” exploiting this capability affords the DoD a source of funds within the zero sum game of appropriations “with minimal cash outlays.”⁶⁶ Applying these estimates to the data discussed in Section One of this paper indicates the following: DoD spending of \$3.44 billion for facilities in FY 07 indicates potential cost savings for facilities

between \$170 million to \$688 million; whereas, the \$17.9 billion spent in FY 08 for DESC purchased fuels shows a potential savings range between \$895 million to \$3.58 billion.

**SECTION 4: A FRAMEWORK FOR AN ENERGY & ENERGY EFFICIENCY (E2E)
LINE OF APPROPRIATIONS**

*"Call it what you will, incentives are what get people to work harder."
-Nikita Khrushchev⁶⁷*

Through modifications to the current O&M line of appropriation the President and Congress have a means to support further trade-offs between DoD energy efficiency initiatives and other competing priorities. This modification also provides built-in incentive mechanisms to create a win-win outcome and culture change for all stakeholders. The concept proposes removing the energy and fuel budgeting authority from under the O&M appropriations category in order to create a seventh category: Energy & Energy Efficiency, or E2E.

An obvious initial counterargument to establishing an E2E appropriation category is the mechanics behind the current Authorization-Appropriations process is so deeply ingrained that many stakeholders would not allow this to happen. Inertia will need to be generated in order to overcome the resistance change; however, the time to make these drastic changes is prior to a catastrophic event. There is no need to have another 1973 Oil Embargo or a catastrophic sustained increase in oil prices to prompt change.⁶⁸ Massive and hasty Government reform in order to adjust to catastrophic events would only indicate the change occurred too late. This E2E modification, thus, would address General Ronald E. Keys, USAF (ret), comments on energy efficiency and mission effectiveness:

There is a lot of talk about changing the culture, but the culture is not just people. It is just as much about the budget process itself, how we calculate investment payback, what rules impede innovation and how we set priorities. That often gets overlooked in the hoopla of the moment and ends up on the backs of our people at the operating level.⁶⁹

In short, complete culture change within DoD happens when the appropriations and resulting budgets are sufficient to support such a change. The E2E line of appropriations would contain several unique qualities to incentivize the change necessary to sustain an energy efficiency culture within DoD.

First, tangible annual funding and law will back the E2E line of appropriations. The symbolic nature of creating this new appropriation will elevate E2E to the necessary level of sustained visibility required to ensure DoD is adequately resourced to attain the goals outlined in the EOs, Acts, and policies. Very few actions resonate as loudly from Washington as the lawful authorization and appropriation of Government funds. The President and Congress will show tangible long-term commitment for energy efficiency and associated security concerns while supporting DoD efforts.

This symbolic change will also send the necessary signals for the cultural paradigm shift required to generate full commitment to DoD energy efficiency. Rear Admiral David R. Oliver (ret.) from the Center for Naval Analysis states: "...change is always a cultural disruption which involves a trauma and few can adapt. These things can get very emotional. People get attached to what they think they know."⁷⁰ If the data provided at the end of Section Four illustrates a remote indication of savings, then enacting the E2E line of appropriations into law provides the energy efficiency culture a greater chance of increasing its position of influence in DoD's leadership hierarchy in order to assist the warfighter.

Second, E2E appropriations will end the "use or lose" mentality of the one-year O&M funding line. The 2009 GAO report, *Defense Management, DOD Needs to Increase Attention on Fuel Demand Management at Forward-Deployed Locations*, further support this claim since "officials told us [the GAO] that DoD's budget process in effect discourages commanders from

generating savings by reducing their future budgets.”⁷¹ In order to curtail concerns that continual cost savings will inevitably shrink future DoD funding, the law will guarantee the following fiscal years E2E appropriations will be the higher of the two following categories from the current year’s budget:

- (1) Aggregate energy spending (AES) adjusted for inflation, for deployable units and non-deployed units, posts, bases, and stations
- (2) AES adjusted for inflation (listed above), as well as requested plus-ups in order to meet any unforeseen increases in energy costs.

For the second category, there is a definitive need to request a reprogramming of funds from Congress in order to justify the unforeseen rises in energy costs. Upon approval from Congress, this will automatically re-set the unit’s E2E appropriations baseline for the following year’s budget. The justification for additional E2E funds will provide greater detail to DoD and Congress on energy efficiency, consumption, and spending. Deployed units, posts, bases, and stations will inevitably be required to track their expenditures in order to provide DoD with a metric for possible future reprogramming savings. Lower turn-in rates might indicate the need for greater attention and assistance from higher headquarters in order to continually increase cost savings and resultant energy efficiency. Furthermore, it will address the 2009 GAO reports concern that “fuel consumption is not systematically recorded.”⁷² The requirement to monitor spending will increase the need for energy efficiency training and further the cultural change currently lacking at the lowest levels.

The counterargument to the “use or lose” mentality centers around strategic signaling and the message funding increases or E2E savings could provide to adversaries. First, DoD maintains

a war reserve of fuel stocks that is currently classified.⁷³ As such, any E2E spending towards fuel reserves will be classified and quell concerns for strategic signaling to our adversaries.

The second counterargument involves how E2E funding increases could signal DoD and possibly the United States' increased dependence on foreign sources of oil. The reality of this situation is there are no energy conditions inhibiting DoD's ability to function: our adversaries know this. The 2008 DSB reports the United States Government's ability to enact eminent domain over commercial energy contracts ensures uninterrupted DoD operations "if needed for national security;" due to political concerns, this statement infers total war scenarios.⁷⁴ The GAO defines eminent domain "as an inherent right of sovereignty..." that "... is a government's power to take private property for a public use while compensating the property owner."⁷⁵ Despite eminent domain, DoD still has had to overcome significant obstacles within the last decade in order to pay for its energy demands; however, publicizing our E2E savings to cover these costs and choosing not to enact the Government's sovereign right of eminent domain will surely add to the United States' legitimacy as the world's most capable military organization.

The third counterargument is commanders should not have to deal with detailed energy efficiency concerns during kinetic or "on the move" combat operations; combat leaders have much greater issues to concern themselves with while in the heat of battle. In reality, commanders are already tracking their resources to the best of their abilities in order to sustain combat operations. This counterargument differs greatly from the need to provide detailed energy efficiency monitoring for the static Forward Operating Bases (FOB), Contingency Operating Bases (COBs), and Combat Outposts (COP) where the proliferation of services and requirements are relegated to the camp commandants.

No combat leader should be saddled with the burden of counting gallons of fuel while “on the move” conducting sustained kinetic combat operations. On the other hand, every combat leader should be involved with the operation and proliferation of the FOBs, COBs, and COPs in a sustained counter insurgency (COIN) or mass humanitarian assistance environment. Energy efficiency is not just a camp commandant’s chore; it is the responsibility of the operational commander and every leader in this person’s chain of command. If the commanders have the responsibility to monitor an E2E budget after the cessation of “on the move” combat operations, they will strive to ensure energy efficiency is maximized in order to save lives, reduce time in theater conducting operations, and conserve taxpayer dollars.

The third requirement for the E2E appropriation will be to eliminate the opportunity to exchange O&M funds necessary for energy efficient purchases against the limitless expenditures covered under the broad O&M category. The E2E funds will be protected from all requirements except paying for energy and incentivizing energy efficiency improvements through cost savings. A logical outgrowth of this concept will result in leaders maximizing their long-term cost savings. Therefore, leaders on all levels will have an additional incentive to seek increased energy efficiency KPPs for all DoD acquisition programs and support the requirements of the NDAA for 2009 and 2010 QDR. Moreover, there will be more energy efficient equipment and an aggregate reduction in the FBCF across the deployed and combat environments.

The counterargument to removing funding from O&M is a further reduction in flexibility in spending for this category; however, therein lays the inherent benefit with pursuing this change. The problem is not just about correctly leveraging the funding budgeted for fuels within the O&M category. The change is geared towards reinforcing the fundamental cultural shift necessary to ensure DoD is redirecting specific funds for energy efficiency back into similar

efforts in order to lessen the overall burdens for the deployed combat troops. The impact of Congressionally mandated requirements effectively inhibits the flexibility afforded DoD leadership; whereas, DoD regulations allow for greater latitude and less impunity, than law.

Fourth, the E2E appropriations will mandate all leaders utilizing energy funds to meticulously monitor their unit's expenditures and usage in the non-deployed and deployed environments. As previously discussed, the need to myopically monitor energy expenditures during "on the move" operations will be dependent on the leaders situation and requirements. Nevertheless, the expectation will be a better understanding and reporting of energy costs, in lives and money, at every level and category of consumption. Not only will battlefield commander's appreciate the amount of fuel going into their fuel tanks, but, the amounts spent powering their non-deployed facilities will also come into focus for DoD and Congress. The product of this awareness will transfer into even greater energy efficiency at non-deployed posts, bases, and stations, while also promoting greater considerations for operational energy planning in deployed and combat environments.

The operational unit's lack of energy oversight while working and training in a non-deployed status will naturally carry over to the current OIF/OEF environments. Requests for fuel submitted are normally submitted to higher headquarters and the fuel arrives on the next logistic train for use. If a commander is directly responsible for certifying where the fuel actually ends up and is held accountable for the associated costs, the incentives to be more efficient will increase. The unnecessary proliferation of logistic trains is a direct result of commanders not realizing the correlation between the fuel requested to the proliferation of services on their respective FOBs, COBs, and/or COPs. In short and demonstrated in Appendix C, the fuel expended and the energy generated was utilized in an inefficient fashion; more for

FOB, COB, and COP services than operations. Recent developments however, in the aforementioned DoD policy, results of the 2010 QDR, and General Stanley McChrystal's recent actions in Afghanistan (explained later in this paper) indicate this mindset is changing.

The counterargument to monitoring energy consumption is, due to operational planning and training concerns, current operational commanders must rely on posts, bases, and stations to handle their non-deployed energy requirements. These commanders rely on their higher headquarters or even higher level organization to pay the bills associated with energy expenditures; the lack of ownership infuses a lack of oversight. Units training to deploy are not properly equipped to handle the additional burdens of tracking their garrison energy usage.

Another culture shift, thus, is the initial perceived personnel shortages will incentivize energy efficiency leadership all the way to the lowest Private. This collective involvement will inherently work to identify and lessen inefficiencies; with the expectation these ingrained concepts will transfer over when deployed. If the deployed forces develop their procedures and are trained to monitoring their energy use in garrison, they will be more accustomed to monitor their use while deployed. Recalling the Navy's i-ENCON program example, ships must know their associated energy costs prior to pulling into a port; it is ingrained in the Navy's culture because the ship must pay its bills and any savings made through the i-ENCON program result in budgetary rewards.

A recent example where E2E savings could have been leveraged for immediate assistance is with the generators and Heating, Ventilating, and Air Conditioner (HVAC) systems at Camp Leatherneck, Afghanistan. The Marine (Corps) Energy Assessment Team's (MEAT) determined 42% of the camps fuel consumption went to powering 196 generators whose average load was 30%.⁷⁶ Further compounding the issue, 75% of the generators power demand went towards

serving HVACs that lost more than 50% of their output to inefficient structures.⁷⁷ The MEAT's recommendation was to take 131 of these generators off-line; ultimately reducing generator fuel requirements by 36% and overall camp fuel demand by 15%.⁷⁸ As will be discussed later in this section, these energy inefficiencies could have been averted if the culture of energy efficiency was already ingrained with the leaders and managers of these units and an E2E funding appropriation was available.

Fifth, as opposed to the one year O&M obligation period demonstrated in Figure 1 from Section Three, the E2E funds will change to a two year obligation period. The extended timeframe for these funds will allow DoD to carry an equivalent of two-years of O&M fuel funding for energy requirements. This concept creates money within the "zero sum" reality of Government budgeting resulting from a longer obligation lifespan and the ability to properly plan for the application of savings.

The incentive for both Congress and DoD is the built-in ability to deal with unexpected price fluctuations in the energy markets or to offset increased energy demand during extreme weather spells. The tremendous increase in fuel prices during the short timeframe of FYs 2004 through 2006 demonstrates the market's volatility. The spike from \$5.9 billion to \$13.6 billion illuminates how the savings from an E2E modification will assist DoD in covering these increases.⁷⁹

Sixth, the E2E appropriations will allow for re-programming of funds after one year to any funding category requiring energy efficiency support, with the top priority going to deployed energy efficiency concerns. E2E re-programming will have an additional requirement for detailed justification of use in troop morale and welfare programs that have the potential to negatively incentivize energy efficiency for the deployed force. If energy prices do not increase,

cost savings will be available for immediate reprogramming at the DoD level for any funding category requiring energy efficiency funding; the priority of spending will go to programs and services in support of deployed troops.

The re-programming of cost savings will provide greater latitude to the current incentives outlined in section 2851 of the NDAA for FY2007 in that the priority of spending will go to energy efficiency spending in support of deployed troops.⁸⁰ As cited in the NDAA for FY2007 energy cost savings center around implementation on facilities:

(1) One-half of the amount shall be used for the implementation of additional energy conservation measures at buildings, facilities, or installations of the Department of Defense or related to vehicles and equipment of the Department, which are designated, in accordance with regulations prescribed by the Secretary of Defense, by the head of the department, agency, or instrumentality that realized the savings referred to in subsection (a).

(2) One-half of the amount shall be used at the installation at which the savings were realized, as determined by the commanding officer of such installation consistent with applicable law and regulations, for—

(A) improvements to existing military family housing units;

(B) any unspecified minor construction project that will enhance the quality of life of personnel; or

(C) any morale, welfare, or recreation facility or service.⁸¹

The details surrounding how energy efficiency cost savings can be applied to DoD facilities are further explained in Title 10, United States Code, Subchapter 2912, and the August 2009 update of Volume 12, Chapter 12, DoD Financial Management Regulations.⁸²

Increasing the flexibility and speed in reprogramming E2E funds could thus, generate further cost and energy efficiency savings for the entire DoD. The incentives and overall gains in the E2E will supersede the lost flexibility of keeping fuel within the O&M appropriation. The 2009 GAO Report, *Defense Management, DOD Needs to Increase Attention on Fuel Demand Management at Forward-Deployed Locations*, echoes this sentiment: “without establishing a

viable funding mechanism for these (deployed energy efficiency) projects, DoD is not well-positioned to achieve fuel savings at its forward-deployed locations.”⁸³ The E2E appropriations will have the agility built into the guidelines and not have to compete with O&M priorities.

The requirement for a detailed justification of morale, welfare, and recreation (MWR) activities based on “efficiency across the battlefield” was demonstrated as recently as February 2010, when General Stanley McChrystal directed the closings of nearly 50 Army and Air Force Exchange (AAFES) fast food concessions in the Afghanistan operations area. General McChrystal’s, Command Sergeant Major Michael Hall stated, “Supplying nonessential luxuries to big bases in Bagram and Kandahar makes it harder to get essential items to combat outposts and forward operating bases, where troops who are in the fight each day need [to be] resupplied with ammunition, food, and water.” Although General McChrystal stands to lose MWR money from these closings the efficiencies generated will “reduce flight and ground convoy traffic, reduce both local and military security requirements, free up ramp space on airfields, and drastically reduce water and electricity needs.” The elimination of these inefficiencies also creates greater space for the 30,000 American and 7,000 international troops expected to arrive in the near future.⁸⁴

As previously discussed, under the E2E construct, if leaders on all levels are required to monitor the use of their limited energy funds they are more apt to eliminate the proliferation of unnecessary activities. In this case, the tough decision to create efficiency in order to generate greater combat power was left up to the theater commander’s to make. The delays and inefficiencies lost while generating the proper reports needed for the theater commander to make the decision merely exacerbated the problem. Allowing capable combat leaders at the lowest

levels the ability through E2E to make energy efficiency decisions under budget constraints and incentives will avoid the need for senior level decision makers to provide direction.

Finally, further incentives could also be found in the obligation periods for the re-programmed funds. In order to incentivize DoD to not hastily spend any E2E costs savings, funds reprogrammed for procurement or RDT&E projects will have extended obligation periods. When E2E savings are converted to RDT&E, the obligation period would extend for one year; whereas, E2E savings converted to Procurement, PCN, or MILCON will have an additional obligation period of two years. The concept is to incentivize placement of funds on those immediate emerging energy efficiency needs, at the right time and for the largest benefit.

Appropriation Category	Obligation Period
Research, Development, Test & Evaluation (RDT&E)	2 year E2E + 1 year
O&M, Procurement, PCN, and MILCON	2 year E2E + 2 year

Table 2. Two-year E2E appropriations with reprogrammed funding obligation periods.

The ideal office to lead the re-programming efforts for energy efficiency cost savings will be the newly created DoD OEPP office. The OEPP's position as a fusion center with budgetary influence over operational energy efficiency concerns will not only help the warfighter, but it will increase the office's symbolic importance and influence among other agencies within DoD. Furthermore, tracking the E2E cost savings and running concurrent energy wargaming efforts will allow the OEPP to provide even more succinct recommendations for the placement of these funds.

If unit commanders had the ability to utilize E2E savings to purchase more effective military generator units from organization like the DoD Project Manager for Mobile Electric Power (MEP) and militarized HVACs from the current inventory to meet their requirements, the likelihood of energy efficiency gains will be significantly greater.⁸⁵ If the commanders owned,

maintained, and personally paid for the additional equipment on a restricted E2E budget, there is an increased likelihood they will pay greater attention to their energy efficiency concerns. The counterargument to this example says that additional military maintainers are required to support the military equipment. This would require increased military personnel funding; however, in a decreasing budgetary environment increased personnel funding is an unlikely scenario.

In cases where surge maintenance support is required, it is inherently beneficial to provide military members with additional training to supplement the lack of maintenance knowledge or maintenance personnel. In extreme cases maintenance support can be contracted without the need for their commercial generators. The commercial equipment contractors utilized in the OIF/OEF environments was not built to withstand the environment or provide the support required. As a result, the amount of generators on the FOBs, COBs and COPs continued grow in number.⁸⁶

The proliferation in commercial generators resulted from longer wait times for repair parts, the need to cannibalize parts from older generators, redundancy necessary to cover anticipated breakdowns without immediate repair, or contractors that took advantage of U.S. forces not knowing their true energy requirements for each location. Once commercial generators arrived, began operating, and providing support, the U.S. was obligated to pay with O&M funds. All the while, U.S. forces were still responsible for providing the transportation assets for the commercial parts as well as the fuel that went into these generators. This resulted in even greater logistics trains supporting these inefficient operations.⁸⁷ The E2E line of appropriations will seek to reduce the proliferation in unnecessary commercial support requirements by allowing combat leaders the ability to increase the inventory of DoD equipment they know how to operate, support, and maintain.

Sections Three and Four proposed a framework for the E2E appropriations line. This framework is “neither a formalized model nor a theory;”⁸⁸ however, it does provide the means to discuss important relationships between Government appropriations and incentivizing DoD leaders towards greater energy efficiency. The requirement for leaders on all levels to monitor and justify the expenditure of E2E funds creates the necessary incentive to eliminate waste at the lowest possible denominator. Similarly, the feedback loop created from the lowest to the highest levels of leadership measured against the metric of mandated E2E funding provides further support for the culture change necessary to ensure sustained energy efficiency in DoD.

SECTION 5: CONCLUSIONS AND RECOMMENDATIONS

“Without a clearly defined concept and intent, the necessary unity of effort is inconceivable.”
-MCDP 1, Warfighting⁸⁹

Within DoD, funding that supports a clearly defined concept and intent is the ultimate discriminator for action. The NDAA for 2009 and the 2010 QDR are two recent documents providing clear direction for improvements; however, the current construct of DoD appropriations does not fully incentivize energy efficiency within all levels of leadership. Nevertheless, the Marine Energy Assessment Team’s study and General McChrystal’s recent actions in Afghanistan indicate DoD is learning and actively working towards increasing energy efficiency throughout the deployed forces. Leveraging the framework of the E2E appropriations will assist in the increase and sustainment of such efforts. Appendix D provides the following conclusions and recommendations in a matrix format.

First, the E2E appropriation category would apply holistically to the deployed and non-deployed environments in order to stimulate a consistent culture of energy efficiency and awareness. The creation of an E2E appropriation category into law provides the symbolic, tangible, and sustainable incentives necessary at every level of DoD to increase the tempo of

technology advances while elevating the importance of engaged leadership. Second, the elimination of the “use or lose” spending mentality guarantees minimum funding for the following Fiscal Year while promoting effective choices.

Third, E2E funding focused on energy efficiency concerns will create a positive feedback loop not thoroughly leveraged under the O&M category. Divorcing E2E appropriations from O&M protects these funds from the myriad of other requirements O&M is responsible for funding while maintaining a specific focus on energy efficiency. Furthermore, the ability to increase E2E cost savings provides incentives for leaders who live with the outputs from DoD acquisition process to insist on increased energy efficiency KPPs from upper level leaders. This provides further support to the outcomes desired from the NDAA for 2009 and 2010 QDR.

Fourth, leaders who conduct detailed monitoring of E2E appropriations while in non-deployed and deployed status creates a better understanding and awareness of energy consumption. The necessity to quantify energy spending in order to justify unit level E2E budgets forces leaders at every level to better track their energy efficiency through their budget. This accountability provides better statistics at higher levels while allowing leaders the ability to maximize benefit from their efforts. No leader, however, should be saddled with the burden of counting gallons of fuel while “on the move conducting sustained kinetic combat operations. Conversely, every leader should remain intimately involved with the FBCF required to support the operation and proliferation of the FOBs, COBs, and COPs in a sustained counter insurgency (COIN) or mass humanitarian assistance environment. If leaders have the responsibility to monitor an E2E budget after the cessation of “on the move” combat operations, they will strive to ensure energy efficiency happens for the savings in lives, time in theater conducting operations, and taxpayer dollars.

Fifth, an increase to a two-year obligation period allows DoD the ability to cover the preponderance of increased price fluctuations rather than re-programming from other appropriation categories or forcing Congress to cover the deficits with further supplemental funding. The E2E appropriation's creates funding within the "zero sum game" of Government budgeting resulting from the overlapping fiscal year budgets. The longer obligation lifespan and the ability to re-program funds with more life for proper placement among energy efficiency concerns is an added incentive towards increasing energy efficiency and cost savings.

Sixth, in cases where price fluctuations are not evident, cost savings will be applied to projects or programs capable of benefiting from energy efficiency increases while requiring detailed justification of cost savings toward morale and welfare programs. Finally, extending periods for re-programmed funds reduces the rush to spend while allowing for better planning and response times to leadership requests. The DoD's Director of Operational Energy Plans & Programs should guide the re-programming of available E2E funds in order to effectively support the warfighter while also increasing the DOEPPs authority and influence.

The magnitude of enacting such an appropriation is on par with Secretary of Defense Robert McNamara's implementation of the Planning Programming and Budgeting System (PPBS) during the 1960s, or the required changes legislated in the 1986 Goldwater-Nichols Act. More importantly, and from a warfighters perspective, an E2E appropriation line is not just about incentivizing leadership to save money or energy; it is about saving lives. Preventing warfighters from protecting unnecessary fuel deliveries, on hazardous roads, strewn across foreign battlefields actually supports leadership in the conduct of their operational job requirements. The fact that DoD can incentivize energy efficiency and properly spend Government funds in this process are merely beneficial secondary and tertiary outcomes.

Endnotes

- ¹ Military Review, "Breaking the Tether of Fuel." Jan-Feb 2007. http://findarticles.com/p/articles/mi_m0PBZ/is_1_87/ai_n27135951/ (accessed September 15, 2009).
- ² U.S. Department of Defense, *Quadrennial Defense Review*, (Washington DC: Department of Defense, February 2010), 87.
- ³ DoD, *Quadrennial Defense Review*, 84 – 88.
- ⁴ U.S. Department of Defense, *Report of the Defense Science Board on More Capable Warfighting through Reduced Fuel Burden*, (Washington D.C: Office of the Under Secretary of Defense For Acquisition and Technology, May 2001), 10.
- ⁵ President of the United States, *National Defense Industrial Resource Preparedness*, Executive Order 12919, The Federal Register, Volume 59, Number 108. (Washington DC: June 7, 1994). http://www.acq.osd.mil/ip/docs/eo_12919-highlighted.pdf (accessed 04 February 2010).
- ⁶ U.S. Department of Defense, *Supply Chain Material Management Regulation*, DoD 4140.1-R, May 23, 2003, 191.
- ⁷ U.S. Department of Defense, *DoD Management Policy for Energy Commodities and Related Services*, Directive 4120.25, 2.
- ⁸ U.S. Congress, *Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, Public Law 110-417*, 110th Congress, October 14, 2008, Section 331, <http://www.coherentbabble.com/PublicLaws/PL110-417ds.pdf> (accessed 24 October 2009).
- ⁹ National Intelligence Council, *National Intelligence Council 2020 Project, Mapping the Global Future*, (Pittsburgh, PA: Government Printing Office, 2004), 12.
- ¹⁰ Headquarters U.S. Marine Corps, *Marine Corps Vision & Strategy 2025* (Washington, DC: Headquarters U.S. Marine Corps, June 30, 2008), 11.
- ¹¹ USMC, *Marine Corps Vision & Strategy 2025*, 14.
- ¹² USMC, *Marine Corps Vision & Strategy 2025*, 23.
- ¹³ President of the United States, *National Defense Industrial Resource Preparedness*, Executive Order 12919, The Federal Register, Volume 59, Number 108, Washington DC: June 7, 1994, http://www.acq.osd.mil/ip/docs/eo_12919-highlighted.pdf (accessed 04 February 2010); President of the United States, *Strengthening Federal Environmental, Energy, and Transportation Management*, Executive Order 13423, National Archives and Records Administration, Federal Register, January 26, 2007. <http://edocket.access.gpo.gov/2007/pdf/07-374.pdf> (accessed 23 October 2009); U.S. Congress, *Energy Policy Act of 1992, Public Law 109-58*, 102nd Congress, 2nd Session, January 1992, <http://www.ferc.gov/legal/maj-ord-reg/epa.pdf> (accessed 23 October 2009); U.S. Congress, *Energy Policy Act of 2005, Public Law 109-58*, 109th Congress, August 8, 2005, http://www.epa.gov/oust/fedlaws/publ_109-058.pdf (accessed 23 October 2009); U.S. Congress, *Energy Independence and Security Act of 2007, Public Law 110-140*, 110th Congress, December 19, 2007, <http://leahy.senate.gov/issues/FuelPrices/EnergyIndependenceAct.pdf> (accessed 23 October 2009), Andrews, Anthony, *Department of Defense Facilities Energy Conservation Policies and Spending*, CRS Report for Congress R40111, (Washington, DC: Congressional Research Service, February 19, 2009), 2-6 and 23, <http://fas.org/sgp/crs/natsec/R40111.pdf> (accessed January 18, 2010).
- ¹⁴ DoD, *Quadrennial Defense Review*, 87.
- ¹⁵ Andrews, *Department of Defense Facilities Energy Conservation Policies and Spending*, 9.
- ¹⁶ Andrews, *Department of Defense Facilities Energy Conservation Policies and Spending*, 8.
- ¹⁷ Andrews, *Department of Defense Facilities Energy Conservation Policies and Spending*, 1.
- ¹⁸ U.S. Department of Defense, "Facilities Energy Directorate Home(page)," Office of the Deputy Under Secretary of Defense Installations and Environment website, <http://www.acq.osd.mil/ie/energy/index.shtml> (accessed February 8, 2010).
- ¹⁹ Andrews, Anthony. *Department of Defense Fuel Spending, Supply, Acquisition, and Policy*, CRS Report for Congress R40459 (Washington, DC: Congressional Research Service, September 22, 2009), 2, http://assets.opencrs.com/rpts/R40459_20090922.pdf (accessed January 20, 2010).
- ²⁰ Andrews, *Department of Defense Fuel Spending, Supply, Acquisition, and Policy*, 2 and 5.

- ²¹ Andrews, *Department of Defense Fuel Spending, Supply, Acquisition, and Policy*, 5 and 17.
- ²² Banfield, Dr. Zoe, Chris Courtaux, and Dr. John Golightly, "The Fully Burdened Cost of Energy," (Rusi Defence Systems Website, October, 2009), http://www.rusi.org/downloads/assets/Banfield_Courtaux_Golightly_RDSAut09.pdf (accessed January 10, 2010).
- ²³ U.S. Congress, *Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, Public Law 110-417*, 110th Congress, October 14, 2008, Section 332, <http://www.coherentbabble.com/PublicLaws/PL110-417ds.pdf> (accessed 24 October 2009).
- ²⁴ U.S. Department of Defense, *Report of the Defense Science Board Task Force on DoD Energy Strategy, "More Fight – Less Fuel,"* (Washington, DC: Office of the Under Secretary of Defense For Acquisition, Technology, and Logistics February, 2008), 13.
- ²⁵ Andrews, *Department of Defense Fuel Spending, Supply, Acquisition, and Policy*, 17.
- ²⁶ Government Accountability Office, *Defense Management, DOD Needs to Increase Attention on Fuel Demand Management at Forward-Deployed Locations*, (Washington DC: Government Accountability Office, February, 2007), 29.
- ²⁷ House Committee on Appropriations, *Summary: 2010 Appropriations Bill, Full Committee Markup*, July 22, 2009; U.S. Congress, *Department of Defense Appropriations Act, 2010*, Public Law 111-118, 111th Congress, 1st session, December 19, 2009.
- ²⁸ Center for Naval Analyses, *Powering America's Defense: Energy and the Risks to National Security*, (Washington DC: Center for Naval Analyses, May, 2009), 39; DoD, *Report of the Defense Science Board Task Force on DoD Energy Strategy, "More Fight – Less Fuel,"* 17.
- ²⁹ DoD, *Report of the Defense Science Board Task Force on DoD Energy Strategy, "More Fight – Less Fuel,"* 26.
- ³⁰ DoD, *Report of the Defense Science Board Task Force on DoD Energy Strategy, "More Fight – Less Fuel,"* 26.
- ³¹ DoD, *Report of the Defense Science Board Task Force on DoD Energy Strategy, "More Fight – Less Fuel,"* 29.
- ³² Andrews, *Department of Defense Fuel Spending, Supply, Acquisition, and Policy*, 17 and 19; U.S. Congress, *Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, Public Law 110-417*, 110th Congress, October 14, 2008, Sections 331-334 and 902, <http://www.coherentbabble.com/PublicLaws/PL110-417ds.pdf> (accessed 24 October 2009).
- ³³ U.S. Department of Defense, *Report of the Defense Science Board Task Force on Improving Fuel Efficiency of Weapons Platforms*, Memorandum for the Chairman, Defense Science Board (Washington DC: Office of the Under Secretary of Defense For Acquisition and Technology, May 2001), 1.
- ³⁴ DoD, *Report of the Defense Science Board Task Force on Improving Fuel Efficiency of Weapons Platform*, Memorandum for the Chairman, 2.
- ³⁵ DoD, *Report of the Defense Science Board Task Force on DoD Energy Strategy, "More Fight – Less Fuel,"* 104.
- ³⁶ Congress, *NDAA of 2009*, Sections 332.
- ³⁷ DoD, *Report of the Defense Science Board Task Force on DoD Energy Strategy, "More Fight – Less Fuel,"* 99.
- ³⁸ President of the United States, *Federal Leadership in Environmental, Energy, and Economic Performance*, Executive Order 13514, October 5, 2009, Section 2, paragraph (h). http://www.whitehouse.gov/assets/documents/2009_fedleader_eo_rel.pdf (accessed January 18, 2010).
- ³⁹ \$4.24 and \$3.84 billion numbers are attributed to: Towell, Pat, Stephen Daggett, Amy Belasco, *Defense: FY2009 Authorizations and Appropriations*, CRS Report for Congress RL34473 (Washington DC: Congressional Research Service, February 25, 2009), 4, <http://fas.org/sgp/crs/natsec/RL34473.pdf> (accessed January 12, 2010); \$3.86 billion attributed to: Andrews, *Department of Defense Facilities Energy Conservation Policies and Spending*, 21;; U.S. Congress. *American Recovery and Reinvestment Act of 2009*. 111th Congress, 1st session, January 6, 2009.
- ⁴⁰ Congress, *NDAA of 2009*, Sections 332.
- ⁴¹ U.S. Department of Defense, *Joint Capability Integration and Development System*, CJCSI 3170.01G, March 1, 2009; U.S. Department of Defense, *Manual for the Operation of the Joint Capabilities Integration and Development System*, CJCSM 3170.01D, February 2009, Updated July 31, 2009. B-5, <https://acc.dau.mil/communitybrowser.aspx?id=267116> (accessed February 20, 2010).

- ⁴² U.S. Department of Defense, *Final Report of the Defense Science Board (DSB) Task Force on DoD Energy Strategy*, Memorandum for the Chairman, Defense Science Board, (Washington DC: January 14, 2008), 1.
- ⁴³ DoD, *Final Report of the Defense Science Board (DSB) Task Force on DoD Energy Strategy*, 1.
- ⁴⁴ DoD, *Final Report of the Defense Science Board (DSB) Task Force on DoD Energy Strategy*, 2.
- ⁴⁵ DoD, *Final Report of the Defense Science Board (DSB) Task Force on DoD Energy Strategy*, 3.
- ⁴⁶ DoD, *Quadrennial Defense Review*, 87.
- ⁴⁷ Congress, *Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, Public Law 110-417*, Subtitle A, Section 902; Andrews, *Department of Defense Facilities Energy Conservation Policies and Spending*, 5.
- ⁴⁸ DoD, *Report of the Defense Science Board Task Force on DoD Energy Strategy*; "More Fight – Less Fuel," 68.
- ⁴⁹ U.S. Department of Defense, "Installations and Energy Home(page)," Office of the Deputy Under Secretary of Defense Installations and Environment website, <http://www.acq.osd.mil/ie/index.shtml> (accessed February 20, 2010).
- ⁵⁰ Congress, *Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, Public Law 110-417*, Subtitle A, Section 902.
- ⁵¹ DoD, *Quadrennial Defense Review*, 87.
- ⁵² U.S. Department of Defense, *Installation Energy Management*, Instruction 4170.11, December 11, 2009, 1.
- ⁵³ U.S. Department of Defense, *Annual Energy Management Report, Fiscal Year 2008*, (Washington DC: Office of the Deputy Under Secretary of Defense (Installations and Environment) January 2009), Section I.B.1 Awards, 9 – 14.
- ⁵⁴ Andrews, *Department of Defense Facilities Energy Conservation Policies and Spending*, 13.
- ⁵⁵ Department of the Navy, "Record Year for Navy's Incentivized Energy Conservation Program," Naval Sea Systems Command Office of Corporate Communications website, October, 22, 2009, http://www.navy.mil/Search/display.asp?story_id=49159 (accessed January 19, 2010).
- ⁵⁶ Center for Naval Analyses, 10.
- ⁵⁷ Cullop, Floyd G, *The Constitution of the United States, An Introduction*, (New York: Penguin Books, 1984), 44.
- ⁵⁸ Heniff, Bill, *Overview of the Authorization-Appropriations Process*, CRS Report for Congress RS20371, (Washington DC: Congressional Research Service, June 17, 2008), 1. <http://lugar.senate.gov/indianaspending/pdf/Overview.pdf> (accessed January 9, 2010).
- ⁵⁹ U.S. Congressional Budget Office, "Mandatory Spending Control Measures," Congressional Budget Office Website, <http://www.cbo.gov/doc.cfm?index=4680&type=0> (accessed January 11, 2010); Heniff, 1.
- ⁶⁰ Heniff, 1.
- ⁶¹ Andrews, *Department of Defense Fuel Spending, Supply, Acquisition, and Policy*, 5.
- ⁶² U.S. Department of Defense, *Financial Management Regulation*, DOD 7000.14.R, Volume 2A, Chapter 1, October, 2008, 1-14, <http://comptroller.defense.gov/fmr/> (accessed January 11, 2010).
- ⁶³ U.S. Department of Defense. *Financial Management Regulation*. DoD 7000.14R, Volume 2A, Chapter 1, 1-6.
- ⁶⁴ Headquarters U.S. Marine Corps, *Ten by '10, Top 10 Things To Do by 2010 to Reduce USMC Energy Risks*, , (Washington DC: Facilities Energy & Water Management Program Campaign Plan, May 05, 2009), 2; Towell, 10.
- ⁶⁵ Towell, 10.
- ⁶⁶ U.S. Department of Energy, "U.S. Department of Energy – Energy Efficiency and Renewable Energy, Federal Energy Management Program - Operations and Maintenance," Federal Energy Management Program website, http://www1.eere.energy.gov/femp/operations_maintenance/ (accessed January 16, 2010).
- ⁶⁷ Khrushchev, Nikita, "Incentive Quotes," <http://www.brainyquote.com/quotes/keywords/incentives.html> (accessed January 19, 2010).
- ⁶⁸ "Western powers came close to intervening militarily and simply taking the oil. By some accounts, only the threat of a counterstrike by the Soviet Union kept them from doing so, and that deterrent no longer exists." Roberts, Paul. *The End of Oil, On the Edge of a Perilous New World*, (New York: Houghton Mifflin Company, 2004), 59.
- ⁶⁹ Center for Naval Analyses. 10.
- ⁷⁰ Center for Naval Analyses, 32.

- ⁷¹ Government Accountability Office, *Defense Management, DOD Needs to Increase Attention on Fuel Demand Management at Forward-Deployed Locations* (Washington DC: Government Accountability Office, February, 2007), 31.
- ⁷² GAO, *Defense Management, DOD Needs to Increase Attention on Fuel Demand Management at Forward-Deployed Locations*, 32.
- ⁷³ Andrews, *Department of Defense Fuel Spending, Supply, Acquisition, and Policy*, 5.
- ⁷⁴ DoD, *Report of the Defense Science Board Task Force on DoD Energy Strategy, "More Fight – Less Fuel,"* 12.
- ⁷⁵ Government Accountability Office, *Eminent Domain, Information About it uses and effects on property owners is limited* (Washington. DC: Government Accountability Office, November, 2006), 6, <http://www.gao.gov/new.items/d0728.pdf> (accessed January 10, 2010).
- ⁷⁶ Headquarters U.S. Marine Corps, Marine Energy Assessment Team, Afghanistan Outbrief, Marine Energy Assessment Team (Washington, DC: October 1, 2009), Slide 12.
- ⁷⁷ USMC, Marine Energy Assessment Team, Afghanistan Outbrief, Slide 13.
- ⁷⁸ USMC, Marine Energy Assessment Team, Afghanistan Outbrief, Slide 20.
- ⁷⁹ DoD, *Report of the Defense Science Board Task Force on DoD Energy Strategy, "More Fight – Less Fuel,"* 13.
- ⁸⁰ Congress, *John Warner National Defense Authorization Act for Fiscal Year 2007*, 109th Congress, 2nd sess, January 3, 2006, Section 2851.
- ⁸¹ Congress. *John Warner National Defense Authorization Act for Fiscal Year 2007*, Section 2851.
- ⁸² Andrews, *Department of Defense Facilities Energy Conservation Policies and Spending*, 4; U.S. Department of Defense. *Financial Management Regulations, "Identification, Retention, and Use of Energy and Water Conservation Savings,"* DOD 7000.14R, Vol. 12, Chap. 12, August, 2009, 12-3 and 12-4.
- ⁸² Congress. *John Warner National Defense Authorization Act for Fiscal Year 2007*, Section 2851.
- ⁸³ GAO, *Defense Management, DOD Needs to Increase Attention on Fuel Demand Management at Forward-Deployed Locations*, 31.
- ⁸⁴ Jowers, Karen, "A Whopper of a decision," *Marine Corps Times*, February 22, 2010.
- ⁸⁵ U.S. Department of Defense, DoD Project Manager, Mobile Electric Power website, <http://www.pmmep.army.mil/> (accessed February 04, 2010).
- ⁸⁶ Joe Morris, FY 2005 Multi-National Force West Chief of Contracts, email message to author, March 5, 2010.
- ⁸⁷ Joe Morris, FY 2005 Multi-National Force West Chief of Contracts, email message to author, March 5, 2010.
- ⁸⁸ O'Neill, Bard E, *From Revolution to Apocalypse, Insurgency & Terrorism, Second Edition* (Washington DC: Potomac Books, Inc, 2005), 199.
- ⁸⁹ Headquarters U.S. Marine Corps, *Warfighting*, MCDP1 (Washington DC: U.S. Marine Corps, June 20, 1997), 82.

APPENDIX A: FUEL PLANNING, DISTRIBUTION, AND SUPPORT FOR THE FBCF
 Joint Publication 4-03, *Joint Bulk Petroleum and Water Doctrine*

I-4

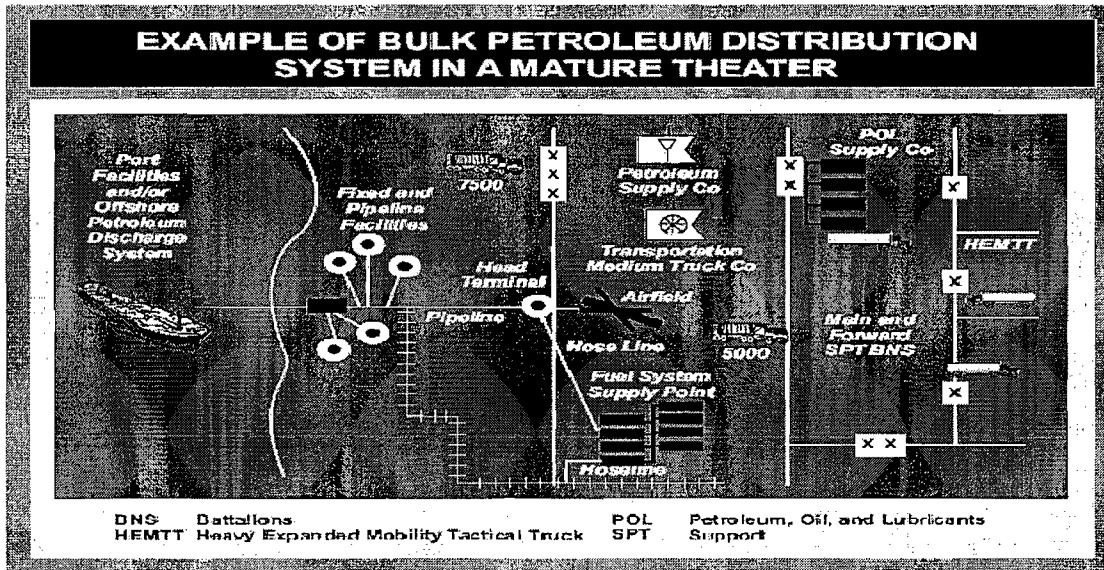


Figure I-2. Example of Bulk Petroleum Distribution System In a Mature Theater

I-6

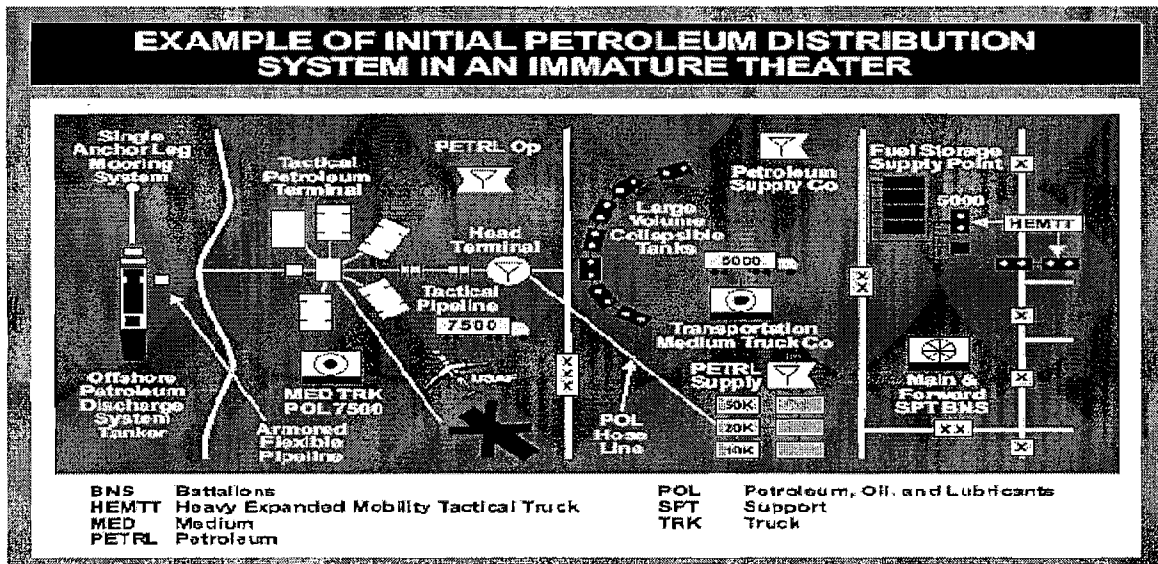


Figure I-3. Example of Initial Petroleum Distribution System in an Immature Theater

APPENDIX A: FUEL PLANNING, DISTRIBUTION, AND SUPPORT FOR THE FBCF
Joint Publication 4-03, Joint Bulk Petroleum and Water Doctrine

I-9

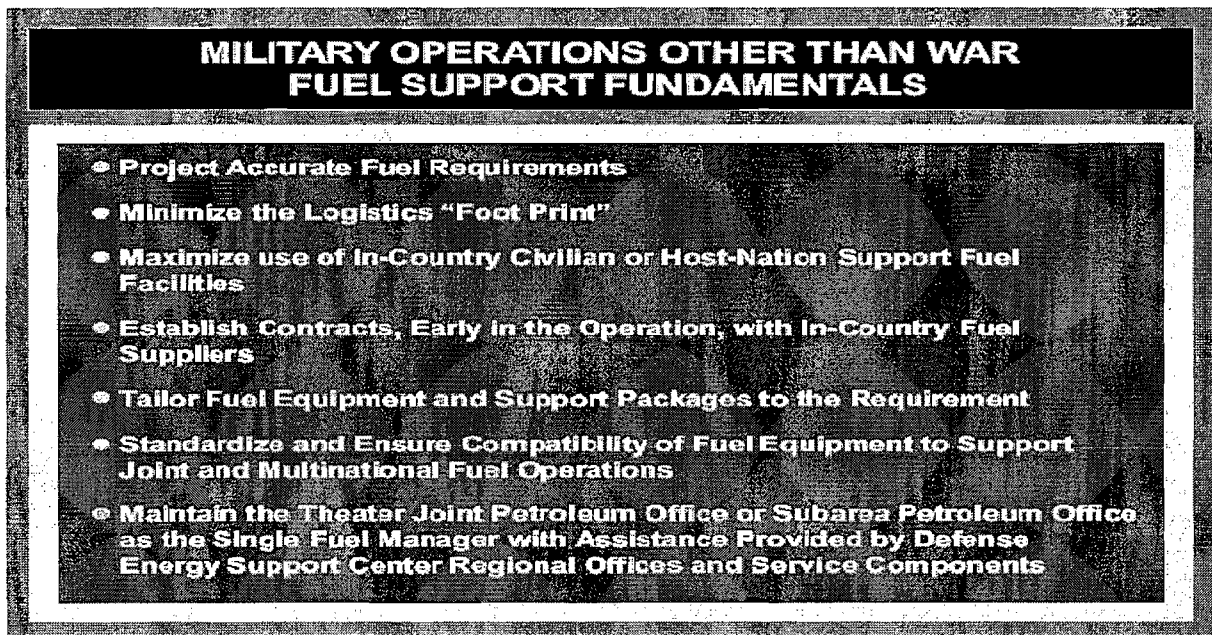


Figure I-4. Military Operations Other Than War Fuel Support Fundamentals

I-11



Figure I-5. Planning Considerations

APPENDIX A: FUEL PLANNING, DISTRIBUTION, AND SUPPORT FOR THE FBCF
Joint Publication 4-03, Joint Bulk Petroleum and Water Doctrine

II-4

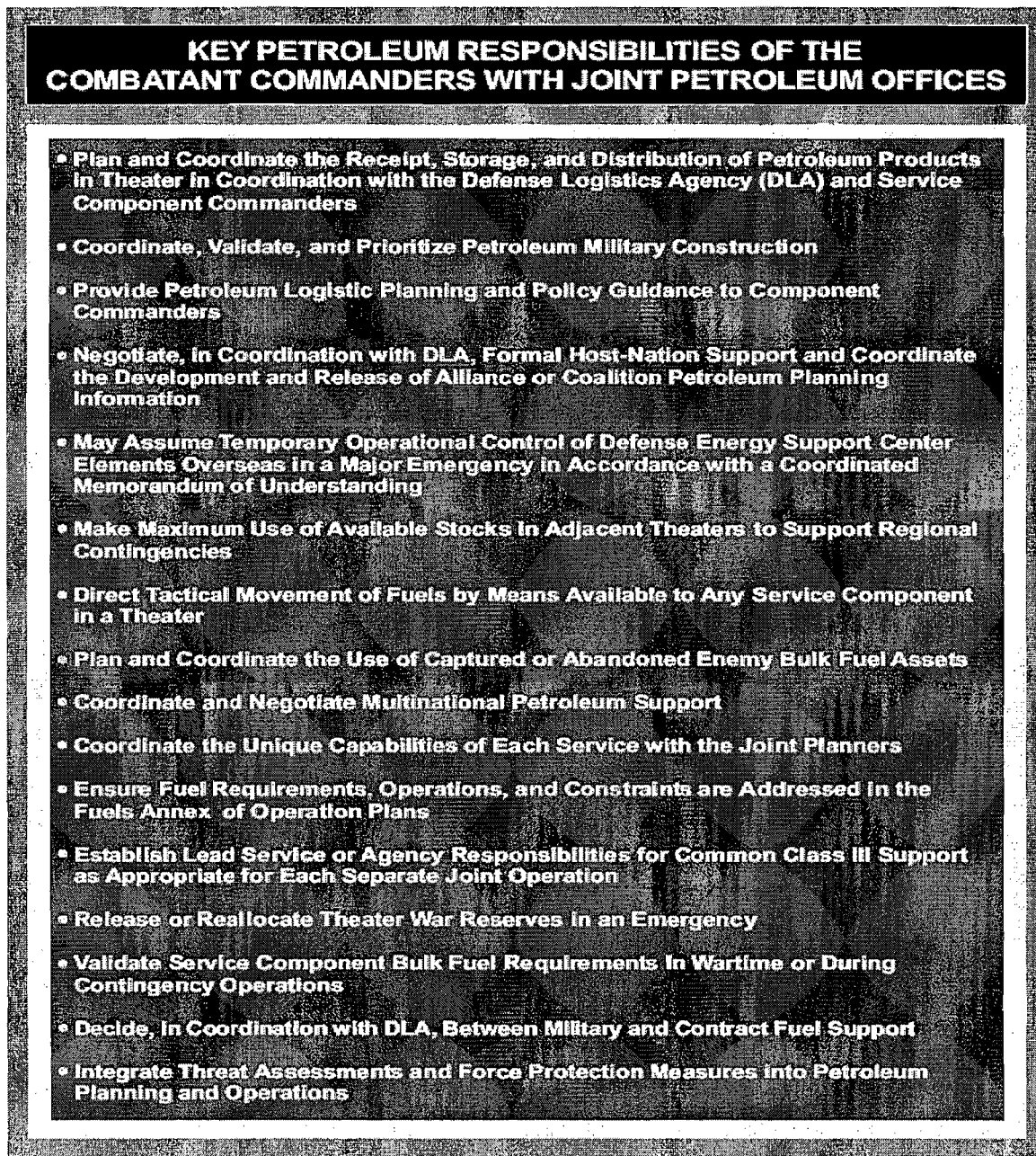


Figure II-1. Key Petroleum Responsibilities of the Combatant Commanders with Joint Petroleum Offices

APPENDIX B: DOD APPROPRIATIONS DEFINITIONS
from ACQUIpedia website

<https://acc.dau.mil/CommunityBrowser.aspx?id=28864> (accessed January 11, 2010)

Research, Development, Test and Evaluation (RDT&E) appropriations fund the efforts performed by contractors and government activities required for the Research and Development (R&D) of equipment, material, computer application software, and its Test and Evaluation (T&E) to include Initial Operational Test and Evaluation (IOT&E) and Live Fire Test and Evaluation (LFT&E). RDT&E also funds the operation of dedicated R&D installations activities for the conduct of R&D programs.

Procurement appropriations fund those acquisition programs that have been approved for production (to include Low Rate Initial Production (LRIP) of acquisition objective quantities), and all costs integral and necessary to deliver a useful end item intended for operational use or inventory upon delivery.

Operation and Maintenance (O&M) appropriations fund expenses such as civilian salaries, travel, minor construction projects, operating military forces, training and education, depot maintenance, stock funds, and base operations support.

Military Personnel (MILPERS) appropriations fund costs of salaries and other compensation for active and retired military personnel and reserve forces based on end strength.

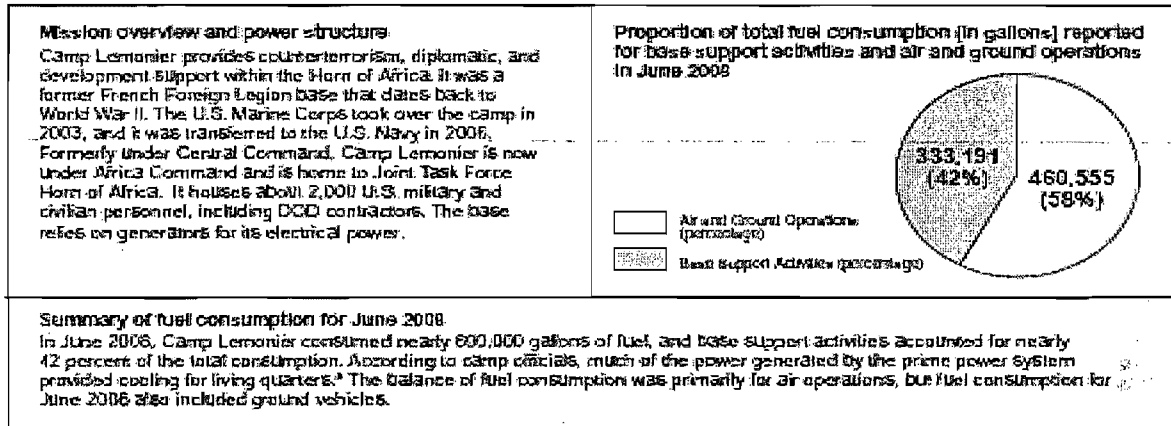
Military Construction (MILCON) appropriations fund major projects such as bases, schools, missile storage facilities, maintenance facilities, medical/dental clinics, libraries, and military family housing.

APPENDIX C: CHARTS OF DEPLOYED FUEL DEMAND IN JUNE 2008

Charts drawn from The GAO Report: *DoD Needs to Increase Attention on Fuel Demand Management at Forward-Deployed Locations*

Page 43

Figure 8: Camp Lemonier

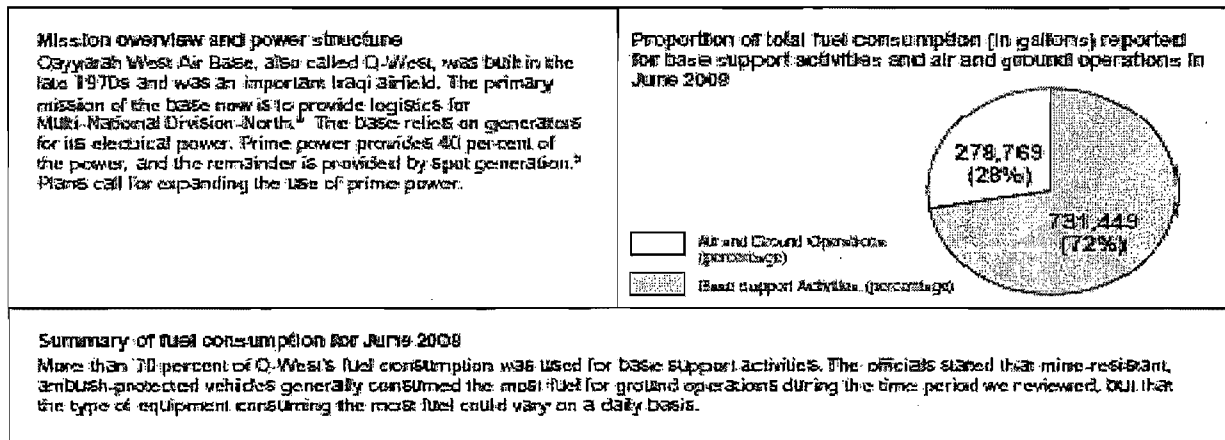


Source: GAO analysis of DOD data (pie chart).

⁸According to a DOD Project Manager/Mobile Electric Power official, prime power refers to mobile, but large, generators that operate off of higher voltages than spot generators and provide large amounts of continuous power.

Page 44

Figure 9: Q-West Air Base



Source: GAO analysis of DOD data (pie chart).

⁹Iraq is divided into major areas of responsibility assigned to six major subordinate commands. These include (1) Multinational Division-Baghdad, (2) Multinational Division-North, (3) Multinational Force-West, (4) Multinational Division-Central South, and (5) Multinational Division-Southeast.

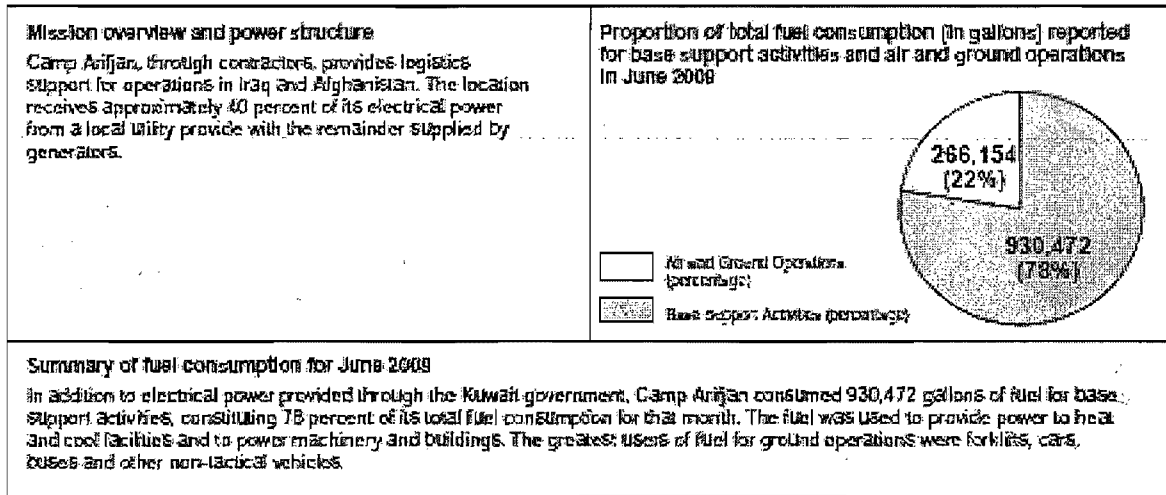
⁹Spot generation, or distributed power, generally refers to generators that operate at lower voltages and produce less power than prime power units.

APPENDIX C: CHARTS OF DEPLOYED FUEL DEMAND IN JUNE 2008

Charts drawn from The GAO Report: *DoD Needs to Increase Attention on Fuel Demand Management at Forward-Deployed Locations*

Page 45

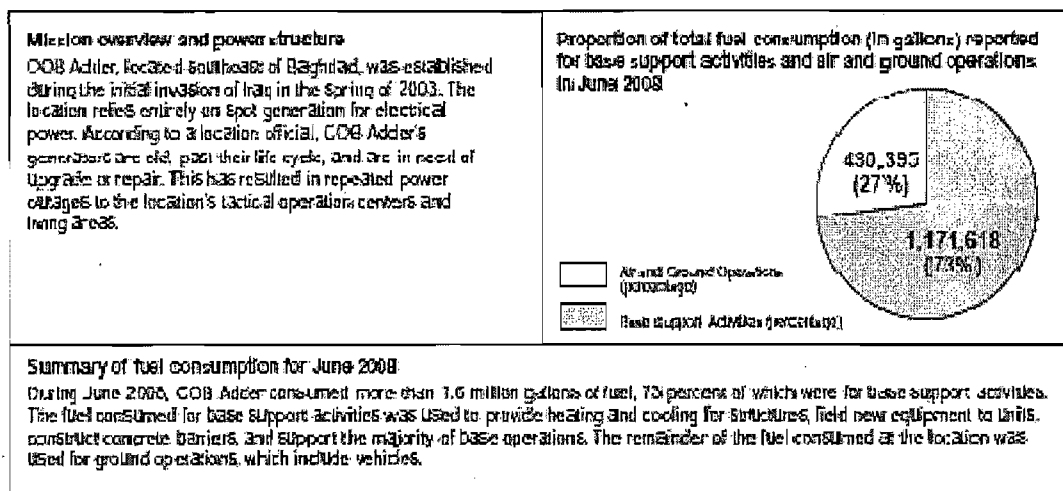
Figure 10: Camp Arifjan



Source: GAO analysis of DOD data (see chart)

Page 46

Figure 11: Contingency Operating Base Adler



Source: GAO analysis of I&A data (see chart)

APPENDIX D: SUMMARY MATRIX

Recommendation	Incentive
1) Backed by law and tangible funding	1) Symbolic cultural paradigm shift 2) Law is not as flexible as DoD regulations 3) Tangible commitment to sustained energy efficiency actions for non-deployed and deployed forces
2) Established minimum yearly funding baseline	1) Eliminate ‘use or lose’ mentality of the one-year O&M 2) Reinforce the importance of detailed monitoring of energy efficiency, consumption, and costs in lives and funds order to justify requested plus-ups that re-set minimum baseline
3) E2E funding strictly for energy bills and efficiency projects and programs	1) Inability to move funds designed for energy efficiency requirements to other priorities allowed under O&M 2) Focused funds for only energy bills, efficiency projects and programs stimulates a positive feedback loop 3) The ability to increase E2E cost savings incentivizes commanders who live with the outputs from the DoD acquisition process to insist on increased energy efficiency Key Performance Parameters from upper level leaders
4) Monitoring energy funds	1) Monitor and plan for proper application of future savings 2) Better understanding and awareness of energy costs; at every level of consumption and leadership; in deployed and non-deployed environments
5) Two-year obligation period	1) Extended timeframes allow for overlapping funding period to cover the preponderance of increased price fluctuations rather than ‘re-programming’ from other appropriation categories or forcing Congress to cover the deficits with supplemental funding 2) The E2E appropriations creates money within the “zero sum game” of Government budgeting resulting from longer a obligation lifespan and the ability to properly plan for the application of savings
6) Re-programming of funds after first year to any funding category with a priority on deployed energy efficiency concerns	1) In cases where price fluctuations are not evident, cost savings will be applied to projects or programs capable of benefiting from energy efficiency increases 2) Detailed justification for moral and welfare programs that have the potential to negatively effect energy efficiency
7) Extended periods for re-programmed funds	1) Avoid the rush to spending 2) Further empower the Director of OEPP in the proper application of funds 3) Allow DoD extended time periods to thoroughly plan and respond to operational leadership’s requirements

BIBLIOGRAPHY

- Andrews, Anthony. *Department of Defense Facilities Energy Conservation Policies and Spending*. CRS Report for Congress R40111. Washington, DC: Congressional Research Service, February 19, 2009. <http://fas.org/sgp/crs/natsec/R40111.pdf> (accessed January 18, 2010).
- Andrews, Anthony. *Department of Defense Fuel Spending, Supply, Acquisition, and Policy*. CRS Report for Congress R40459. Washington, DC: Congressional Research Service, September 22, 2009. http://assets.opencrs.com/rpts/R40459_20090922.pdf (accessed January 10, 2010).
- Andrews, Anthony. "Department of Defense Fuel Spending and Supply Power Point Brief." AIE Military Energy & Alternative Fuels Conference. October 19-20, 2009.
- ACQUInet. "Authorization / Appropriation Acts Passed." ACQUInet website. <https://acc.dau.mil/CommunityBrowser.aspx?id=28864> (accessed January 11, 2010).
- Banfield, Dr. Zoe, Chris Courtaux, and Dr. John Golightly. "The Fully Burdened Cost of Energy." Rusi Defence Systems Website. October, 2009. http://www.rusi.org/downloads/assets/Banfield_Courtaux_Golightly_RDSAut09.pdf (accessed January 10, 2010).
- Barnes, Ryan. The Importance Of Inflation And GDP. Investopedia website. <http://www.investopedia.com/articles/06/gdpinflation.asp> (accessed February 16, 2010).
- Brand Neutral. "The Prius Effect: Learning from Toyota." Part of the Brand Neutral White Papers. Beverly Hills, Ca: updated in December 2007.
- Carfrey, Lance Corporal Bryan G. "Marine Corps sets vision to conserve energy." Headquarters Marine Corps website, August 14, 2009, <http://www.marines.mil/units/hqmc/Pages/MarineCorpssetsvisiontoconserveenergy.aspx> (accessed 03 Sept 2009).
- Center for Naval Analyses. *Powering America's Defense: Energy and the Risks to National Security*. Washington DC: Center for Naval Analyses, May, 2009.
- Cullom, RADM Philip H. "Navy Task Force Energy Update Power Point Brief." Director of Fleet Readiness. Washington DC: OPNAV N43, October, 2009.
- Cullop, Floyd G. *The Constitution of the United States, An Introduction*. New York: Penguin Books, 1984.
- Drew, Dennis M. and Donald M. Snow. "Making 21st Century Strategy: An Introduction to Modern National Security Processes and Problems." Maxwell AFB, Al: Air University Press, 2006.

- Energy Information Agency. British Thermal Units (Btu) - Energy Units *Explained*. EIA website. http://tonto.eia.doe.gov/energyexplained/index.cfm?page=about_btu (accessed February 16, 2010).
- Gardiner, Ian. *In the Service of the Sultan, A First Hand Account of the Dhofar Insurgency*. Barnsley, South Yorkshire: Pen & Sword Books Ltd, 2008.
- Glain, Stephen. *Mullahs, Merchants, and Militants: The Economic Collapse of the Arab World*. New York: St. Martin's Press, 2004.
- Gordon, Michael R., and General Bernard E. Trainor. *The General's War*. New York: Little, Brown and Company, 1995.
- Greenspan, Alan. *The Age of Turbulence*. New York: The Penguin Press, 2007.
- Headquarters U.S. Marine Corps. *Warfighting*. MCDP 1. Washington DC: Headquarters U.S. Marine Corps, June 20, 1997.
- Headquarters U.S. Marine Corps. *Strategy*. MCDP 1-1. Washington DC: Headquarters U.S. Marine Corps, November 12, 1997.
- Headquarters U.S. Marine Corps. *Command and Control*. MCDP 6. Washington DC: Headquarters U.S. Marine Corps, October 4, 1996.
- Headquarters U.S. Marine Corps. *MCWP 4-11.6, Petroleum and Water Logistics Operations*. Washington DC: Headquarters U.S. Marine Corps, June 19, 2005.
- Headquarters U.S. Marine Corps. *Marine Corps Flying Hour Program (FHP) Management*. MCO 3125.1B. Washington DC: Headquarters U.S. Marine Corps, April 27, 2009.
- Headquarters U.S. Marine Corps. *Marine Corps Vision & Strategy 2025*. Washington, DC: Headquarters U.S. Marine Corps, June 30, 2008.
- Headquarters U.S. Marine Corps. *Marine Energy Assessment Team, Afghanistan Outbrief*. Marine Energy Assessment Team. Washington, DC: Headquarters U.S. Marine Corps, October 1, 2009.
- Headquarters U.S. Marine Corps. *Ten by '10, Top 10 Things To Do by 2010 to Reduce USMC Energy Risks*. Facilities Energy & Water Management Program Campaign Plan. Washington DC: Headquarters U.S. Marine Corps, May 05, 2009.
- Heniff, Bill. Overview of the Authorization-Appropriations Process. CRS Report for Congress RS20371. Washington DC: Congressional Research Service, June 17, 2008. <http://lugar.senate.gov/indianaspending/pdf/Overview.pdf> (accessed January 9, 2010).

Hofstrand, Don. Energy Measurements and Conversions. Iowa State University, University Extension website. www.extension.iastate.edu/agdm (accessed February 16, 2010).

Hooks, Robert M. U.S. Department of Defense, Defense Logistics Agency, Defense Energy Support Center International Logistics (DESC-FGI) PowerPoint Presentation. September 27, 2005.

Jarvis, Robert L. "DESC Overview, Power Point Brief." Defense Energy Support Center Workforce Development Office. Washington DC: April 18, 2006.

Jowers, Karen. "A Whopper of a decision." *Marine Corps Times*, February 22, 2010.

Kennedy, President John F., "Man on the Moon Address." A Special Address to Congress on the Importance of Space. May 25, 1961, Home of Heroes website. http://www.homeofheroes.com/presidents/speeches/kennedy_space.html (accessed January 2, 2010).

Khrushchev, Nikita. "Incentive Quotes." <http://www.brainyquote.com/quotes/keywords/incentives.html> (accessed January 19, 2010).

Kosiak, Steven M. *The FY2009 Defense Appropriations Act*. Center for Strategic and Budgetary Assessment. Washington D.C. 22 Oct 08 http://www.csbaonline.org/4Publications/PubLibrary/B.20081022.FY2009_Defense_Ap/B.20081022.FY2009_Defense_Ap.pdf (accessed 23 October 09).

Krepinevich, Andrew, *Defense Investment Strategies in an Uncertain World*. Center for Strategic and Budgetary Assessments, 2008. http://www.csbaonline.org/4Publications/PubLibrary/R.20080821.Defense_Investment/R.20080821.Defense_Investment.pdf (accessed 24 Oct 2009).

Krepinevich, Andrew, "Power Point Brief: Defense Investment Strategies in an Uncertain World." Center for Strategic and Budgetary Assessments, 21 August 2008. http://www.csbaonline.org/4Publications/PubLibrary/S.20080820.Investment_Strateg/S.20080820.Investment_Strateg.pdf (accessed 24 Oct 2009).

Lieberman, Marc, and Robert Hall. *Introduction to Economics*. Cincinnati, Ohio: South-Western College Publishing, 2000.

Merriam-Webster on-line Dictionary. "Incentive." <http://www.merriam-webster.com/dictionary/INCENTIVE> (accessed January 12, 2010).

Military Review. "Breaking the Tether of fuel." Jan-Feb 2007. http://findarticles.com/p/articles/mi_m0PBZ/is_1_87/ai_n27135951/ (accessed September 15, 2009).

National Intelligence Council. *National Intelligence Council 2020 Project, Mapping the Global Future*. Pittsburgh, PA: Government Printing Office, 2004.

Oaks, David M., Matthew Stafford, and Bradley Wilson. *The Value and Impacts of Alternative Fuel Distribution Concepts Assessing the Army's Future Needs for Temporary Fuel Pipelines*. Technical Report. Santa Monica: RAND, 2009. http://www.rand.org/pubs/technical_reports/2009/RAND_TR652.sum.pdf (accessed 23 Oct 2009).

O'Neill, Bard E. *From Revolution to Apocalypse, Insurgency & Terrorism, Second Edition*. Washington DC: Potomac Books, Inc, 2005.

Overy, Richard. *Why the Allies Won*. New York: W.W. Norton & Company, 1995.

Pagonis, Lieutenant General Willam G. Pagonis (ret). *Moving Mountains: Lessons in Leadership and Logistics from the Gulf War*. United States of America: Harvard Business School Press, 1992.

Population Reference Bureau. "World Population Data Sheet 2009." Population Reference Bureau website. http://www.prb.org/pdf09/09wpds_eng.pdf (accessed January 3, 2010).

President of the United States. *National Defense Industrial Resource Preparedness*. Executive Order 12919. The Federal Register. Volume 59, Number 108. Washington DC: June 7, 1994. http://www.acq.osd.mil/ip/docs/eo_12919-highlighted.pdf (accessed 04 February 2010).

President of the United States. *Strengthening Federal Environmental, Energy, and Transportation Management*. Executive Order 13423. Washington DC: National Archives and Records Administration, Federal Register, January 26, 2007. <http://edocket.access.gpo.gov/2007/pdf/07-374.pdf> (accessed 23 October 2009).

President of the United States. *Federal Leadership in Environmental, Energy, and Economic Performance*. Executive Order 13514. The White House website, Washington DC: October 5, 2009. http://www.whitehouse.gov/assets/documents/2009_fedleader_eo_rel.pdf (accessed January 18, 2010).

President of the United States. *The National Security Strategy of the United States of America*. Washington DC: Government Printing Office, March, 2006. <http://www.strategicstudiesinstitute.army.mil/pdffiles/nss.pdf> (accessed 03 September 2009).

Roberts, Paul. *The End of Oil, On the Edge of a Perilous New World*. New York: Houghton Mifflin Company, 2004.

Shaffer, Al. "DoD Energy Security Task Force Briefing." Executive Director, Defense Energy Security Task Force. Washington DC: May 22, 2007.

Spencer, Benjamin. "The Precious Sortie: The United States Air Force at the Intersection of Rising Energy Prices, an Aging Fleet, a Struggling Recapitalization Efforts, and Stressed Defense Budgets." Master's Thesis, Marine Corps University, 2009.

The Energy Conversation Online Network. <http://www.energyconversation.org/> (accessed 03 Sept 2009).

The Free Dictionary. "Intervening Variable." <http://www.thefreedictionary.com/intervening+variable> (accessed January 4, 2010).

Towell, Pat, Stephen Daggett, Amy Belasco. *Defense: FY2009 Authorizations and Appropriations*. CRS Report for Congress RL34473. Washington DC: Congressional Research Service, February 25, 2009. <http://fas.org/sgp/crs/natsec/RL34473.pdf> (accessed January 12, 2010).

Towell, Pat. *Defense: FY2010 Authorization and Appropriations*. Congressional Research Service R40567. Washington, D.C.: Congressional Research Service, September 18, 2009. <http://fpc.state.gov/documents/organization/130798.pdf> (accessed 23 October 2009).

United Nations Department of Economic and Social Affairs/Population Division. *World Population to 2300*. United Nations. New York, NY: United Nations, 2004.

U.S. Congress. *American Recovery and Reinvestment Act of 2009*. 111th Congress, 1st sess., January 6, 2009.

U.S. Congress. *Department of Defense Appropriations Act, 2010*. Public Law 111-118. 111th Congress. 1st sess., December 19, 2009.

U.S. Congress. *Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, Public Law 110-417*. 110th Congress, October 14, 2008. <http://www.coherentbabble.com/PublicLaws/PL110-417ds.pdf> (accessed 24 October 2009).

U.S. Congress. *Energy Independence and Security Act of 2007, Public 110-140*. 110th Congress, December 19, 2007. <http://leahy.senate.gov/issues/FuelPrices/EnergyIndependenceAct.pdf> (accessed 23 October 2009).

U.S. Congress. *Energy Policy Act of 1992, Public Law 109-58*. 102nd Congress, 2nd Session, January 1992. <http://www.ferc.gov/legal/maj-ord-reg/epa.pdf> (accessed 23 October 2009).

U.S. Congress. *Energy Policy Act of 2005, Public Law 109-58*. 109th Congress, August 8, 2005. http://www.epa.gov/oust/fedlaws/publ_109-058.pdf (accessed 23 October 2009).

- U.S. Congress. *John Warner National Defense Authorization Act for Fiscal Year 2007*. 109th Congress, 2nd sess., January 3, 2006.
- U.S. Congress. *Omnibus Appropriations Act 2009, Public Law 111-8*. 111th Congress, March 11, 2009. <http://www.coherentbabble.com/PublicLaws/PL111-8-HR1105.pdf> (accessed on 24 October 2009).
- U.S. Congress. *Summary: 2010 Appropriations Bill, Full Committee Markup*. Committee on Appropriations. David R. Obey, Chairman. Washington DC: July 22, 2009.
- U.S. Congress. *Supplemental Appropriations Action 2009, Public Law 111-32*. 111th Congress June 24, 2009. <http://www.coherentbabble.com/PublicLaws/PL111-032.pdf> (accessed on 24 October 2009).
- U.S. Congressional Budget Office. "Mandatory Spending Control Measures." Congressional Budget Office Website. <http://www.cbo.gov/doc.cfm?index=4680&type=0> (accessed January 11, 2010).
- U.S. Department of the Air Force. *Air Force Energy Plan 2010*. Washington, DC: Assistant Secretary of the Air Force for Installations, Environment, and Logistics, 2009.
- U.S. Department of the Army. *Army Energy Security Implementation Strategy*. Washington DC: The Army Senior Energy Council and the Office of the Deputy Assistant Secretary of the Army for Energy and Partnerships, January 13, 2009.
- U.S. Department of the Army. *Army Facilities Management*. Army Regulation 420-1, Chapter 22, Army Energy and Water Management Program. Washington, DC: Department of the Army, 2009. http://www.army.mil/USAPA/epubs/pdf/r420_1.pdf (accessed 23 October 2009).
- U.S. Department of the Army. *Joint Petroleum Logistics Planning Guide*. Fort Lee, VA: Petroleum and Water Department, U.S. Army Quartermaster and School, June, 2003.
- U.S. Department of the Army. *Sustain the Mission Project: Casualty Factors for Fuel and Water Resupply Convoys, Final Technical Report*. Arlington, VA: Army Environment Policy Institute, September 2009.
- U.S. Department of Defense. *Annual Energy Management Report, Fiscal Year 2008*. Washington DC: Office of the Deputy Under Secretary of Defense (Installations and Environment), January 2009.
- U. S. Department of Defense. DOD Energy Blog, <http://dodenergy.blogspot.com/> (accessed 03 Sept 2009).

- U. S. Department of Defense. DOD Goes Green Website. http://www.defenselink.mil/home/features/2009/0809_green/ (accessed 03 Sept 2009).
- U.S. Department of Defense. *DoD Executive Agent (DoD EA) for Bulk Petroleum*. DoD Directive 5101.8. Washington DC: Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, August 11, 2004.
- U.S. Department of Defense. *DoD Management of Bulk Petroleum Products, Natural, Gas, and Coal*. DoD 4120.25M. Washington DC: Office of the Under Secretary of Defense for Acquisition and Technology, June, 1994.
- U.S. Department of Defense. *DoD Management Policy for Energy Commodities and Related Services*. DoD Directive 4120.25. Washington DC: Office of the Under Secretary of Defense for Acquisition and Technology, April 20, 1999.
- U.S. Department of Defense. DoD Project Manager, Mobile Electric Power website. <http://www.pm-mep.army.mil/> (accessed February 04, 2010).
- U.S. Department of Defense. "Facilities Energy Directorate Home(page)." Office of the Deputy Under Secretary of Defense Installations and Environment website. <http://www.acq.osd.mil/ie/energy/index.shtml> (accessed February 8, 2010).
- U.S. Department of Defense. *Final Report of the Defense Science Board (DSB) Task Force on DoD Energy Strategy*. Memorandum for the Chairman, Defense Science Board. Washington DC: Department of Defense, January 14, 2008.
- U.S. Department of Defense. *Financial Management Regulation*. DoD 7000.14R, Volume 2A, Chapter 1. Washington DC: Department of Defense, October, 2008. <http://comptroller.defense.gov/fmr/> (accessed January 11, 2010).
- U.S. Department of Defense. *Financial Management Regulations: Identification, Retention, and Use of Energy and Water Conservation Savings*. DoD 7000.14R, Volume 12, Chapter 12. Washington DC: Department of Defense, August, 2009.
- U.S. Department of Defense. "Installations and Energy Home(page)." Office of the Deputy Under Secretary of Defense Installations and Environment website. <http://www.acq.osd.mil/ie/index.shtml> (accessed February 20, 2010).
- U.S. Department of Defense. *Installation Energy Management*. DoDI 4170.11. Washington DC: Office of the Under Secretary of Defense For Acquisition, Technology, and Logistics, December 11, 2009. <http://www.dtic.mil/whs/directives/corres/pdf/417011p.pdf> (accessed 23 October 09).

- U.S. Department of Defense. *Joint Bulk Petroleum and Water Doctrine*. Joint Publication 4-03. Washington DC: Department of Defense, May 23, 2003.
- U.S. Department of Defense. *Quadrennial Defense Review*. Washington DC: Department of Defense, February 2010. 84 – 88.
- U.S. Department of Defense. *Report of the Defense Science Board on More Capable Warfighting through Reduced Fuel Burden*. Washington DC: Office of the Under Secretary of Defense For Acquisition and Technology, May 2001.
- U.S. Department of Defense. *Report of the Defense Science Board Task Force on Improving Fuel Efficiency of Weapons Platforms*. Memorandum for the Chairman, Defense Science Board. Washington DC: Office of the Under Secretary of Defense For Acquisition and Technology, May 2001.
- U.S. Department of Defense. *Report of the Defense Science Board Task Force on DoD Energy Strategy, "More Fight – Less Fuel."* Washington, DC: Office of the Under Secretary of Defense For Acquisition, Technology, and Logistics, February, 2008.
- U.S. Department of Defense. *Standardization of Mobile Electric Power (MEP) Generating Sources*. DoD Directive 4120.11. Washington DC: Office of the Assistant Secretary of Defense for Production and Logistics, April 13, 2004.
- U.S. Department of Defense. *Supply Chain Material Management Regulation*. DoD 4140.1-R. Washington DC: Office of the Deputy Under Secretary of Defense for Logistics and Material Readiness, May 23, 2003.
- U.S. Department of Defense. *Supply Chain Material Management Policy*. DoD Directive 4140.1 Washington DC: Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, April 22, 2004.
- U. S. Department of Defense. *The National Defense Strategy*. Washington. DC: Department of Defense, June, 2008. <http://www.defenselink.mil/news/2008%20national%20defense%20strategy.pdf> (accessed 03 Sept 2009).
- U.S. Department of Energy. "U.S. Department of Energy – Energy Efficiency and Renewable Energy, Federal Energy Management Program - Operations and Maintenance." Federal Energy Management Program website. http://www1.eere.energy.gov/femp/operations_maintenance/ (accessed January 16, 2010).
- U.S. Department of Energy. "O&M First: Resource Efficiency Managers Officer Alternative Approach to Realizing Energy Efficiency." Federal Emergency Management Program O&M Center of Excellence. Washington DC: U.S. Department of Energy, June, 2004. http://www1.eere.energy.gov/femp/pdfs/om_rem.pdf (accessed January 16, 2010).

- U.S. Department of the Navy. *Department of the Navy (DoN) Energy Strategy for Acquisitions*. Washington DC: The Assistant Secretary of the Navy (Research, Development and Acquisitions), January 4, 2010.
- U.S. Department of the Navy. "Record Year for Navy's Incentivized Energy Conservation Program." Naval Sea Systems Command Office of Corporate Communications website, October, 22, 2009. http://www.navy.mil/Search/display.asp?story_id=49159 (accessed January 19, 2010).
- U.S. Government Accountability Office. *Defense Budget, Observations of the Air Force Flying Hour Program*. Washington DC: Government Accountability Office, July, 1999.
- U.S. Government Accountability Office. *Defense Management, DOD Needs to Increase Attention on Fuel Demand Management at Forward-Deployed Locations*. Washington DC: Government Accountability Office, February, 2007.
- U.S. Government Accountability Office. *Eminent Domain, Information About it uses and effects on property owners is limited*. Washington. DC: Government Accountability Office, November, 2006. 6. <http://www.gao.gov/new.items/d0728.pdf> (accessed January 10, 2010).
- Warner, Jerry, and Peter W. Singer. *Fueling the "Balance": A Defense Energy Strategy Primer.*, Washinton DC: The Brookings Institution, August, 2009. http://www.brookings.edu/papers/2009/08_defense_strategy_singer.aspx?p=1 (accessed 03 Sept 2009).
- Work, Robert O. "The 2009 Quadrennial Defense Review: Will it Matter?" Center for Strategic and Budgetary Assessments. August 26, 2008. http://www.ndia.org/Divisions/Divisions/SOLIC/Documents/Content/ContentGroups/Divisions1/Special_Operations_Low_Intensity_Conflict/CSBA%202009%20QDR.pdf (accessed 24 Oct 2009).
- World Energy Council. "Energy Efficiency Policies around the World: Review and Evaluation, 1.3 Definition and Scope of Energy Efficiency." World Energy Council website. http://www.worldenergy.org/publications/energy_efficiency_policies_around_the_world_review_and_evaluation/1_introduction/1175.asp (accessed January 9, 2010).