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DEPARTMENT OF DEFENSE FUEL DEMAND MANAGEMENT AT FORWARD-DEPLOYED LOCATIONS AND OPERATIONAL ENERGY INITIATIVES

HEARING

BEFORE THE

READINESS SUBCOMMITTEE

OF THE

COMMITTEE ON ARMED SERVICES
HOUSE OF REPRESENTATIVES

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DEPARTMENT OF DEFENSE FUEL DEMAND MANAGEMENT AT FORWARD-DEPLOYED LOCATIONS AND OPERATIONAL ENERGY INITIATIVES

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
READINESS SUBCOMMITTEE,
Washington, DC, Tuesday, March 3, 2009.

The subcommittee met, pursuant to call, at 1:05 p.m., in room 2118, Rayburn House Office Building, Hon. Solomon P. Ortiz (chairman of the subcommittee) presiding.

OPENING STATEMENT OF HON. SOLOMON P. ORTIZ, A REPRESENTATIVE FROM TEXAS, CHAIRMAN, READINESS SUBCOMMITTEE

Mr. ORTIZ. This hearing will come to order. And I thank our distinguished witnesses for appearing before this subcommittee today to discuss energy use and management for military operations.

This hearing builds upon themes addressed in a hearing this subcommittee held last year where we considered the Department of Defense (DOD) energy use in the context of recommendations made by the Defense Science Board Energy Security Task Force and the Government Accountability Office (GAO). That hearing encompassed all of the Department's energy use, including the energy needed for military installations and the energy needed to train for and execute military operations. Today's hearing provides an opportunity to focus on the management of the energy needed for military operations and ways to reduce fuel demand at forward-deployed locations.

In the near future, this subcommittee will also have another opportunity to focus on installations, energy policies, and initiatives. This also remains of interest.

Management of operational energy is an important topic today, because we have learned through experience that delivering fuel to the battlefield imposes a heavy logistical burden. In fact, fuel logistics represent up to 70 percent of the material the Army ships into battle, according to a Defense Science Board report. Forces responsible for providing protection to fuel convoys are put at risk and are diverted from other missions.

Although installations have worked for three decades to improve their strategy efficiency, weapons platforms and tactical equipment historically have been given a free pass. But reducing operation fuel demands can enhance the operational effectiveness of our forces and save taxpayers' dollars.

Both the Department of Defense and Congress have begun to take steps to address operational energy demands. The 2009 De-

fense Authorization Act implements findings of the Defense Science Board and GAO by establishing a high-level organizational framework for management of the energy needed for military operations. While a nominee has yet to be named, I look forward to working with the director of Operational Energy in the future.

The 2009 Defense Authorization Act also puts into law a Department of Defense initiative to consider fuel logistic support requirements in planning requirements, development and acquisition process the defense feels as a time line for the implementation of this effort by October 2011.

The Department of Defense is developing by working together innovative strategies to enhance the energy efficiency and weapons platforms and provide energy solutions for forward-deployed forces, and today I look forward to hear more about these efforts today. I also look forward to hearing about the findings and recommendations of the GAO who through their work shed additional light on fuel demands by forward-deployed forces.

[The prepared statement of Mr. Ortiz can be found in the Appendix on page 37.]

Mr. ORTIZ. The chair now recognizes the distinguished gentleman from Utah, Mr. Bishop, for any remarks that he would like to make. Mr. Bishop.

STATEMENT OF HON. ROB BISHOP, A REPRESENTATIVE FROM UTAH, READINESS SUBCOMMITTEE

Mr. BISHOP. Thank you, Mr. Chairman. And it is indeed a pleasure to be here especially with our two guests who will be testifying in just a moment. I look forward to the report as to where we have gone. I, like a lot of other people, have a great deal of interest in the overall energy issue, especially as it relates to the military. Coming from an area where I do, obviously synthetic fuels become significant and important. But I understand today we are going to simply focus in on the different aspect of that, dealing with simply forward deployment. And I am looking forward to that.

On behalf of Mr. Forbes, who is incapacitated right now and not able to get here because of weather conditions, I would ask unanimous consent to have his opening statement placed in the record.

Mr. ORTIZ. It will be placed into the record. And Mr. Forbes is a very dedicated servant of the people; but because of the storm that we had, he couldn't be with us today.

[The prepared statement of Mr. Forbes can be found in the Appendix on page 39.]

Mr. ORTIZ. Today we have two distinguished witnesses representing the Department of Defense and the Government Accountability Office. We have Mr. Alan Shaffer, Acting Director, Defense Research and Engineering, United States Department of Defense; and Mr. William M. Solis, Director, Defense Capabilities and Management, United States Government Accountability Office.

Without objection, the witnesses' prepared testimony will be accepted for the record.

Mr. Shaffer, we welcome you and Mr. Solis to this hearing today. Whenever you are ready, you can begin your testimony today, sir.

STATEMENT OF ALAN R. SHAFFER, ACTING DIRECTOR, DEFENSE RESEARCH AND ENGINEERING, U.S. DEPARTMENT OF DEFENSE

Mr. SHAFFER. Thank you, Chairman Ortiz, members of the committee. Thank you for the opportunity to discuss the progress the Department of Defense has made in energy security for our soldiers, sailors, airmen, Marines, and civilians, as well as the nation.

It is important at the outset to frame energy security in a broad context. To be sure, the cost of energy affects the overall budget of the Department. In fiscal year 2007, the Department spent about $13 billion on energy-related programs, up from $11 billion in fiscal year 2005. But energy security entails more than just the cost of fuel. The logistics of energy resupply affect force security. Energy use affects our ability to maneuver and our strategic decisions.

In the summer of 2006, then- Major General Rick Zilmer, commander of the deployed Marine forces in Al-Anbar Province, Iraq, issued a joint urgent operational need (JUON) that said, "Reducing the military dependence on fuel for power generation could reduce the number of road-bound convoys. Without this solution, personnel loss rates are likely to continue at their current rate." End of quote. This JUONs was a wakeup call to the reality of irregular military operations.

In response to the JUONs, the Army Rapid Equipping Force established the Power Surety Task Force to determine what could be done to address this need. The task force found that there were few turnkey-ready capabilities applicable to the harsh operating conditions at a forward operating base. While maintaining enhanced security awareness, the Department has maintained an overriding principle of not subjecting forces to greater risk by prematurely deploying technologies that have not been proven in field testing.

A little over two years ago, the Department established and operated the Defense Energy Security Task Force, which I have had the honor to serve as the executive director. The task force has coordinated the growing energy programs and raised awareness of energy issues across the Department. Each military department has established an energy security focal office.

In total, the Department's investment in energy security-related projects has grown from requests of about $440 million in fiscal year 2006 to $1.3 billion in fiscal year 2009, not including funding in the recently passed American Recovery and Reinvestment Act, which provided $300 million to the Department for energy-related research and development (R&D).

Embedded in this investment are a number of projects specifically focused on either reducing energy demands or increasing energy supply. I will highlight just a few. But I have to point out that not all energy solutions are high technology. One of our more effective actions to date has been to insulate deployed facilities using spray foam, which yields energy savings reductions of 40 to 75 percent depending upon the environment, compared to noninsulated tents. The additional insulation could save as much as 180,000 gallons of fuel per day.

The three-year Net-Zero Plus Joint Concept Technology Demonstration (JCTD) sponsored by United States Central Command to make forward operating bases as energy efficient as possible will

conclude in 2010. The Net-Zero JCTD will prototype, measure, and assess a variety of technologies that could collectively use less energy than they create and be recommended for inclusion in all DOD installations and tactical bases.

The Army's Tank and Automotive Research and Development Center in Warren, Michigan is leading a ground vehicle fuel efficiency demonstrator to test the feasibility and affordability of achieving up to 40 percent decreases in fuel consumption in tactical vehicles without sacrificing performance or capability. The Air Force is developing technologies to increase jet engine efficiency. The Navy is testing technology to enhance ship fuel efficiency. When you put all of that together, it makes the force more efficient for the amount of fuel used.

We are also exploring the use of renewable energy at forward locations through testing of generators that can be powered by solar or wind energy. The hybrid intelligent power generator, also known as high power, is demonstrated in quote/unquote intelligent power management and the integration of renewable energy technologies to reduce fuel and energy consumption in tactical and deployed operational environments.

Defense Advanced Research Projects Agency (DARPA) has recently initiated a $100 million program to further develop an affordable algae-based synthetic fuel, with the goal of driving the cost to $2 per gallon in 18 months, and allow it to be made locally.

The Army and Navy are developing and demonstrating compact and mobile 10 kilowatt high-temperature fuel cells to power critical equipment, including GPS receivers, radio and communications equipment, and other deployed electronics.

DOD has made progress in integrating energy considerations into our business processes, requirements development, acquisition, and budgeting, and we focused on describing energy operations by the return on investment, both financially and in terms of operational capability. For instance, in November 2008, the DOD Acquisition Directive, also known as 5000.2, directed energy costs be included in calculations for total ownership costs, to include the fully burdened cost of fuel, the cost to deliver fuel the last tactical mile.

Through the Energy Security Task Force, the DOD has developed a DOD Energy Security Strategic Plan, providing a framework for energy management across the enterprise, with four Deputy Secretary of Defense-approved strategic outcomes, they are: maintain or enhance operational effectiveness by reducing total force energy demands, the subject of our hearing today; increase energy strategic resilience by developing alternative or assured fuels and energy; three, enhance operational and business effectiveness by institutionalizing energy solutions in DOD planning and business processes; and, four, establish and monitor Department-Wide energy metrics.

In summary, the DOD has proactively responded to the energy challenge. We have initiated numerous demonstrations in other projects to reduce consumption and increase assured alternatives for our installations and forward-deployed tactical locations. Technologies that make good business sense both financially and operationally are being developed for implementation on a wider scale.

Thank you, Mr. Chairman.

Mr. ORTIZ. Thank you.

[The prepared statement of Mr. Shaffer can be found in the Appendix on page 40.]

Mr. ORTIZ. Mr. Solis, whenever you are ready. Good to see you again, sir.

STATEMENT OF WILLIAM M. SOLIS, DIRECTOR, DEFENSE CAPABILITIES AND MANAGEMENT, U.S. GOVERNMENT ACCOUNTABILITY OFFICE

Mr. SOLIS. Thank you. Chairman Ortiz, Ranking Member Bishop, members of the subcommittee, I appreciate the opportunity to be here to discuss DOD's efforts to reduce fuel demand at forward locations. Of particular interest are those locations not connected to local power grids and therefore must rely on fuel-powered generators for electricity. The U.S. military has several hundred such locations in Iraq and Afghanistan today.

In 2008, DOD supplied more than 68 million gallons of fuel each month, on average, to support U.S. military forces in Iraq and Afghanistan. In fact, DOD reported last year that fuel demand for these operations is higher than for any war in history.

While weapons systems such as aircraft, Mine Resistant Ambush Protected vehicles, and trucks certainly require large amounts of fuel, DOD reports that the single largest battlefield consumer is generators, which provide power for base support activities. By base support activities, I am referring to things such as air conditioning, heating, lighting, refrigeration, and communications, all necessary to support the troops that are stationed at these forward-deployed locations.

However, transporting large quantities of fuel to forward-deployed locations presents an enormous logistical burden and risk. Large truck convoys moving fuel to forward locations in Iraq and Afghanistan have encountered enemy attacks, severe weather, traffic accidents, and pilferage. Moreover, the cost of fuel has greatly fluctuated over the last several years, and high fuel costs will continue to be of concern.

Today I will summarize our recent work on fuel demand at forward locations. We are also releasing our full report in conjunction with this hearing. First, let me address some of DOD's ongoing efforts to reduce fuel demand at forward locations. Mr. Shaffer covered some of these in his statement, so I will briefly note three specific efforts.

A notable effort, as he mentioned, is the application of foam insulation on tents. Applying foam reduces the amount of fuel required by generators to provide power to these structures. Demonstrations show that the application of foam insulation reduces dust, heat, cold and noise, as well as air conditioning requirements. While at Camp Lemonier in Djibouti, we were able to see a tented gymnasium that had been foamed. According to camp officials, they were able to remove two of the five air conditioning units used to cool the gymnasium. This resulted in an estimated fuel savings of 40 percent and a reduction of indoor temperature from about 95 to 100 degrees Fahrenheit to about 72 degrees.

As this example illustrates, foaming tents, in addition to fuel savings, also improves the quality of life for troops serving in harsh environments. At the time of our review, DOD was pursuing foam insulation on a wide-scale basis in Iraq, and had plans to pursue this initiative in Afghanistan as well.

A second effort is the development of microgrids at the forward-deployed locations. Essentially, this effort consolidates small loads on generators by creating groupings of multiple generators. At Camp Arifjan in Kuwait, we learned of plans to create such microgrids, with the expectation that this effort would improve overall energy efficiency and reduce the number of generators that operate most of the times of the year.

Lastly, DOD and the military services have a number of R&D efforts underway. For example, the Air Force Lab has created a renewable energy tent city, a collection of various deployable shelters powered by solar and fuel cell generators. There are also DOD efforts to develop more fuel-efficient generators and environmental control units. However, since many of these efforts are in the R&D stage, the extent to which they will be fielded and under what time frame is still uncertain.

Now I will turn to DOD's approach to managing fuel at forward-deployed locations. While the efforts I have highlighted show potential for achieving greater fuel efficiency, DOD still lacks an effective approach to fuel demand at forward-deployed locations. The Department recognizes that it needs to reduce its dependence on petroleum-based fuel and the logistics footprint of its military forces as well as reducing operating costs with high fuel usage. However, DOD faces difficulty in achieving these goals because managing fuel at forward-deployed locations has not been a departmental priority, and its fuel reduction efforts have not been well coordinated or comprehensive.

More specifically, our work revealed three shortcomings:

First, DOD lacks guidance directing forward locations to address fuel demand, as well as specific guidelines that incorporate fuel demand reduction and construction, maintenance, and procurement policies. DOD generally lacks guidance that directs forward-deployed locations to manage and reduce their fuel demand at the Department level, combatant command level, and military service level.

While DOD is driven to address energy issues at U.S. installations, largely by Federal mandates and DOD guidance, agency officials were unable to identify guidance for forward-deployed locations, and they told us that fuel reduction in the past has been a low priority compared with other mission requirements.

Second, DOD lacks incentives and viable funding mechanism for locations to invest in fuel reduction initiatives. Officials at Camp Lemonier, for example, had identified several projects that would reduce camp fuel demand, but they saw little return on investment for them to undertake some projects, because they would not see the associated savings for other uses toward the camp improvements. Moreover, many of DOD's forward-deployed locations rely heavily on supplemental funding appropriations related to the Global War on Terror (GWOT), and delays in receiving this funding can present challenges in covering existing costs.

Third, DOD lacks visibility and accountability within the chain of command for achieving fuel reduction. DOD's current organizational framework does not provide departmental visibility for fuel demand at these forward locations.

We found that the information on fuel demand management strategies and reduction efforts is not shared among locations, military services, and across the Department in a consistent manner. Moreover, DOD guidance does not designate any DOD office or official as being responsible for fuel demand management at forward locations, nor could we identify anybody specifically accountable for this function.

Our report contains several recommendations that we believe can help DOD address these issues and provide for a more effective approach to managing fuel demand at forward locations. In this regard, we see important roles for the combatant commands, the military services, joint staff, and DOD's operational energy director, once this individual is named. DOD generally concurred with the recommendations in our report.

Finally, we recognize it may not be practical for DOD to decrease fuel usage at every deployed location, and commanders must place their highest priorities on meeting mission requirements. However, DOD's high costs, operational vulnerabilities, and logistical burdens in sustaining deployed locations that depend heavily on fuel-based generators underscore the importance for the Department to give systemic consideration to incorporating fuel demand into policy decisions for forward-deployed locations.

The issues surrounding fuel demand take on added significance when considering recent developments in Afghanistan. As you know, the administration recently announced its intention to boost U.S. military presence in Afghanistan, deploying several thousand troops above the current levels starting later this spring. Many of these troops are likely to be deployed at forward locations, some of them remote, that rely extensively on fuel-powered generators, which in turn will drive up fuel demands. That will place even greater demands on the fuel logistics system, heightening the associated burdens and risks that I described earlier. Therefore, it is time for DOD to proactively and systematically manage fuel demand at forward locations.

Mr. Chairman, that concludes my statement. I will be happy to answer any questions.

[The prepared statement of Mr. Solis can be found in the Appendix on page 58.]

Mr. ORTIZ. Thank you very much for both of your testimonies. It is very enlightening. Not that I am surprised, but I see where we really used a lot of fuel, and the thousands of gallons that some of this equipment uses.

And Mr. Shaffer, the GAO report notes that long truck convoys moving fuel to forward-deployed locations have encountered enemy attacks and severe weather, traffic accidents, and pilferage. As DOD begins to increase troop levels in Afghanistan, how will it ensure that fuel delivery challenges will be addressed? And I think this is very, very serious, because to add 30,000 more soldiers—and this is what we anticipate will happen—now, what steps are being planned to decrease fuel demand at forward-deployed locations in

Afghanistan so that the risk associated with high fuel usage and delivery can be reduced? Maybe you can help us understand that a little bit better.

Mr. SHAFFER. Mr. Chairman, thank you for the question. I wish I had what would be a better answer for you. What we have found as we have gotten into this whole area of deployable energy is that a number of the systems don't work as well as we had hoped that they would in a forward-deployed location. So we are still at the research and development, and advanced research and development phase. Now, that is not to say that we, the DOD, are making the systems, but we have to harden the systems and understand how they will operate. And let me give you a case in point, because we talked about generators, sir.

Right now, the Army has a program called Advanced Medium Mobile Power Systems. It is their medium-scaled generator. A forward-deployed operating base battalion has about 24 60-kilowatt generators deployed with that forward operating base (FOB). No one would like to get more efficient generators than we, the Department, would. In fact, the report that you cited from the Defense Science Board showed that under wartime conditions, the amount of fuel we use for generators jumps up to about 370 million gallons per year for the ground Army alone.

This Advanced Mobile Power Station, the new generator, will cut the energy use between 10 and 20 percent. In a full wartime scenario, we are estimating reducing the fuel used by 52 million gallons. In fact, the program manager for that program is sitting in the back here, Colonel Wallace.

Now, the easy question would be, why don't we just deploy commercial systems? Because the integrator for this particular generator set is Cummins Manufacturer in Minnesota, and they make a pretty good commercial generator. But the commercial generators don't worry about electromagnetic interference. And if we bring the generators out to the field and they have a high degree of EMI, electromagnetic interference, that could affect the radio communications and other things in the forward operating base. So a lot of the little harsh realities of a forward operating base that don't apply to a commercial system apply to some of our forward-deployed locations.

We are pushing just as hard as we can to develop some of these technologies, Mr. Chairman. But, again, we go back to the overriding first principle is we want to make sure that we test things so we don't have unintended consequences that decrease our capability.

This advanced mobile medium power station or power system is being delivered on a fairly accelerated delivery schedule at Aberdeen Proving Grounds starting in June of this year, will go through about a one-year full-up test, testing the EMI and other things and other operability and conditions, and we look to start fielding these systems in 2010, not as fast as we would like to, but we don't want to field systems before we are sure that they won't cause additional problems. That is fundamentally where we are at, sir.

Mr. ORTIZ. You know, and when we move the 30,000 troops to Afghanistan, it is going to be harder to make this delivery. The terrain is different, it is getting a little worse in that area. But how

soon will it take for you to have some of this equipment that you are talking about? I know you say you are going to start sometime in June, July testing this equipment. How long do you anticipate it will take before you can say, well, this equipment is going to work?

Mr. SHAFFER. Sir, we are going to go on the very fastest test protocol that we can, but I can't give you a specific time line. They do have to make sure that these things work.

I would like to point out some other things that we are doing. We mentioned the spray foam. That was an idea that came out of the Power Surety Task Force that started up in response to General Zilmer's JUONs. We have subsequently moved oversight of the Power Surety Task Force under the Office of the Secretary of Defense (OSD) to work for everybody. And there are plans right now to begin spray foaming tents in Afghanistan, and we are just working through the contractual operations of who is going to put the spray foam on the tents. But we put spray foam on the tents in Afghanistan, and that will reduce the overall heating required or the cooling required for our troops in summer and also heating in winter.

It is a fascinating thing, Mr. Chairman. We have the spray foam set up and have tested it at Fort Irwin National Military Training Center, and I had the opportunity to be out there last August. You would go up and touch the side of the tent, and the temperature on the skin of the tent was about 130 degrees, 135 degrees in the direct sunlight. You would go inside one of these tents that was foamed, and the temperature would be about 75 to 80 degrees. Now, it is not very often I am looking for a jacket at 75 or 80 degrees; but when you are out in 105 or 110 degrees and you walk into something cool, you feel refreshed.

This is what we have to do for our troops. By spray foaming the tents, by bringing the temperature down, by bringing the electric demands down, we believe we will give a better fighting force that is more refreshed also. So there is a lot of variables at play.

I can't tell you exactly when we will have things in place in theater, sir, but we are moving and pushing just as fast as we can to get things out there as they are developed, as they work. We accelerated the spray foam in Iraq, and it turned out we had a local contractor who could not perform the mission. That first contract was terminated. We are looking to pick up the contract to pick up the rest of the tents. But, again, as fast as we can get things out there that will hold up, sir, we will get them to the field.

Mr. ORTIZ. Thank you. I would ask a question for Mr. Solis, and then I would yield to my good friend Mr. Bishop after my question.

The GAO report states that DOD lacks a viable funding mechanism for fuel reduction projects at forward-deployed locations. In commenting on the GAO draft report, DOD stated that it was not convinced financially incentives were the best fuel-reduction strategy for forward-deployed locations. Why does GAO believe that funding is an issue, and what are some examples of viable funding mechanisms for energy-efficiency projects at forward-deployed locations, Mr. Solis?

Mr. SOLIS. Thank you for the question. I think what we are talking about there is that a lot of the funding for these installations

in the forward-deployed locations rely on supplemental funding, and some of those priorities don't necessarily meet up with the kinds of investments that you need as we have talked about here in terms of other types of more efficient generators, those kinds of things.

The other things, in terms of incentives, in terms of financial incentives—and it is not exactly the same kind of thing. One of the things that we talked about is the Navy has a ship program, for example, that provides incentives for ship commanders that if they make certain improvements, that some of that money can be used elsewhere in terms of other ship improvements. So savings then can be allocated to other uses on that ship.

The other thing in terms of a financial mechanism, you know, for example, one of the things that we saw related on corrosion projects is that this, again, is something where you have something that a commander may not put as a priority; but in terms of long-term investment, in terms of saving dollars, that is something where we saw if there is a program element, a funding line, a separate funding line, that that commander can draw from without necessarily affecting their mission, I think that goes a long way in terms of providing that commander with alternatives for funding without necessarily affecting their mission.

Mr. ORTIZ. My follow-up question would be, I know that we put something like $300 million to do some of this research. Do you think that is a sufficient amount of money? Because it seems to be that there is going to be a lot of testing different equipment.

And this is for both of you. Do you think, is that sufficient money to do what we want to do so we can keep our soldiers from being in harm's way, to protect them during the winter and during the summer?

Mr. SHAFFER. Chairman Ortiz, first, in the Recovery Act we are very, very pleased to have the $300 million. As we have had the Energy Security Task Force in place—and I mentioned that we had the senior representatives from each of the services, a focal office—we have coordinated that investment, the $300 million across the services to try to get the maximum out of it. I can't tell you if $300 million is right or is not right. I know that we have $300 million of valid, viable projects that will support the Department both in reducing our energy demand forward, but also reducing our energy demand here at our installations in the continental United States (CONUS).

So there are a number of things that are getting close to being developed and close to ready, but not quite there yet. So there will be a lot of testing going on. Three hundred million dollars, we think we will be able to spend that wisely.

Mr. ORTIZ. Mr. Solis.

Mr. SOLIS. If I could give you an answer. And I am not going to say whether that is the right amount of money; but here I will go back to the recommendation that we made in terms of the need for a Director of Operational Energy.

That person would also be involved in looking at, across the board, what are the funding requirements that are needed to try to deal with some of the issues that we are talking about today? Right now, every service is sort of doing their own thing. You don't

really have visibility across the board. So I would say that somebody, and hopefully the Director of Operational Energy, once that person is named, could be that person that would look across the board to see what are the funding requirements. Much like, again—and I refer back to what the corrosion office did, is look across the board: What makes sense? What are going to provide the greatest returns on investment? What is going in this case to reduce our logistics footprint? What is going to take those tankers off the road?

So I would go back and say that until that person is there, I think it is going to be very difficult to see, across the board, whether or not $300 million is sufficient, $500 million, or $1 billion, until that person is there.

Mr. ORTIZ. Thank you so much. My good friend, Mr. Bishop.

Mr. BISHOP. Thank you. Let me follow up on that individual, that person—questions about that, in just a second. But let me start, first of all, with Mr. Shaffer.

In both your testimony as well as Mr. Solis' testimony, both written and oral, talked about how fuel reduction is a lower priority when you are out in the front lines. I can kind of understand that. But you also talked about the funding process as a difficulty. And I would simply like to say forward-deployment locations are almost always funded through supplementals.

So I guess the question would be, how can DOD ensure these kind of energy-efficient programs or projects are going to be adequately resourced when you give the uncertainties that are always maintained with supplemental funding for these issues?

Mr. SHAFFER. That is a very good question, Mr. Bishop. Let me start by saying the operational employment of systems will be funded by supplemental. But the Department as a whole has recognized over the last couple of years that we have had the task force in place that we do need to have—and because of operational concerns, we do need to invest more in developing maturing—and rapidly, by the way, I should say—rapidly maturing technologies to reduce our forward-deployed energy footprint.

And I know, I read the GAO report about what the Director of Operational Energy Plans and Programs would do.

I will tell you that through the Energy Security Task Force, we do have an active running visibility and spreadsheet into what the Department is investing for energy security at large. It is about $1.3 billion in fiscal year 2009. A large chunk of that—and I can't give you the exact percentage—but a large chunk of that is focused specifically on maturing those technologies needed to bring down our forward-deployed energy footprint either at a forward operating base, or with some of our tactical platforms that move forward.

So we do have visibility. I think the Department has looked at it in the base budget by tripling the base budget investment and maturing new technologies in the last three years. And then, when it gets to operational employment, there will be some supplemental dollars that will help that along. But for things like the advanced mobile generator that I was talking about just recently, the Army recognized that need and has put it into their program as a program of record. They are scheduled in total to field 67,000 sets beginning late in fiscal year 2010, 2011. And that will be part of the

standard table-of-equipment allowance to every forward brigade team and battalion team.

So it is a mixture. We are injecting new energy-efficient technology solutions into our force, because it makes our force more operationally capable. As far as the incentives to forward-deployed troops, that is through supplementals.

But at the end of the day, the reason the Department came back and partially concurred with the GAO finding about incentives and financial incentives, forward-deployed troops, the best incentive is you have a better fighting force and you have a better chance of bringing troops home alive. Operational energy efficiency will give that incentive to forward commanders, and that is an incentive that money doesn't begin to match.

Mr. BISHOP. And I appreciate that last particular point, and obviously that is why the prioritization has to be there. What I guess I am hearing from you—and correct me if I am wrong with this—is what we are really talking about is not necessarily a systemic change in the way money would be allocated in the base, but rather the amounts of money that would be allocated to different line items that currently are there.

Mr. SHAFFER. Yes, sir. I think that is an accurate assessment.

Mr. BISHOP. On one of those other areas. In the last authorization bill that was passed there was the position of the Director of Operational Energy Plans that was required as part of that legislation. Could you just tell me what the status of the Department's efforts are on that particular position?

Mr. SHAFFER. Sir, that particular position is nominated by the President and confirmed at the consent of the Congress. We have not gotten down, we the Department have not gotten down to nominating that position right now. I can't tell you where the administration is in their process of nominating that position. I do know it reports directly to the Secretary, and it is an important position. But I can't tell you where we are with regard to that particular nomination right now.

Mr. BISHOP. But with the change of administration, has the new administration signaled its intent to establish that position, or is that still not necessarily—has not been decided yet?

Mr. SHAFFER. Sir, I don't think that there is any question about whether or not the position will be created. It is in law, and therefore the Department will take a look at that. I have heard no one say that we, the Department, are not going to create this position.

Mr. BISHOP. All right.

Mr. SOLIS. Sir, if I could only add to answer part of your question. I believe Secretary Gates did say or indicate that they were going to name somebody for that.

Mr. BISHOP. Let me ask one last question. And you mentioned very briefly as far as the kinds of incentives when you are dealing in a forward. How does DOD intend to address the issue of measuring fuel consumption in these forward-deployed locations, which once again has to be probably not the number one priority at that time, but how do you actually implement and come up with legitimate information and data?

Mr. SHAFFER. Sir, that is one heck of a question. It is a very good question, one I kind of hoped you weren't going to ask today.

Mr. BISHOP. All right. I will take my time back and you don't have to do it.

Mr. SHAFFER. What I will tell you is that in the Energy Strategic Security Plan that we have put together, the fourth of the four goals was to develop an effective set of metrics for measuring energy use both in garrison and deployed. We are not there yet, sir, and that will be a very important task for the new Director of Operational Energy Plans. And I would suggest that that would be one of the most important things that person could do.

Mr. BISHOP. Thank you, sir. I appreciate it.

Mr. ORTIZ. My good friend, Mr. Taylor.

Mr. TAYLOR. Thank you, Mr. Chairman.

And, gentlemen, I think it is very timely what you are doing. We had the Transportation Command in just last week, telling us about the 10-day transit just through Afghanistan, to get a gallon of anything from the port of Karachi to the Afghan border. So I think it is very timely.

A couple questions. Whose job is it on a base or in a region, whose job is it to try to minimize the amount of fuel that is used, without affecting operational capabilities? I am very, very impressed with your 26 million gallons per month just with the generators. I was wondering if you have further broken that down. For example, how much of that electrical capacity is used to heat water? Do you have any idea?

Mr. SHAFFER. Sir, I do not have that particular. Let me take that for the record and go back and see if we can find that out.

[The information referred to can be found in the Appendix on page 71.]

Mr. TAYLOR. The reason I am asking is I think I supplied you gentlemen or someone at the GAO with products that are commonly available in the private sector used extensively on boats, where they use the radiator cooling fluid, the heat that is generated in that engine, to both heat water and to heat spaces. And I realize that the water is a lot easier to transport through pipes than it is that warm air. But I would imagine a pretty significant amount of the energy that is used is heating water during the wintertime in Iraq and Afghanistan where most Americans don't realize it gets pretty doggone cold out there. So I was curious if anyone has looked into that, because that is existing technology about Raritan and other companies.

The second thing is, do you actually have a statistic as far as fuel demand per GI?

Mr. SHAFFER. Sir, if I can, first, let me on the first point that you have made—and I will make this pledge to you. In going through some of the background material for this hearing, I came across the bullet that said that last year you had asked about, I think, about the heat exchanger.

Mr. TAYLOR. Right. They use a heat exchanger for water, a radiator-type device for heating a space.

Mr. SHAFFER. I do not know that anybody has done that. What I will pledge to you, sir, is we will have the Power Surety Task Force take a look at that and see how that could fit into our Net-Zero Joint Capability Technology Demonstration and some of the other testing things, and we will give it a fair hearing.

Mr. TAYLOR. I want a specific response to what percentage of that is used to heat water.

Mr. SHAFFER. Yes, sir.

Mr. TAYLOR. Because I am guessing it is significant.

Mr. SHAFFER. Yes, sir. We will find that information out.

[The information referred to can be found in the Appendix on page 71.]

Mr. TAYLOR. And I would like a specific response. I came to a calculation of about 18 gallons per GI per day. Is that anywhere near—that would be total force divided into total gallons. Total deployed force divided by total gallons.

Mr. SHAFFER. Yes, sir. I think that I have seen different figures ranging anywhere from about 8 gallons per deployed force member up to around 18. So depending on how you look at it, somewhere in that range. But, again, this gets back to the questions by Mr. Bishop. We don't have the right set of metrics right now to fully understand the problem.

Mr. TAYLOR. Well, going back to my question. And the very real, not just the trucks that are lost, not just the fuel that was lost, but to the best of my knowledge thus far, 135 drivers who have been killed just transiting Pakistan. This is very real. If you can reduce the number of trucks on the road, you are reducing casualties.

So the question is, whose job is it, within the restraints of an operational zone where combat comes first, whose job is it to try to reduce that demand in a way that does not diminish the combat effectiveness of that forward operation location?

Mr. SHAFFER. Yes, sir. At the end of the day, it is always the commander's job. And that is why Major General Zilmer sent out the JUONs.

The actual fuel handling is done by the logistician. And there is the combination of operational commanders, the G4s, the J4s, the civil engineers, and the Defense Energy Supply Center. But the specific—at the end of the day, sir, the specific responsibility is with the deployed commander.

Mr. TAYLOR. Who in the DOD, as different vendors come to us and say, I have got something, this oil additive, this fuel additive will improve your productivity, who in the DOD actually tests those products to see if they are for real?

Mr. SHAFFER. Sir, it depends upon the specific technology. But the fuel additive is—we have actually turned some of those pieces and some of those fuel additives over to the Tank Automotive Engineering Research Development Engineering Center at Warren, Michigan, and they actually have a cell there that tests some of those fuel additives to see if they work, if they work over a long period of time, if they foul the equipment at all. And that is the right place, because that particular center is then looking to inject those particular capabilities into our ground fleet.

Within the Navy, the testing is done primarily over at the Naval Ship Center, Carderock, or Navy Research Laboratory.

So we do have people who do test the various pieces of equipment, but it would vary depending upon which gear it is.

If you ever have any questions, sir, you can go ahead and have your staff send it to me, and we will make sure that someone takes a hard look at it; because if we can deploy something—you men-

tioned 135 soldiers killed. If we can deploy something that will save one American's life——

Mr. TAYLOR. Well, clarification. Those were contract drivers.

Mr. SHAFFER. It doesn't matter. An American is an American first.

Mr. TAYLOR. They are still human beings.

Mr. SHAFFER. So if we can reduce casualties in any way, sir, that is something we are pledged to do.

Mr. TAYLOR. Thank you, Mr. Chairman.

Mr. ORTIZ. Ms. Shea-Porter.

Ms. SHEA-PORTER. Thank you, Mr. Chairman.

I have a question, please, about the Tactical Garbage to Energy Refinery. Two units were deployed in May of 2008 I think for a 90-day demonstration and pilot program. Could you please update us about how that turned out? Was it successful? And, if so, are we going to see more of that? Obviously that helps where we don't have to have as many convoys who are going to be having to transport garbage.

Mr. SHAFFER. Yes, ma'am. I wish I could tell you that they had worked as well as advertised. They did not. We deployed them, as you said, for 90 days. The goal was to operate this system for 20 hours a day at a forward operating base with a battalion. We made the assumption that it would be 4 pounds of trash per person per day, 500 people deployed, so that would be about a ton of fuel a day, or a ton of trash. That ton of trash should have turned into 100 gallons of JP–8, which would fuel a 60-kilowatt generator for 20 hours. Unfortunately, the harsh operational forward setting, we couldn't get that many hours a day out of that particular rig. We were only getting on order sometimes four to six hours a day of operation before the dust and dirt and everything would cause it to stop operating.

What I can tell you is that we did see promise. And, in fact, we have seen promise in these garbage-to-energy converters in fixed locations. So, actually, on February 18 and 19 at Aberdeen Proving Grounds, the Army called together a group of people to take a look at how do we move to the next step? How do we harden some of these—they are called tactical garbage-to-energy refinery (TGER) systems—so they can be deployed and actually reduce some of our energy demand?

Now, at a forward-operating base, we looked at operating one 60-kilowatt generator basically per day. A battalion size FOB has about 24 generators per day of that size. So it is going to be just a small reduction, but it does other things. Instead of producing energy, if we can get rid of a ton of trash a day and turn it into something useful, that is very important, because that increases the security of our forces. We don't have to use our forces or contracted forces in guarding trash. We don't have to have them doing the security details.

So there are so many operational advantages. And it goes back to our primary principle: We want to deploy anything we can that gives us energy efficiency, provided we at least maintain our operational capability. Garbage to energy, that particular system would increase our capability.

Ms. SHEA-PORTER. And will you put more money, more R&D money into that?

Mr. SHAFFER. I have to see if this is an R&D or an engineering problem, ma'am, so I do not know. Let me take that for the record and go back and talk with the team who pulled together at Aberdeen.

Ms. SHEA-PORTER. I would appreciate that. And I yield back. Thank you.

Mr. ORTIZ. Mr. Kissell.

Mr. KISSELL. Good afternoon, gentlemen. I appreciate your being here today.

Mr. Shaffer, just a couple numbers I had written down, and I am not sure I got them correctly. The total amount of money we spend on fuel per year, the Department of Defense?

Mr. SHAFFER. Sir, which year? Because of the escalating costs, we have been all over the place. The last full year we have numbers for is 2007; and in 2007, we spent about $13 billion.

Mr. KISSELL. That was the number I had written down. Now, I wrote down also $1.3 billion in research for alternative energy. Was that the right number?

Mr. SHAFFER. It is more than alternative energy, sir. It is $1.3 billion in energy security-related projects across the Department. That involves also doing some of our installation research and testing. So it is alternative fuels, platforms, and installations.

Mr. KISSELL. And I know this question is going into, instead of—I know the fluctuations in how much energy cost. But the overall amount of energy, the fuel that we are using just in gallons or whatever measure we use, is it holding steady? Is it going up significantly? Or have any of these improvements started bringing it down?

Mr. SHAFFER. The last year we have good numbers for, sir, is 2007. And, basically, in about the last five to seven years we have had about a six percent decline in overall energy use in the Department.

At our installations, the decline has been even more dramatic. So we have declined even more. So even though we have been forward deployed fighting a war, right now our energy use is slowly coming down.

Mr. KISSELL. Do we have any goals in that regard toward what we are trying to get it down to?

Mr. SHAFFER. No specified goals. On the installation side, sir, we do. We have the published goals of the Energy Security Act and other things. So we do have goals on the installation side.

We don't have any firm goals on the tactical side, and we could be criticized for that, but it becomes very difficult on the tactical side because so much is dependent upon the type of operation you are employing, how much maneuver you are doing, what situation, where you are deployed. Deploying to Iraq and air conditioning tents in summer takes a lot more energy than deploying to someplace where it is a temperate region. So I would like to tell you we have good metrics, sir, but we do not. We probably need to get better metrics. But we don't have specified goals other than down.

Mr. KISSELL. How close or what do we need to do start getting those better metrics, because that is something you mentioned three or four times.

Mr. SHAFFER. I honestly think, and I mentioned this earlier in my remark to Mr. Bishop, I believe that getting a good set of metrics that help us understand the situation should be one of the higher priorities of the new Director of Operational Energy Plans. That is in the statute. It is a very, very important step to improving our overall capacity and capability in the Department. Short of that, the development of metrics will be pretty much at the joint staff level, and they are unfortunately right now extremely busy.

Mr. KISSELL. I would agree with you. Mr. Solis, you had mentioned that we lacked—maybe having this as a priority for energy efficiency, maybe we lacked guidance in how to come about this, and in listening to you guys talk today, I find myself the mixture of excitement at the possibilities of improvement and the mixture of frustration that maybe we don't have the guidance. Do we need that Director to get the guidance, or is that something that could come from somewhere else?

Mr. SOLIS. One of the recommendations that we made is that there does need to be better guidance that is provided by the combatant commanders. Mr. Taylor asked about who was in charge, and right now there really is no guidance that comes down from a combatant commander that talks about reducing energy fuel demands at forward locations. That is across the board. And there is also nothing there in terms of the military services in terms of fostering that kind of look-see. So I think there is that lack of guidance, and I think that is something that as a starting point would help improve the management and emphasis in priority that has looked at fuel demands at forward locations.

I would also mention to you, we talked a little, or you mentioned a little, about metrics as well. I would also offer first off what you need to do in terms of not only goals is to look at, and what we tried to do in our report, is what is actually happening at some of these foreign locations. Not surprisingly, if you look at Bagram, a lot of the fuel goes towards air and weapons systems. But if you look at a lot of the other locations that we looked at in Djibouti and Iraq, a lot of that—and when I say a lot, more than 50 percent, sometimes 60, 70 percent is going towards base operations. So I think if you look at how, where you are burning your fuel, how you are burning your fuel, I think that then can also help you decide what investments you are going to make.

So I think you need guidance. You need to understand what you are doing at these locations so then you can better tailor what your investment approach would be.

Mr. KISSELL. And one last question, and it goes to what you just said. If I read through this correctly, the Air Force and our aviation uses the majority of our fuels; is that correct?

Mr. SOLIS. That is correct.

Mr. KISSELL. And we have been talking about a lot of forward-based ideas. So it would seem in what you just said that if the Air Force is using the majority of the fuels in operational bases, do we have kind of meaningful programs there for reducing and improving, and is that working?

Mr. SOLIS. Let me go back. Certainly the Air Force is burning a lot of fuel, it uses a lot of fuel. But as I mentioned before, if you go to look at some of these forward-operating locations, the predominant use of fuel is for base operations, not necessarily for the weapons systems or for the aircraft.

I believe that the Air Force is looking into different things in terms of I think there is a synfuel initiative that they have; there are other things that they are doing, as far as I understand, to try to reduce their use of fuel. They have just come out with a strategic plan. We haven't evaluated it. But there are other things that they are trying to do in terms of looking at the weight of their aircraft, flying direct distances and a number of other things. I don't know if Al has any more information, but they have come out with a strategic plan to look at how they reduce their fuel consumption in their aircraft.

Mr. SHAFFER. Yes, sir. And let me take a very short answer at your question, also.

Because the Air Force uses more energy, more fuel than our other services, they recognized, I think, a little bit ahead of the other services the need for energy security. So the Air Force has been serious about this business for the last three to four years. They have a number of projects, in addition to the synfuel project, to increase their energy efficiency. They are looking at—and this is going to sound silly—they are looking at winglets on the ends of some of their transporting aircrafts. Those are, if you look out at your commercial aircraft—those are the struts that go up. Well, under certain circumstances winglets can increase your energy efficiency, your mileage, by 10 percent. That is significant. We have to test it to make sure it doesn't cause any capability loss for some of our fighting force. But the Air Force is serious about that.

The Air Force has also recast their turbine engine research program. It used to be known—I have to throw out these acronyms only because otherwise they clog up my brain. It used to be known as IHPTET, Integrated High Performance Turbine Engine Technology program. The point of IHPTET was to increase your thrust to weight. That has been changed to a program called VAATE, Versatile Affordable Accelerated Turbine Engine. The whole point of VAATE is to get 25 to 30 percent more energy efficiency out of our turbine engines, and we are accelerating that along with looking at some the core engine technologies to give us better energy efficiency, a better capability to operate in a high bandpass mode. And the Air Force really looks like they are on the verge of making some breakthroughs in turbine engines. That would be great for the nation because the Air Force is doing this with commercial vendors, our aircraft engines, and that would be good for our industry also. So I think the Air Force is making some progress, sir.

Mr. ORTIZ. Ms. Giffords.

Ms. GIFFORDS. Thank you, Mr. Chairman. I very much appreciate you holding this hearing, and to the gentlemen who are testifying today, I think this is one of the most important, perhaps one of the most insightful hearings we are probably going to have all year.

A couple of questions, and, of course, this is couched in the fact that 80 percent of the energy that is used by our Federal Govern-

ment is used by the Department of Defense. The vast majority of that is used for operational activities, and 94 percent of that is petroleum fuels. So getting this right, we have the ability not just to revolutionize the Federal Government, but certainly our country, industry and the planet.

One of the things that struck me was in the report, and this is from Mr. Solis, that cited the Department's lack of established incentives or a viable funding mechanism for investing in the fuel-reduction projects. The Department in its official line said they are not convinced that financial incentives represents the best strategy to reduce fuel usage.

When I think about how much money that we are spending on contractors, is this something that could be perhaps used under existing or future logistics contracts in terms of getting them to move towards energy consumption?

Mr. SOLIS. Again, I don't know that you need separate contracts. I think what we were talking about there in terms of like funding mechanism or incentives, first a funding mechanism, again, there is nothing—there is not a separate line; it mostly, from our view, is mostly supplemental.

Again, the forward locations now that we are talking about, if you do look at the installation side here in CONUS, there are a lot of funding mechanisms. There are things in the military construction (MILCON) budget that allow for energy improvements in terms of looking at how you can get returns on investment and save fuel or reduce fuel and energy demands. There may be some other means of doing that. I am not sure necessarily by contracting you necessarily have to do it, but what there has to be certainly is something out there that says here are the priorities of the Department, here is what we are going to fund, here is how we are going to do it.

Ms. GIFFORDS. I would be interested in working with members of the committee specifically to talk about why it is that we have not heard from the Obama administration about implementing section 902 from the last Defense Authorization Act, because I think having this coordinator could be really a key position for us. And so if we could talk later on that, Mr. Chairman.

Following the lines what was talked about in Mr. Shaffer's beginning comments about the ESKIMO spray program, this seems to be like a total no-brainer. Obviously it works; what, 40 to 70 percent conservation or energy reduction. Why is it that we are not immediately expanding this to all temporary facilities, permanent facilities and even bases here? I come from southern Arizona. It gets to be 110, 120 degrees. It seems to me we should be using this foam everywhere.

Mr. SHAFFER. Thank you, ma'am. The first answer is, we are reinitiating the contract in Iraq and looking to do it, a contract, in Afghanistan. So I think that we are cleaning up the Central Command (CENTCOM) area of responsibility.

The other answer is why aren't we doing this everywhere here? You know, that is a very good question. Now, there is a mechanism to do this, because I have done the return-on-investment calculations, and these types of things will pay for themselves fairly quickly. Under the Energy Conservation Investment Program, ECIP, the

local base commander has the opportunity to work with a commercial firm to go ahead and make those changes locally, because at the end of the day, a local base commander pretty much owns their base facility. We have made the information available to them. We meet in a senior energy forum with the leaders of each of the services. I can take back specifically your comments to both the Air Force and the Army. I don't know if you have any Navy bases in Arizona, but I can take it back directly to the Air Force and Army and ask that question directly of them.

[The information referred to can be found in the Appendix on page 71.]

Ms. GIFFORDS. And not just in Arizona; obviously everywhere, but specifically in areas that make the most sense, even those areas that have a climate similar to Iraq and Afghanistan. It seems to me if we get this right here, obviously we can deploy that technology more easily.

And following up, you had talked about the TGER program. There is also that transportable hybrid electric power station. Solar is big in Arizona. Can you talk about some of the successes of that? I understand that there was a program that was tested. It was tested at one point, but then during the GAO study it was determined that it was not ready for deployment in Iraq.

Mr. SHAFFER. Yes, ma'am. The TTHES program, the Tactical High Energy—the Tactical Transportable High Energy System (TTHES) had some wonderful technology and would have worked very, very nicely in a fixed location. When you get to packaging it up and taking it apart, the system just didn't hold up to the rigors of packaging and deployment.

So we have the Power Surety Task Force, and, by the way, that particular program spun off a four- to five-year development program called HI–Power, where we are looking at ruggedizing those technologies that we can and getting them out as fast at possible.

The TTHES also gave rise to the Joint Capability Technology Demonstration Net-Zero Project, which includes transportable and tactical solar powers. And it is fascinating because I have seen this whole group come along to where they were just kind of almost jury-rigged type of solar panels to now we are almost able to roll them out in a fabric. Again, we are not there yet, but we are getting very close. And the manufacturing capability for solar firms is stepping up to try to give us a more rugged and viable capability.

And if I can go back to one question you asked earlier about the spray foaming. We really stumbled upon that, the Power Surety Task Force, and deployed it to Fort Irwin. Now, as we bring it to Fort Irwin, we are bringing through the battalions and brigades that are going over to Iraq. Those soldiers and commanders are seeing the value of spray foaming, and they are bringing it back to their location. So I think this is a technology that will grow because it works.

Ms. GIFFORDS. One final question, Mr. Chairman. Commander's Emergency Response Program (CERP) funds were used in nearly two dozen projects in Iraq. Did you have a chance, Mr. Solis, during your investigation to determine whether or not they worked, either personally or anecdotally? Do we have good information about

how those dollars unrolled and what type of technology exactly was used?

Mr. SOLIS. I am sorry, did you say CERP funds? We have done some work on that, but I am not familiar with that. I would probably have to take that for the record, if I could.

Ms. GIFFORDS. Mr. Shaffer.

Mr. SHAFFER. Ma'am, I will do the same thing. I will take that one for the record because I don't have that data with me.

[The information referred to can be found in the Appendix on page 71.]

Ms. GIFFORDS. Mr. Chairman, obviously the potential here is tremendous, and I just want to make sure that with the new administration we are working together to take this technology—when you look at the numbers, it is astounding. We should be able to make sure that particularly with the solar, which is becoming more and more cost-effective, that we are putting it in Iraq and Afghanistan and making it as easy to use as possible.

Mr. ORTIZ. I appreciate your comments. Sometimes we look at ammunition and body armor, but I think this is a very, very important issue that we have to address. If you don't have the fuel, you can't protect our soldiers by not utilizing the airplanes or the helicopters. You are right. This has been very, very interesting. But let me yield to the gentleman from Maryland Mr. Kratovil.

Mr. KRATOVIL. Thank you, Mr. Chairman.

Mr. Chairman, let me just tell you one of the most difficult things getting used to as a former prosecutor is waiting to answer these questions. It is always nice when it is a smaller group. So thank you.

Mr. Solis, let me start with you, if I may. I know the report gives five recommendations. What we seem to come back to throughout these questions is the importance of naming this Director of Operational Energy Plans and Programs. I know that is not listed. Would you agree that of all the things that we could move forward on, that that would be the most significant in really making progress on this issue?

Mr. SOLIS. I think it is one thing, and we actually did make that recommendation in our previous report, but I would also mention, as we said in our report, this report, that there still needs to be some guidance that is coming down from the combatant commanders on down so that people understand what the requirements are for forward location not only just in terms of saying that it needs to be put in there, but what are the construction standards that folks are going to look to, what are the living standards? All these kind of things have to be part of that guidance that comes down from the combatant commander.

But having said that, there still needs—the Operational Director still is an important position that needs to be filled.

Mr. KRATOVIL. I guess my question is you are talking about guidance. My question is where does that guidance come from? And I am going to go to that first recommendation.

Mr. Shaffer, what do you see as the major obstacles, practical considerations that are obstacles to carrying out that first recommendation in terms of the combatant commanders?

There was some pushback, and I am asking what are your practical objections to it.

Mr. SHAFFER. Let me make sure that I answer the question that you wanted to have answered. You wanted to know, sir, what, we, the Department, think the first thing that the Director of Operational Energy Plans should do to be effective in issuing the guidance.

Mr. KRATOVIL. No. What I am asking is the first recommendation is to direct the combatant commanders in consultation with the military service component commands to establish requirements for managing fuel demand at forward-deployed locations within their areas of responsibility. My question is do you see any practical problems with that recommendation?

Getting back to sort of where is this guidance coming from?

Mr. SHAFFER. Yes, sir. And I am thinking, because I will give you a partial answer, sir, but at the end of the day, this is really one that has to go back and be addressed to the combatant commanders and the joint staff, because they set the operational guidance.

I think that one of the things that the Department has to weigh, and we have weighed this very carefully as we have gone forward with the Energy Security Task Force, is there is a number of wonderful opportunities out there in the energy security realm. But again, and I have said this a couple of times, we have to come back to the very first principle of energy security. We have been very, very conscious within the Department not to rush to deploy something that would cause degradation in our operational capabilities or fighting force. And I think that that will be part of the dynamic that will go out in issuing the guidelines, because it would be very easy for someone to say as a combatant commander, thou shalt go out and reduce energy consumption by such and such a percentage, and make that a directive. But when you are out in an operational setting, the commander has to have the flexibility to do everything they can to protect our forces.

So that is going to be a very difficult dynamic, and we are going to have to take some time working through that with the operational commanders.

Mr. KRATOVIL. Mr. Solis.

Mr. SOLIS. I am not sure that we would necessarily advocate saying that the mission doesn't take precedence. I think what we are saying is you need to understand that right now there is nothing out there to guide the base commanders on how to deal with reducing fuel demands at forward locations. What we have talked about today in many cases are individual initiatives that base commanders unto themselves sort of take up. But again, there is nothing out there in terms of when a unit or a commander goes out there and first establishes a base, how do I go about doing this in terms of trying to make sure I am accomplishing my mission, but also reducing fuel demands?

And, by the way, I think they go hand in hand, particularly, again, as we talk about Afghanistan. You have to look at reducing fuel demands because that is going to affect how you do your operation. And until that happens, and until there is better guidance,

I think, that comes down, I think it is going to continue to be an issue for the Department until they begin to deal with this.

Mr. KRATOVIL. Thank you.

Mr. ORTIZ. Dr. Fleming.

Dr. FLEMING. Thank you, Mr. Chairman.

I am intrigued by this foaming. It has not been deployed yet, it is still experimental; is that correct?

Mr. SHAFFER. Dr. Fleming, it actually has been deployed in Iraq, and we have got through roughly 50 percent of the total amount of tentage that we wanted to foam. The problem we ran into was the performance of the contractor. So the Army went out and novated that first contract and are looking to recompete it. At the end of the day, and I don't have the figures with me handy, we can get those to you as part of the record, we are foaming a large majority of the tents at forward-operating bases in Iraq.

[The information referred to can be found in the Appendix on page 72.]

Dr. FLEMING. Do you foam the entire structure, or is it just the tiny openings? And also, when you take the tent down, do you just remove the foam, and you can refoam later? How does that work?

Mr. SHAFFER. Sir, the process of foaming takes away the possibility of taking it down. You actually spray-foam the entire tent, and, in fact, we can get some pictures to you. It comes in various thicknesses that actually go over the entire tent superstructure. You keep, of course, the windows open, the doors open, but other than that, the entire tent is foamed.

Now, again, if you go back to the return on investment, if you are going to have tents up in a place for a long period of time, the amount of energy you save very, very quickly pays for that tent. So it becomes a return on investment, in addition to giving your troops a much better environment in which to live.

Dr. FLEMING. It makes a tent more or less disposable then?

Mr. SHAFFER. Yes, sir.

Dr. FLEMING. But, as you say, the cost is offset by the energy savings. So that is great.

With regard to saving energy, that is really what this hearing is all about. What is a major impetus for saving energy? Is it cost? Is it logistics? Does it make it easier to deploy out in the field? What are sort of the, I guess, priorities of that strategy?

Mr. SHAFFER. Sir, that is a wonderful question, and it is a very complex question, and it is one I am not going to answer directly. Energy security is so complex, but everywhere you turn, there is a benefit to the Department. And I will give you a little anecdote. When we brought the operational goals to then-Deputy Secretary England, our first goal said something along the lines of, reduce energy use while maintaining operational capability. He actually, the Deputy Secretary, turned that bullet into saying, increase operational efficiency by increasing your energy efficiency. So you actually get operational capability enhancement by increasing your energy efficiency.

But you also have force security issues because you don't have to have the long convoys. You have operational issues. And at the end of the day, energy will affect us strategically also with our dealing with other countries, because you have to take a look at we

have talked a couple of times about Afghanistan: What do we have to do strategically in that part of the world to make sure that we can continue oil flowing to our troops and forces in Afghanistan? And that affects the dynamic of our operational capabilities. So what is more important, strategic operational capability and lives? Money? They are all very, very important.

Dr. FLEMING. One more question. You know, a lot of great technologies that we use every day came out of military and also space requirements. And so my question is, how much of what you are doing is off the shelf, and how much of it is still sort of an experimental thing as we go forward?

Mr. SHAFFER. Yes, sir. Most of what we are finding and most of what we are developing, with the exception of some of the advanced alternative fuels, is really just engineering and ruggedizing commercial off-the-shelf products. I talked about the generators that the Army is doing a wonderful job fielding for us earlier. We are using effectively commercial generators being bought from Cummins Corporation in Minnesota. But there are certain requirements, ruggedization and shielding requirements, so you don't have electromagnetic interference that are absolutely vital to military applications. So we are taking commercial systems and modifying them or engineering them.

Dr. FLEMING. Thank you.

And thank you, Mr. Chairman.

Mr. ORTIZ. Mr. Johnson.

Mr. JOHNSON. Thank you, Mr. Chairman, and also thank you for hosting this hearing and for holding this hearing.

I want to go back to the Tactical Garbage to Energy Program, which, of course, turns garbage into energy. And I believe, Mr. Shaffer, that you indicated that there were positive results from that program; is that correct?

Mr. SHAFFER. I would say, sir, that they were promising results, not necessarily positive results, because it didn't work quite as well as we would have wanted it to. But there is a very, very good promise of the future as we harden and ruggedize the TGER.

Mr. JOHNSON. What leads you to take that assessment that it is a—it is something that—your word is different from mine, but I will say a positive result. I mean, is that fair to say, a positive result?

Mr. SHAFFER. Yes, sir.

Mr. JOHNSON. But there are some bugs that need to be worked out?

Mr. SHAFFER. Yes, sir.

Mr. JOHNSON. What are those, by the way?

Mr. SHAFFER. Rather than give you some false information, let me take that for the record, sir, because there was, as I said, a workshop that was just held less than two weeks ago at Aberdeen Proving Grounds where the experts got together, and I don't have all the specific information right now. I know that it dealt with the amount of time between when the system went down, how the system handled dust, steady flow of garbage. But let me get the specifics for you, sir, and get that back to you.

Mr. JOHNSON. All right, please do.

[The information referred to can be found in the Appendix on page 72.]

Mr. JOHNSON. Are those two units deployed to Iraq still in operation at this time?

Mr. SHAFFER. I do not believe so, but let me verify that and get that back to you. I don't know for a fact. I think we brought them back home.

[The information referred to can be found in the Appendix on page 72.]

Mr. JOHNSON. Was there any way during the time period that these units were in use that you were able to determine the cost-effectiveness of this program versus leaving it the way that it has always been?

Mr. SHAFFER. Sir, I don't know. And again, I will take that for the record and get that back to you.

[The information referred to can be found in the Appendix on page 72.]

Mr. JOHNSON. Mr. Solis, do you have an opinion on any of those questions that I asked?

Mr. SOLIS. Again, we looked at a number of these different projects, and as we noted, and as Mr. Shaffer noted, a lot of these are still in the R&D phase, and more work needs to be done in terms of looking at the viability of some of these projects or initiatives and technologies before they deploy. And that is all I could really offer on it.

Mr. JOHNSON. Yes. Do both of you believe that we should extend this pilot project, or should we expand it, or should we simply ignore it?

Mr. SHAFFER. Sir, as evidenced by the fact that we had a fairly significant group of folks get together at Aberdeen Proving Grounds, I don't think that we want to abandon this project. Even if it doesn't solve the energy issues that we face, it will help. Even if it doesn't solve the energy issues that we face, the additional force security applications of being able to turn trash into oil are pretty significant, because right now the only thing that we can do with trash at our bases are burn it in a pit, which we don't like to do; hire people to carry it away, which increases our force security demands; or go ahead and bury it ourselves, which we don't like to do. So none of the current options are as good as turning some of this garbage into oil. So if we can do it in any way that is cost-effective, it would be—it would make no sense not to.

Mr. JOHNSON. And let me ask this question: Are there plans to incorporate renewable battery cell technology into Department of Defense's efforts to reduce its reliance upon petroleum-based fuels?

Mr. SHAFFER. Yes, sir. The bulk of our work right now in renewable batteries and fuel cells are more at the smaller end scale, because when we send dismounted infantry out on a long-duration mission right now, sometimes we are loading those kids up with 30 to 40 pounds of batteries. We are focusing on them the small end of the batteries right now because that appears to be where the technology is most mature. We have some small efforts into larger fuel cells and larger batteries for things like submarines, but that technology seems to be a little bit further off. So right now, sir, we

are really focused on the dismounted infantry and individual battery end.

Mr. JOHNSON. One last question, Mr. Chairman. Since we do have what I would consider to be landfills, in other words since we do bury our—some of our trash and garbage, that begins to break down, and methane gas is formed. Do we have any plans to instead of burning off that—instead of burning off that methane gas to be able to convert that methane gas into energy?

Mr. SHAFFER. I am not aware of any, but let me check on that and get back to you. I have not heard of that discussed.

Mr. JOHNSON. Thank you.

[The information referred to can be found in the Appendix on page 72.]

Mr. ORTIZ. Mr. Conaway.

Mr. CONAWAY. Thank you, Mr. Chairman.

Mr. Shaffer, I am a Certified Public Accountant by background. Would you give me your definition of cost-benefit analysis, cost-effectiveness?

Mr. SHAFFER. In the use that I was using it, it is strictly a financial thing. It is how much does the thing cost, how much can be saved, and how quickly can it pay for itself. So that is why you do the cost-benefit analysis, but you also have to keep the operational considerations out there separately; how does it improve our force structure?

Mr. CONAWAY. Does that play a role in the decisionmaking process at all?

Mr. SHAFFER. Oh, yes, sir.

Mr. CONAWAY. On the foam tent, you said it pays for itself within a certain period of time. Does that take into consideration the full life cycle of the foam tent? In other words, the fact that you have got to haul new tents to the battlefield when you move; you have got significant disposal issues, I suppose, of that foam and that tent that you wouldn't have if you just had the tent and kept moving it around; is your concept of cost-benefit analysis the full life cycle of the issue?

Mr. SHAFFER. Sir, it would, but understand that most of the places that we are foaming right now are fairly fixed forward-operating bases. They are places where we have folks and have had folks for some period of time. So it is not like—and I remember this very well when I was on Active Duty. I was in the Air Force, but I was assigned to the Army. We would move every 24 hours. That is not the situation we are finding ourselves right now. We are going out in widely dispersed bases, and they are setting up for some period of time.

Mr. CONAWAY. So the answer is no?

Mr. SHAFFER. The answer is no, sir.

Mr. CONAWAY. So the extra hauling it around, extra fuel in hauling it over to Iraq and that kind of stuff, that wouldn't be figured into in your cost-benefit.

Where in the system do we decide that the efforts to save fuel, as an example, degrades our ability to do the job? Who gets to make that decision? And what kind of flexibility do they have of not doing the fuel-saving technique because we can't get the job done? Where is that decision made?

Mr. SHAFFER. Sir, it is always the operational commander's prerogative, and first and foremost in any of this energy security stuff, and I go back to what we said, the primary rule or principle for energy efficiency and energy security is that within the Department it will not come at operational—degradation of operational capability.

Mr. CONAWAY. I appreciate that comment.

We have talked a lot ad nauseam about this trash-to-fuel thing. One of the issues in any fight is the ratio of folks who are actually pulling the triggers versus that long line of folks behind them that make sure they have all the stuff they need. Is the increased supply logistics chain that is driven by much of these new things, is that taken into consideration in the cost-benefit analysis and whether or not we would deploy that?

Mr. SHAFFER. Sir, I don't think we have matured to the point where I can give you an answer yes or no. I would say no right now. But, you know, right now we are in the process, the combatant commander wants the capability, and we do everything we can to provide that capability forward.

Mr. CONAWAY. Is that something that, as we make these decisions, that the system ought to examine? In other words, if we can do this whiz bang, eco-friendly deal, but it takes 15 extra guys to do that, is the decision whether or not to move forward with the whiz bang deal, the added people, shouldn't that have a piece of the decisionmaking process of the extra supply chain that is created by that?

Mr. SHAFFER. Yes, sir. But at the end of the day, those decisions would be made by the operationally deployed commander. We don't push anything into theater that the commander of Central Command or Multinational Force Iraq or Multinational Force or Operation Enduring Freedom wants, so it is always basically the commander, the operational commander, approves everybody coming in and out of their theater of operations.

Mr. CONAWAY. It is not a far stretch, though, from setting these standards to then evaluating that commander against those standards and whether or not he or she gets promoted based on those kinds of things.

You missed a couple of evaluation centers. Mr. Taylor came up with an idea of some sort of a fuel additive. Are those evaluation centers proactive in looking for off-the-shelf new stuff that is coming out? We have great confidence in the inventors in this country coming up with all kinds of stuff. Do they have a piece of what they do? Is somebody trying not to miss the obvious and folding that into their system as opposed to waiting?

Mr. SHAFFER. Sir, I would like to tell you we are better at horizon scanning and technology scouting than we are. The bottom line is that most of those people who are doing the testing are pretty well fully employed, and we have people out looking for technologies. But I won't tell you we are beating down the bushes for them. We have more than enough stuff that is sent to us already.

Mr. CONAWAY. Thank you, Mr. Chairman.

Mr. ORTIZ. Mr. Marshall.

Mr. MARSHALL. Thank you, Mr. Chairman.

Just to follow up a little bit on Mr. Conaway's last question, I would guess that you are viewed by the industry out there that is creating new technology, trying to make us more energy-efficient, as a prime buyer, and that that industry is beating down your doors really if they come up with ideas. And they are looking for a platform where development of their idea might be paid for through tax dollars, and they get to keep the patent and then eventually be able to sell to the private sector. It just seems to me a no-brainer that they would be coming to you. Who do they go to, by the way? Who is it that they typically approach?

Mr. SHAFFER. Sir, if it is research and development, they will either come in ultimately into my office, or they will come into one of the science and technology (S&T) executives of the services. So we have S&T execs of each of the services. We have my office——

Mr. MARSHALL. I would imagine you all receive people with open arms in hope that, in fact, they have come up with the latest things that will make it much more efficient for us to conduct operations.

Mr. SHAFFER. Yes, sir. We try to address every one of those that comes in. We have open Web sites, and we also have—actually we have invested and are in the process of investing with the firm called In-Q–Tel. I don't know if you are familiar with In-Q–Tel, because some of the special authorities that are vested within the Intelligence Community, they can go out and do some horizon scanning. We have asked In-Q–Tel to go out for us and look for energy solutions.

So that gets back a little bit to how are we looking for other solutions. We are looking using other government agencies to help us look where we have limitations ourselves.

Mr. MARSHALL. I suppose that is a—just to make sure that we have covered everything—a reasonable expenditure. I hope we are not spending too much money on that, because it is hard for me to believe that any competent person out there developing an opportunity in the energy field wouldn't have in mind DOD as a possible partner.

I found myself thinking about operational risks that are associated with hauling a whole bunch of fuel out to the front and kind of costs associated with that, the fact that personnel have to be diverted, et cetera, and how the prospect of operational risks of that sort might motivate commanders and troops to be more fuel-efficient. And then I found myself being fairly skeptical that that wouldn't, in fact, be much motivation, just sort of recalling my days in combat and how many people were happy to pass on to the next unit the problems that they have got today; well, they are coming in here tomorrow, yes, we sort of figured it out, but it will be risky for us to deal with it, and we will let them figure it out and deal with it. And the problem gets passed off from one unit to the other unit. And that is not always the case, obviously, but it is often the case.

So I found myself wondering what kind of incentives can you put in place that would motivate the individual troop, the individual commander to be as energy-efficient as possible. And I have the sense that GAO might see some opportunities here that perhaps DOD isn't really thrilled about. And if you could, Mr. Solis, could you describe what might be a little bit of a dispute?

Mr. SOLIS. I think, first off, a lot of these bases that we are talking about, while they are considered expeditionary, like in Djibouti, they have been there now for six years. So I think a lot of these—you might understand if it is a small forward-operating base that—you maybe have a platoon size or even squad size—that people are moving in and out constantly. But I think as we think about these things, I think the incentives become more important in terms of for the base commander to be thinking about what is going to reduce, as you mentioned, my operational risk, and what is going to try and improve those kind of things, the quality-of-life issues?

So I think—and what we have seen and what I have seen, is, for example, I go back to what I mentioned before in terms of what the Navy does with its ships, it provides a funding line so that if there are improvements made, that ship, that commander can they then apply some of that funding, those savings, towards other priorities that the ship has. And I think the same kind of thing in terms of looking at for the future in terms of what you can do in a forward-deployed location, I think those are the same kind of things in terms of the incentives that you can think about for the future.

Mr. MARSHALL. There is a tension here, of course. If you are worried about quality of life for the individual unit and members of those units, it seems to me maxing out on the air conditioning in some places, for example, or maxing out on the heat, or, you know, moving your vehicle quicker rather than slower, all of those things are things that all Americans would like to do. We keep our thermostat low in the wintertime and high in the summertime, and you can imagine a commander, given the stresses the troops are under in a particular location, preferring to do just the opposite.

Mr. SOLIS. I would agree. At the end of the day, as Mr. Shaffer said, the operational commander is making the final decisions on what the priorities are and what is going to be, you know, in terms of what is going to—what improvements are you going to make, what are you going to put off, what are my mission requirements. And so those things all have to be considered.

But again, as time goes on and these bases remain there, I think those are the kinds of things that you are looking for in terms of possibly—if you go to Camp Arifjan that was built out in the middle of the desert in Kuwait, when they first got there, obviously the operational considerations were the first and foremost. But as time goes on, as you expand that base, as you increase the number of personnel there, other things come into play. And I think, again, as you look to Afghanistan where you have operational risks, there are other things that come into play, such as reducing the number of tankers and the number of fuel requirements for your operational needs.

Mr. MARSHALL. Mr. Chairman, I appreciate you holding this hearing, and frankly I have the suspicion that in the long run it is going to be technology that makes the major bites. Some process, yes, some incentives, yes, but largely it is going to be technological improvements that make the major bites in reducing our energy consumption.

Thank you, Mr. Chairman.

Mr. ORTIZ. Thank you.

Mr. Rogers.

Mr. ROGERS. Thank you, Mr. Chairman.

This is for Mr. Shaffer. I understand that each of the military departments has established a single senior-level official to oversee energy issues, including forward operational energy issues within their departments. What role does the DOD see these officials playing; not the departments, but across departments? Is there some interaction that you all are expecting?

Mr. SHAFFER. Sir, I actually had a very hard time hearing you with the background noise.

Mr. ROGERS. It is my understanding that each of the military departments have established senior officials to handle energy issues, including operational energy issues.

My question is what role does the Department of Defense expect those officials to play not only with regard to energy issues within their department, but across departments? Networking.

Mr. SHAFFER. Sir, I think that is a very good question. I will answer it by way of illustration, and this is across the Navy, Army and Air Force.

When the stimulus act, the recovery act was passed, $300 million was added to the Department of Defense for research and development in energy-related products. Now, we could have just let each of the services go off on their own and do their own thing, but I convened about four different one-hour sessions with the senior leaders of each of the services, a session to lay out on the table what are we thinking of doing? How can we work together to meet the intent of the American Recovery Act, but at the same time get the very best we could out for the Department of Defense in our operational capability?

So I look at the senior officials as being partners with the Director of Energy—Operational Energy Plans being full partners in implementing what should be everybody's vision, and that is to increase our energy efficiency so we can increase or enhance our operational capability.

Mr. ROGERS. Have they been charged with specific milestones or goals or objectives.

Mr. SHAFFER. No, sir, not yet, because the actual clock that ticks with the specifics of what is delivered comes after the nomination and consent of the Senate, or consent of the Congress, for this new position. So right now they have not. They have, however, all been very instrumental in working with our staff in putting together a strategic plan with our goals.

Mr. ROGERS. I understand that one obstacle with regard to the confirmation, but give me a time horizon that you expect to see some milestones established and then some goals achieved.

Mr. SHAFFER. I want to say within the statute it is either within 60 or 90 days after the Director of Operational Energy Plans comes on board. Again, we have—I have kept the task force in place to put out a strategic plan. We have that. But at the end of the day, I don't want to presuppose or corner the new political appointee into a position. That is going to be that nominee, his or her responsibility to put in place that strategy for the Department. So within 60 to 90 days, sir.

Mr. ROGERS. Thank you.

That is all I have, Mr. Chairman.

Mr. ORTIZ. Talking about the convoys, I think until we develop or come up with new technology, we are going to have to continue to do what we are doing now. When we move these convoys with fuel from point A to point B, and we are talking about contractors that they—we hire contractors, and I am assuming that some of them are foreign contractors.

Mr. SHAFFER. I do not know.

Mr. ORTIZ. If I was the owner of a company that owns these trucks, and I was going to be moving these convoys, this fuel, I think it would be in my best personal interest to have as few guards as I could so that I could make more profit. Is there a requirement as to how many guards you should have when you move those convoys or those trucks?

Mr. SHAFFER. Sir, I will have to take that for the record. I do not believe so, but I don't know that for a fact.

Mr. ORTIZ. Because I think someone mentioned—I think it was you, Mr. Shaffer, you mentioned about 135 truck drivers have been killed. I think this is very, very important, because if we are moving all this fuel and all this equipment, and we don't require them to have guards at least to protect them. If you could come back with us later on, you know, and let us know, because I am not too familiar with what the contractors do and how they do it, how they move all this stuff, this would help me a lot.

Mr. SHAFFER. Yes, sir.

[The information referred to can be found in the Appendix on page 71.]

Mr. ORTIZ. We are going to have votes in the next 20 to 30 minutes, so anybody else has any question at this moment?

If not, thank you so much. I think that this has been a very helpful hearing that we had today, and some of the inputs, some of the information that you gave us, and some of the witnesses asked very, very interesting questions.

Mr. Johnson has a question. Go ahead.

Mr. JOHNSON. Yes. I am sorry, Mr. Chairman. Thank you.

Does the Department of Defense have a recycling program in place?

Mr. SHAFFER. Yes, sir, I think we do. It is not in my area of expertise, so let me go ahead and get the specifics back to you because, I mean, you know, we have the bins everywhere. I look at it, but I don't know the specifics.

[The information referred to can be found in the Appendix on page 73.]

Mr. JOHNSON. Thank you.

And thank you, Mr. Chairman.

Mr. ORTIZ. Not hearing any other questions, this hearing stands adjourned.

Thank you so much.

[Whereupon, at 2:54 p.m., the subcommittee was adjourned.]

A P P E N D I X

MARCH 3, 2009

PREPARED STATEMENTS SUBMITTED FOR THE RECORD

MARCH 3, 2009

CHAIRMAN ORTIZ OPENING STATEMENT,
OPERATIONAL ENERGY HEARING,
READINESS SUBCOMMITTEE, MARCH 3, 2009

This hearing will come to order.

I thank our distinguished witnesses for appearing before this subcommittee today to discuss energy use and management for military operations.

This hearing builds upon themes addressed in a hearing this subcommittee held last year when we considered Department of Defense energy use in the context of recommendations made by the Defense Science Board Energy Strategy Task Force and the Government Accountability Office.

That hearing encompassed all of the Department's energy use, including the energy needed for military installations and the energy needed to train for and execute military operations.

Today's hearing provides an opportunity to focus on management of the energy needed for military operations and ways to reduce fuel demand at forward deployed locations.

In the near future this subcommittee will also have another opportunity to focus on installation energy policies and initiatives. These also remain of interest.

Management of operational energy is an important topic today because we have learned through experience that delivering fuel to the battlefield imposes a heavy logistical burden.

In fact, fuel logistics represent up to 70 percent of the materiel the Army ships into battle according to a Defense Science Board report. Forces responsible for providing protection to fuel convoys are put at risk and are diverted from other missions.

Although installations have worked for three decades to improve their energy efficiency, weapons platforms and tactical equipment historically have been given a free pass.

But reducing operational fuel demand can enhance the operational effectiveness of our forces and save taxpayer dollars.

Both the Department of Defense and Congress have begun to take steps to address operational energy demands.

The 2009 defense authorization act implements findings of the Defense Science Board and GAO by establishing a high-level organizational framework for management of the energy needed for military operations.

While a nominee has yet to be named, I look forward to working with the Director of Operational Energy in the future.

The 2009 defense authorization act also puts into law a Department of Defense initiative to consider fuel logistics support requirements in planning, requirements development, and acquisition processes. The defense bill sets a timeline for implementation of this effort by October 2011.

The Department of Defense is actively developing collaborative strategies and innovative technologies to enhance the energy efficiency of weapons platforms and provide energy solutions for forward-deployed forces. I look forward to hearing more about these efforts today.

I also look forward to hearing about the findings and recommendations of the GAO who, through their work, shed additional light on fuel demand by forward-deployed forces.

The Chair now recognizes the distinguished gentleman from Virginia, Mr. Forbes, for any remarks he would like to make.

(Mr. Forbes remarks)

Today, we have two distinguished witnesses representing the Department of Defense and the Government Accountability Office. We have:

Mr. Alan Shaffer
Acting Director, Defense Research and Engineering, United States Department of Defense

and

Mr. William M. Solis
Director of Defense Capabilities and Management
United States Government Accountability Office

Without objection, the witnesses' prepared testimony will be accepted for the record.

Mr. Shaffer, welcome, and you may proceed with your opening remarks.

(Mr. Shaffer remarks)

Mr. Solis, you also may proceed with any opening remarks you may have.

(Mr. Solis remarks)

Statement of the Congressman Forbes
Ranking member, Subcommittee on Readiness

Hearing on DOD's Fuel Demand Management at Forward-Deployed Locations and Operational Energy
March 3, 2009

Mr. Chairman, thank you for holding today's hearing on DOD's Fuel Demand Management at Forward-Deployed Locations. If I recall correctly, we met almost one year ago today to talk about DOD's energy posture and the findings from the Defense Science Board study on DOD's Energy Strategy. At that time, I commented that the findings and recommendations in the report were important and timely and I also stated that we cannot afford to have, what I believe are very salient and very plausible recommendations, be put on a shelf and forgotten.

So as we meet today, I'm very interested to learn what steps have been taken in the last year to improve DOD's energy posture.

Mr. Solis, once again we welcome you to the committee. I applaud you and your team for their efforts on the report on DOD's fuel demand management at deployed locations. This is just one subset of the broader energy demand picture, but I believe it is an important one. If we can reduce energy demand at our forward operating locations we reduce the convoys on the roads. We reduce our operational risk and we improve mission effectiveness.

Nothing drives this point home more than the recent move by Kyrgyzstan to preclude our use of Manas Air Base. Although I understand that we aren't reliant on Manas for fuel supplies, it does drive home the point that our supply lines are vulnerable in many ways and anything we can do to reduce the demand, also reduces that vulnerability.

Fuel is an enormous part of supply requirements for our troops and I found many of the figures in your report startling. You state that Army generators alone can consume 357 million gallons fuel annually during wartime. I believe a normal fuel truck holds about 9,000 gallons of fuel. If that's the case, it takes almost 40,000 tanker trucks just to provide fuel for the Army's generators. Imagine the impact if we can reduce the fuel consumption of those generators by just 10%? That's a reduction of 4000 trucks --- 4000 trucks that aren't on the road, 4000 trucks that don't have to be secured, and 4000 truck drivers that aren't at risk of being attacked.

I truly believe that fuel demand management at deployed locations is one area where we can make some very minor improvements and reap enormous benefits. Mr. Shaffer, thank you for taking the time to join us today. I look forward to hearing your testimony and am very interested to learn about what is being done to reduce the Department's operational energy requirements. I'm also interested in your recommendations on where we should be making investments in technologies to increase energy efficiency and at our forward deployed locations. Thank you, Mr. Chairman

HOLD UNTIL RELEASED
BY THE COMMITTEE

ALAN R. SHAFFER
PRINCIPAL DEPUTY DIRECTOR
DEFENSE RESEARCH AND ENGINEERING

BEFORE THE SUBCOMMITTEE ON
READINESS
OF THE HOUSE ARMED SERVICES COMMITTEE

March 3, 2009

Introduction

Chairman Ortiz, Ranking Member Forbes, members of the Committee, thank you for the opportunity to discuss the progress the Department of Defense has made in energy security for our Soldiers, Sailors, Airmen, Marines, and civilians, as well as the nation. It is important at the outset to frame energy security in a broad context. To be sure, the cost of energy affects the overall budget of the Department; in FY 2007, the Department spent about $13 billion on energy related programs, which is up from $10.9 billion in FY 2005. But energy security entails more than just the cost of fuel. Despite the seemingly low current oil prices, energy remains important to our warfighters because of a number of other dimensions. Energy affects program costs of weapons systems we buy and maintain; the logistics of energy resupply affects force security. Energy use affects our ability to maneuver. Lowered energy use lets us contribute positively to protection of the climate. And finally, lowered energy use contributes to security of supply and reduced reliance on potentially unreliable suppliers. All totaled, energy affects most aspects of the Department of Defense.

Warfighters recognize that the availability of energy impacts their ability to operate and are considering ways to operate more efficiently and plan for supply disruptions, highlighted by a urgent operational requirement. In the summer of 2006, then Major General Rick Zilmer, commander of the deployed Marine forces in Al-Anbar Province Iraq, issued a Joint Urgent Operational Need (JUON) statement that said

"reducing the military's dependence on fuel for power generation could reduce the number of road-bound convoys....Without this solution [renewable energy systems], personnel loss rates are likely to continue at their current rate. Continued casualty accumulation exhibits potential to jeopardize mission success...". In response to that JUONs, the Army Rapid Equipping Force (REF) established the Power Security Task Force to determine what could be done to address this need. One thing the Power Surety Task Force found was that there were few "turn key" ready capabilities applicable to the harsh operating conditions at a forward operating base. This realization led to nearly tripling the DoD investment in new and emergent technologies and systems that could address the need in the future. However, the Department has maintained the overriding principal of not subjecting forces to greater risk by prematurely deploying technologies that have not been proven in field testing.

U.S. deployed forces are at risk from attacks on supply lines carrying fuel. A longer supply chain requires more fuel and increases contested lines of communications, resulting in greater risk. The force structure needed to move and protect fuel imposes different important burdens on the Department: operational, cost and force structure.

A recent GAO study entitled "DoD needs to increase attention on fuel demand management at forward deployed locations" recommended the DoD establish an effective approach to managing fuel demand at forward deployed locations by developing fuel demand management requirements, designating the new Director of Operational Energy as the lead proponent of fuel demand management at forward locations, and addressing demand management shortcomings in the DoD energy strategy. These are reasonable recommendations, and in fact, are recommendations the Department was already working

on implementing before the report was published. Through the activities of the Department's Energy Security Task Force, the Department of Defense is addressing both fuel and energy demand at forward deployed locations.

This testimony today focuses on steps the Department has made over the past several years to find effective solutions to energy issues. In the past two years, the Department has established and operated a Defense Energy Security Task Force, of which I have had the honor to serve as Executive Director. The Task Force has coordinated the growing energy programs and raised awareness of energy issues across the DoD. Additionally, each Military Department has established an Energy Security focal office. In total, the Department's investment in Energy Security and energy related projects has grown from requests of $440 million in FY 2006 to $1.3 billion in FY 2009, not including funding in the recently passed American Recovery and Reinvestment Act which provided $300 million to the Department for energy-related research and development. Embedded in this investment are a number of projects specifically focused on either reducing energy demands or increasing energy supply to operational forces, as well as in garrison.

We have developed an Energy Security Strategic Plan, with four overarching goals approved by the Deputy Secretary of Defense. Finally, we have embarked on a number of projects to improve our forward deployed energy posture. Energy security will not be attained by a "silver bullet", but rather, by a long, focused campaign. Before going into specifics of our recent projects, we should examine energy security from an operational perspective.

Energy From an Operational Perspective

Over 70 percent of the convoys in Iraq and Afghanistan are for transporting fuel and water[1]. The DoD operational burden eases when fewer fuel convoys, oilers and other fuel delivery assets are needed to support operations or are put in harm's way. Convoys are favored targets of insurgent forces, and attacks have the potential to produce significant casualties and materiel losses – as well as disrupt future operations. Our approach for supplying energy to our combat forces has been to commit significant combat power to protect the assets and personnel to move fuel and water. The result is increased fuel consumption and increased presence on potentially hostile roads. In Afghanistan, the long distances and challenging terrain makes resupply operations even more complex, especially in the winter months where resupply can take up to 45 days from source of supply to the end user[2].

Decreasing fuel demand reduces the size and frequency of convoys, reduces vulnerability and enables combat forces to perform other duties. Moreover, when operational systems require less fuel, their endurance improves. Systems that can produce their needed effects using less fuel, increases their range, reach and persistence, a vital capability when operating against non-state or other asymmetrical actors.

Reducing energy consumption at forward locations should reduce vulnerable supply lines, thereby putting fewer Soldiers, Sailors, Airmen and Marines in harm's way. We have several efforts to reduce forward deployed energy demands or increase the ability to generate power locally. In addition, we have begun significant research

[1] Source: Defense Science Board report on DoD Energy Strategy - "More Fight, Less Fuel" February 2008.
[2] Source: LTC Kurt Weinand, former Army Petroleum, Oil and Lubricants (POL) Officer for CENTCOM.

programs to increase fuel efficiency of ground, air and sea platforms. Of interest, not all energy solutions are "high technology". One of our more effective actions to date has been to insulate deployed facilities using spray foam, which yields energy use reductions of 40 to 75 percent compared to non-insulated tents.

Reducing Demand

The DoD has initiated a broad range of demonstrations and other projects to increase energy efficiency and develop assured alternatives. Among these are a number of projects to reduce energy demand—or manage energy demand, at forward locations.

Technology Demonstrations At Forward Locations

One of the greatest consumers of fuel in Iraq and Afghanistan is generators, used to power critical equipment and cool tents. The Army's Rapid Equipping Force (REF) demonstrated a technique for insulating temporary structures in Iraq, Afghanistan, Djibouti and at the National Training Center in California. The insulation resulted in fewer generators required, and the reduced temperature and noise enabled better sleeping conditions. Energy savings of 40 to 75 percent led Multi-National Force Iraq to award a $95 million contract to insulate nine million square feet of temporary structures. The additional insulation was estimated to save between 77, 000 to 180,000 gallons of fuel per day, equivalent to roughly 13 to 26 truckloads of fuel, with associated cost savings (including the military logistics and force protection saved from the demand reduction). The Army has subsequently awarded a similar contract in Afghanistan.

In an effort to demonstrate the operational efficacy of demand reduction coupled with alternative and renewable power, the Army's Rapid Equipping Force (REF), the

Power Surety Task Force and the National Training Center, at Fort Irwin, California, installed energy efficient structures (domes, foam insulation, renewable power generator, efficient heating, ventilating, and air conditioning systems) in the training area. These structures allow us to experiment with various energy-related projects and can demonstrate to ground commanders how a holistic approach can provide an estimated energy savings of about 60 percent over current systems. This proof of concept effort was completed in just over 90 days and was the forerunner of the Net-Zero Plus Joint Concept Technology Demonstration (JCTD) sponsored by the U.S. Central Command to make forward operating bases as energy independent as possible from power generation.

The Net-Zero JCTD will prototype, measure and assess a variety of technologies that could, collectively, use less energy than they create (using both demand reduction and renewable technologies) and determine which, if any, should be recommended for inclusion in sustainable design efforts in DoD installations and tactical bases. By reducing demand, providing efficient distribution, and using alternative energy sources, the FOB should be able to minimize fuel consumption, and ultimately save lives through the reduction in the number of fuel convoys required. The emphasis is on replacing temporary living, office, and operational facilities with enduring energy efficient structures and integrating renewable energy technologies with improved energy generation to power those structures. This Net-Zero JCTD has a 3-year plan, but promising technologies could be spun out as early as this year.

Other Technology Demonstrations

The Army's Tank and Automotive Research and Development Center (TARDEC) in Warren, Michigan is leading a ground vehicle Fuel Efficient Demonstrator (FED).

The FED is testing the feasibility and affordability of achieving significant decreases in fuel consumption (30 to 40 percent) in a tactical vehicle, without sacrificing the performance or capability. This program is integrating potentially high-payoff fuel efficient technologies, like efficient propulsion and drivelines, and advanced lightweight materials in new and innovative designs. Successful technologies may be incorporated in future procurements for the Joint Light Tactical Vehicle (JLTV), the next generation HMMVW. The FED program is employing a concurrent parallel strategy combining a traditional systems integration approach with a "monster garage" approach. The monster garage includes engineers from industry, academia and government, examining over 100 technologies for inclusion on six concept vehicles. Modeling and simulation is ongoing for both approaches. This program is also benefiting the science and engineering workforce by providing hands-on experience across a broad range of technical areas. Government engineers from across DoD are working side-by-side with the contractors in one year developmental assignments, building skills in vehicle design, systems engineering, vehicle integration, modeling and simulation, testing, and project management. Of note today, we have asked the program manager of the FED to determine if there are other viable designs that could be evaluated using some of the research and development recovery funding.

The Navy is leading an effort to evaluate material coatings on maritime propellers which have the potential to maintain clean blade surfaces for sustainable powering and cavitation performance. Current propellers are susceptible to fouling that increases blade drag, resulting in higher power requirements and earlier onset of cavitation. Improved coatings not only offer reduced cleaning requirements and greater resistance to cavitation

erosion damage, but also the potential to increase energy efficiency by three to five percent. Initial testing is scheduled to be completed by August 2009.

Because of the preliminary success of this project, we have also funded a project to apply these same coatings to the internal combustion engine and drive train of ground vehicles. The preliminary laboratory tests were positive, resulting in a 25 percent decrease in fuel use and 25 percent increase in torque and horsepower of a vehicle tested on a dynamometer. We have initiated steps to extend these tests to extended range field trials. This again highlights the need to test technology solutions to ensure there are no unintended consequences.

The Air Force is developing technologies to increase jet engine efficiency. The Highly Efficient Embedded Turbine Engine (HEETE) initiative, part of the Versatile Affordable Advanced Turbine Engine (VAATE) program, is developing high-pressure ratio, high temperature core turbine technology, with the potential to reduce specific fuel consumption up to 25 percent over today's turbine engines. Such a reduction, if it works, could reduce energy demands for forward locations. HEETE is addressing the highest technical risk element in new engine development – the high pressure compressor component development. The current schedule includes a rig test in FY 2010, demonstrating a technology readiness level of four or five in a laboratory or relevant environment. These technologies are applicable to all turbine engines and could be used in commercial aircraft.

Not all promising savings come from platforms. Sometimes, energy demand for forward locations could be reduced by the type of lighting used. The Pentagon Renovations office is testing light emitting diode (LED) light fixtures in the final wedge

of the renovation, in place of the fluorescent and other lights used in the previous renovated wedges. The effort involves 4,200 light fixtures, each of which uses approximately 20 watts less energy, yielding a total potential energy savings of 376,000 kilowatt hours per year for all of the lights – one-fifth of the Pentagon. The fixtures are expected to last about 11.5 years and have a four year payback, resulting in a net savings of about $6 million over the life of the fixtures. If these systems work as expected, these LED fixtures could become a staple of FOBs of the future.

Assuring Sources

In addition to reducing energy demand, the DoD also needs assured supplies of energy, to include having fuel and other energy sources available and able to get to where they are needed, with reduced energy requirements, to ensure mission sustainability. We are shifting reliance toward alternative and renewable sources of energy, thereby reducing our dependence on non-assured sources of oil. For example, in December 2007, the Air Force commissioned the largest photovoltaic solar array in the Americas – and second largest worldwide (14.2 megawatts) at Nellis Air Force Base. This supports about one fourth of the base's energy usage per day and has an estimated annual cost savings of $1 million. As solar cells become more affordable and reliable, they could be used in a forward deployed package to reduce forward deployed demand.

Renewable and other assured energy sources are important to our ability to sustain missions from our bases, since we are almost entirely dependent on the commercial grid for power. Military installations have appropriate diesel standby power generation for mission critical loads to sustain operations for the short term. However, the Defense

Science Board's (DSB) energy report identified the potential for extended outages that would tax our ability to meet mission needs and are beyond the capability of the standby generators. Renewables can be part of the solution to distributed power generation. As noted by the DSB, the commercial grid is becoming increasingly fragile and susceptible to physical attack by saboteurs or outages from natural events like the 2003 incident in Ohio where a tree branch disrupted power to 9,300 square miles in the Northeast US and Canada.

To mitigate the power reliability problem, we are reducing our electrical demand and improving the security of energy supplied. We have established an internal working group to assess the vulnerability of the distribution system and prioritize solutions.

We are also co-chairing, along with the Department of Homeland Security and the Department of Energy, a Task Force on Electric Grid Vulnerability. The Task Force is chartered by the Office of Science and Technology Policy to examine "gaps and seams" in federal efforts to mitigate grid vulnerability issues. Additionally, the Task Force is examining both physical and cyber security shortfalls. The Task Force, whose membership includes the Federal Energy Regulatory Commission, has received briefings from universities, Edison Electric Institute, Department of Energy National Laboratories, and Homeland Security. Beginning in March, the Task Force will focus on bulk power operators and local distribution companies and expects to have a draft report in July.

DoD also is exploring the use of renewable energy at forward locations through testing of generators that can be powered by solar or wind energy. The Hybrid Intelligent Power generator (HI-Power) is demonstrating intelligent power management and the integration of renewable energy technologies to reduce fuel and energy consumption in

tactical and operational environments. The HI-Power architecture is a paradigm shift from stove-piped power generation to integrated power management. The architecture could provide a modular power grid and intelligent control capability, seamlessly integrating current and future renewable energy sources. Modeling showed a potential 25 to 40 percent reduction in fuel consumption and lower operations and support costs. The HI-Power is a six-year development program, and is linked in with the Net-Zero Plus JCTD.

The Army, along with the other Services, is actively pursuing waste-to-energy and fuel for FOBs, as well as installations. The military has been working with the Defense Advanced Research Projects Agency (DARPA) as well as private industry to identify several promising technologies and methods to achieving waste-to-energy. While battlefield waste (e.g. food, packaging, and wood) may be a viable source of energy and may offset some fuel consumption, it may not provide dramatic reductions of fuel consumption. However, it does provide some improvement with other benefits from waste reduction, like reducing military security escorts for trash removal, keeping our Soldiers out of harm's way, and improved environmental conditions. Several concepts have been tested. For example, the Tactical Garbage to Energy Refinery (TGER) deployed two early prototype systems to Iraq from May to Aug 2008, using a dual bio-reactor and gasifier. These prototype systems validated the concept, but there are a number of challenges for use in non-installation applications, such as unpredictable waste streams (in amount and composition); system efficiency, reliability, ease of operation; and size, weight, and transportability.

In February 2009, the Army conducted a two-day workshop to evaluate the readiness of various waste-to-energy technologies for operational applications. The general consensus was that while these technologies offer potential for both providing power and reducing base camp waste management problems, they are too immature for near-term operational/field applications, and the requirements must be better defined. A significant additional investment will be required to make mobile systems practical. However, commercially proven stationary facilities have great potential to produce continuous megawatts of energy on our installations, using both the installation's own waste stream as well as waste streams from the surrounding communities.

In the past few months, DARPA has also initiated a major project to develop and test various feed stocks for synthetic jet fuel that would have the same energy density as current petroleum-based fuels. DARPA initiated $100 million program to further development of affordable algae-based synthetic fuels (synfuels), with the goal of driving the cost to $2 per gallon in 18 months. In December 2008, DARPA awarded two contracts – $19.9M to General Atomics and $14.9M to SAIC. DARPA also recently issued a broad area announcement for coal-to-liquid fuels that are environmentally friendly and cost competitive with petroleum-based fuels. This project could provide strategic resilience through reduction in the need for local oil.

In addition, several efforts are underway by the Services to test and certify synthetic fuels on aircraft, ground vehicles, and support equipment. The Air Force is certifying its aircraft, applicable vehicles and support equipment, and associated storage and distribution infrastructure for unrestricted operational use of a 50/50 synthetic fuel blend by early 2011. To date, the B-52, C-17 and B-1B have been certified for

unrestricted operations using the synthetic fuel blend. The certification effort is on track to meet the 2011 goal. In addition to the synthetic fuel blend certification, in January, the Air Force initiated a biomass-derived aviation fuel certification program.

The Army and Navy are developing and demonstrating compact and mobile 10 kilowatt high temperature fuel cells to power critical equipment, including GPS, radio and communications equipment, computers, intelligence, surveillance and reconnaissance gear, and laser designators. These systems provide silent, portable power and eliminate dependence on large generator or grid power for battery charging. These fuel cells are demonstrating a high efficiency (about 55 percent) and are being designed to use jet fuel. They provide low weight for the available energy content to the warfighter carrying them. Additionally, they could provide auxiliary power for applications on vehicles for missions over 24 hours.

Improving Processes

DoD has made progress in integrating energy considerations into business processes – requirements development, acquisition, and budgeting – and we are focused on describing energy options by their return on investment, both financially and in terms of operational capability. For instance, in November 2008, the DoD acquisition directive (5000.2) directed energy costs be included in calculations for total ownership costs, to include the fully burdened cost of fuel – the cost to deliver fuel the last "tactical mile". The Office of the Under Secretary for Acquisition, Technology and Logistics (OUSD(AT&L)) also is finalizing guidance on the methodology and requirements new acquisition programs should follow to calculate, report and glean insights from the fully

burdened cost of fuel. In some cases, fuel delivery adds a large dollar and operational cost that has not been considered in the past when making program design and acquisition decisions.

OUSD(AT&L) and the Joint Staff will soon embark on developing a methodology for implementing the Energy Efficiency key performance parameter (KPP), established in 2007. The study will help inform us of when to apply this energy-related KPP, and how to determine what the metrics should be for a given platform or system type.

The Joint Staff is leading a study to assess current simulator usage, develop a cost model for the business case supporting greater simulator use, and determine the feasibility of substituting additional simulator time for live training without decreasing operational capability. Preliminary studies have indicated that the increased use of simulators could potentially yield savings of over $1 billion, resulting from reduced fuel costs, maintenance, and platform "wear & tear". A final report is due in June 2009.

The OUSD(AT&L), the Army, and the Marine Corps are in the very early discussions about how best to set energy "productivity" metrics for the Joint Light Tactical Vehicle program. We expect this to be addressed in the program's study plan prior to the next milestone decision, currently scheduled for 2011. For ground systems, miles per gallon may be a misleading metric because, even in combat situations, vehicle duty cycles include significant idling and the running of electronics gear (communications, sensors, etc.) that draws power and hence, burns fuel. Additionally, new systems may include the requirement to export power. So we're looking at metrics like "gallons per day at various electricity output levels". We're also examining how to

move towards a force that needs less fuel logistics support to be combat effective. So including fuel "tail" demand reductions in our metrics is something we're examining. The bottom line is that this line of thinking on energy demand in our combat forces is new, and not simple to implement. Thinking about energy security in this way represents a culture shift, much as the GAO recommended. Hence, we are being careful to pursue changes that will realistically represent energy impacts, but that will not lead us to making decisions that will reduce operational effectiveness just to save a few gallons of fuel. We are pursuing metrics that will help deliver a force that is more capable and that reduces our fuel demand in theater. These can and should be complementary.

DoD Energy Security Progress

In 2006, the Secretary of Defense established the DoD Energy Security Task Force to make recommendations on increasing energy efficiency, reduce dependence on foreign oil, and integrate energy efforts across the Department. The Task Force included senior leaders in the Office of the Secretary of Defense, the Services and the DARPA from all functional areas with a stake in energy – installations and environment, logistics, technology, acquisition, policy, comptroller and the joint staff. Taking a holistic, systems approach, the Task Force explored energy options across the spectrum of supply, demand and assured distribution to ensure the enterprise understands the interdependencies of energy-related decisions.

DoD is making progress in energy security. Since 2006, we have more than doubled our energy investment, and overall energy consumption is down six percent

since FY 2005. Installations energy demand is down 10 percent since FY 2003, and 12 percent of our electricity comes from renewable sources, well above the federal average.

Through the Energy Security Task Force, DoD has developed the DoD Energy Security Strategic Plan, providing a framework for energy management across the enterprise, with four Deputy Secretary-approved strategic outcomes:

1. Maintain or enhance operational effectiveness by reducing total force energy demands → *REDUCE DEMAND.*

2. Increase energy strategic resilience by developing alternative/assured fuels and energy → *ASSURE SOURCES.*

3. Enhance operational and business effectiveness by institutionalizing energy solutions in DoD planning and business processes → *IMPROVE PROCESSES.*

4. Establish and monitor Department-wide energy metrics → *IMPROVE PROCESSES.*

The main objectives of the Energy Security Strategic Plan has been approved by the Deputy Secretary of Defense, and the formal plan is awaiting signature and will be released shortly. The Services also have established strategic plans and organizational structures to coordinate energy efforts.

Summary

DoD has proactively responded to the energy challenge. The Department, under the coordination of the Energy Security Task Force, improved DoD's energy posture through increased collaboration, resulting in an overall decrease in energy consumption DoD-wide. We have initiated numerous demonstrations and other projects to reduce consumption and increase assured alternatives for installations, both fixed and tactical,

and weapons systems, with anticipated savings from five to 25 percent. Technologies that make good business sense, both financially and operationally, are being implemented on a wider scale. These efforts will improve the Department's energy posture by reducing costs and enabling sustained, uninterrupted operations while putting fewer service members in harm's way. As indicated in the recent GAO report, there is much work still to be done, but DoD is on the right path to addressing their recommendations.

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Testimony

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DEFENSE MANAGEMENT

Increased Attention on Fuel Demand Management at DOD's Forward-Deployed Locations Could Reduce Operational Risks and Costs

Statement of William M. Solis, Director
Defense Capabilities and Management

Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to discuss the Department of Defense's (DOD) efforts to reduce fuel demand at its forward-deployed locations, particularly those that are not connected to local power grids. In 2008, more than 68 million gallons of fuel, on average, were supplied by DOD each month to support U.S. military forces in Iraq and Afghanistan. Transporting large quantities of fuel to forward-deployed locations presents an enormous logistics burden and risk. Long truck convoys moving fuel to forward-deployed locations have encountered enemy attacks, severe weather, traffic accidents, and pilferage. For example, DOD reported that in June 2008 alone, 44 trucks and 220,000 gallons of fuel were lost due to attacks or other events while delivering fuel to Bagram Air Field in Afghanistan. High fuel demand, coupled with the recent volatility of fuel prices, also have significant implications for DOD's operating costs. The fully burdened cost of fuel—that is, the total ownership cost of buying, moving, and protecting fuel in systems during combat—has been reported to be many times higher than the price of a gallon of fuel itself. While DOD's weapon systems require large amounts of fuel, the department reports that the single largest battlefield fuel consumer is generators, which provide power for base support activities such as air conditioning/heating, lighting, refrigeration, and communications. A 2008 Defense Science Board Task Force report noted that Army generators consume about 26 million gallons of fuel annually during peacetime but 357 million gallons annually during wartime.[1]

Today, we are publicly releasing a report that addresses DOD's (1) efforts to reduce fuel demand at forward-deployed locations and (2) approach to managing fuel demand at these locations.[2] My statement will highlight the key findings and recommendations of our report. Our review focused on locations that were in Central Command's area of responsibility. As part of this work, we analyzed DOD documents, interviewed agency officials, and visited two forward-deployed locations—Camp Arifjan, Kuwait, and Camp Lemonier, Djibouti—to gain a firsthand understanding of fuel demand

[1]Defense Science Board Task Force on DOD Energy Strategy, *More Fight—Less Fuel* (February 2008).

[2]GAO, *Defense Management: DOD Needs to Increase Attention on Fuel Demand Management at Forward-Deployed Locations*, GAO-09-300 (Washington, D.C.: Feb. 20, 2009).

reduction efforts and challenges facing these locations.[3] We conducted our review from March 2008 through February 2009 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

This is the third in a series of studies that you have requested examining DOD's energy use for military operations. In March 2008, we issued a report and I testified before this Subcommittee on the need for DOD to establish an overarching organizational framework to guide and oversee energy reduction efforts for military operations.[4] In addition, we are currently conducting work at your request on renewable energy at U.S. military installations.

DOD Has Initiated Efforts to Reduce Fuel Demand at Forward-Deployed Locations but Lacks an Effective Approach to Managing Demand

DOD has efforts under way or planned to reduce fuel demand, but the department lacks an effective approach to enable widespread implementation and sustained attention to fuel demand issues at forward-deployed locations. Many of DOD's efforts to reduce fuel demand at forward-deployed locations are in a research and development phase, and the extent to which they will be fielded and under what time frame is uncertain. Notable efforts by DOD components include the application of foam insulation to tent structures, the development of more fuel-efficient generators and environmental control units, and research on alternative and renewable energy sources for potential use at forward-deployed locations. In addition, during our visits to Kuwait and Djibouti, we found local camp efforts aimed at reducing fuel demand. The following

[3]At the time of our visit in June 2008, both camps were under Central Command's area of responsibility. On October 1, 2008, DOD transferred Camp Lemonier under its newly established Africa Command.

[4]GAO, *Defense Management: Overarching Organizational Framework Needed to Guide and Oversee Energy Reduction Efforts for Military Operations*, GAO-08-426 (Washington, D.C.: Mar. 13, 2008) and *Defense Management: Overarching Organizational Framework Could Improve DOD's Management of Energy Reduction Efforts for Military Operations*, GAO-08-523T (Washington, D.C.: Mar. 13, 2008).

summarizes some of DOD's initiatives. Additional initiatives are highlighted in the report that we publicly released today.[5]

- **Foam insulation for military tents**. DOD is applying foam insulation on tents at some forward-deployed locations to reduce the amount of fuel required by generators to provide power to these structures. Demonstrations by DOD's Power Surety Task Force showed that the application of foam insulation reduced dust, heat, cold, noise, and air conditioning requirements. According to task force officials, based on the results of a recent demonstration, DOD decided to pursue a large-scale effort to apply the foam insulation to temporary structures, such as military tents, in Iraq to reduce the number of generators needed to power the structures. According to a Central Command official, the tent-foaming initiative could reduce energy consumption by approximately 50 percent, potentially reducing the number of convoys needed to supply fuel to locations in Iraq, although metrics had not yet been established to systemically measure efficiency. A senior Army official told us that DOD also has plans to apply foam insulation to tents in Afghanistan.

- **Fuel-efficient generators and environmental control units**. The Project Manager-Mobile Electric Power office, a DOD joint program organization, is developing a next generation of generators, called the Advanced Medium Mobile Power Sources, which employ advanced technologies to achieve greater fuel efficiency and other improvements over current military generators. The office plans to begin procurement of these generators in 2010. In addition, it intends to replace its current environmental control units with improved environmental control units to provide cooling, heating, and dehumidifying for servicemembers and material systems. The improved units, one version of which is currently in low-rate production, are expected to reduce energy consumption by up to 25 percent over current units.

- **Renewable and alternative energy technology initiatives**. Several military services are exploring the use of alternative and renewable energy technologies to generate power at forward-deployed locations and reduce petroleum-based fuel demand. For example, the Air Force Research Laboratory has created the Renewable Energy Tent City—a collection of various deployable shelters powered by solar and fuel cell generators. The Marine Corps Systems Command is developing the Deployable Renewable Energy Alternative Module—a module towed by vehicle that would

[5]GAO-09-300, pp. 12-19.

employ solar, wind turbine, battery, and generator technologies to temporarily power radios or computers until fuel can be resupplied to forward-deployed locations. In addition, the Army Research Laboratory is working with universities and private sector firms to develop a processor that converts tires into energy and recyclable products for potential use at forward-deployed locations.

- **Initiatives at individual locations.** During our visits to forward-deployed locations in Kuwait and Djibouti, we found some local efforts by camp officials to reduce fuel demand. In Kuwait, for example, an official at Camp Arifjan shared plans to consolidate loads on small generators by creating groupings—networks—of multiple generators, which could improve overall efficiency and reduce the number of generators that operate at most times of the year. In Djibouti, officials at Camp Lemonier were able to remove two of the five air conditioning units used to cool the camp's gymnasium after the application of foam insulation to the tent exterior of the facility, resulting in an estimated fuel savings of 40 percent and an indoor temperature reduction from 95-100 degrees to about 72 degrees Fahrenheit.

  While these efforts show potential for achieving greater fuel efficiency, DOD lacks an effective approach to fuel demand management at forward-deployed locations. DOD has stated that it needs to reduce its dependence on petroleum-based fuel and the logistics footprint of its military forces, as well as reduce operating costs associated with high fuel usage. However, DOD faces difficulty in achieving these goals because managing fuel demand at forward-deployed locations has not been a departmental priority and its fuel reduction efforts have not been well coordinated or comprehensive. More specifically, we found that DOD lacked (1) guidance directing forward-deployed locations to address fuel demand, (2) incentives and a viable funding mechanism for locations to invest in fuel reduction initiatives, and (3) visibility and accountability within the chain of command for achieving fuel reduction. The following summarizes these key findings. Additional information is provided in our report.[6]

  1. **Lack of guidance.** DOD generally lacks guidance that directs forward-deployed locations to manage and reduce their fuel demand—at the department level, combatant command level, and military service level. While DOD is driven to address energy issues at its U.S. installations largely by federal mandates and DOD guidance, agency officials were

[6]GAO-09-300, pp. 19-34.

unable to identify similar guidance for forward-deployed locations, and they told us that fuel reduction has been a low priority compared with other mission requirements. Our analysis of combatant command and military service guidance related to forward-deployed location construction showed that the existing guidance is largely silent with respect to fuel demand management and energy efficiency. Similarly, we found a lack of attention to fuel demand as forward-deployed locations are sustained and products are procured for the locations. The Joint Staff has begun an effort to develop common living standards, referred to as "joint standards of life support" (e.g., square footage for living space per person, duration of showers), for military servicemembers at forward-deployed locations, which present an opportunity to make decisions that take into account fuel demand considerations. However, Joint Staff officials told us that fuel reduction has not been considered in this effort to date.

2. **Lack of incentives and viable funding mechanism.** DOD has not established incentives or a viable funding mechanism for fuel reduction projects at its forward-deployed locations, which discourages commanders from identifying fuel demand management as a priority. Officials at Camp Lemonier, for example, had identified several projects that would reduce the camp's fuel demand but told us they saw little "return on investment" for them to undertake such projects because they would not see the associated savings for use toward other camp improvements. Moreover, many of DOD's forward-deployed locations rely heavily on funding from supplemental appropriations related to the Global War on Terrorism, and delays in receiving this funding can present challenges in covering existing costs, making it difficult for commanders to fund more expensive fuel reduction projects. Funding mechanisms exist to promote energy reduction projects at permanent DOD installations, including an energy conservation program and energy-performance saving contracts with private sector firms. In addition, DOD encourages energy reduction efforts at U.S. installations through energy awareness programs and energy-efficiency awards; and the Navy has established an energy conservation program through which ships that use less than the Navy's established baseline amount of fuel receive the associated quarterly fuel savings toward the purchase of shipboard items. Without incentives and a viable funding mechanism, commanding officials at DOD's forward-deployed locations are unlikely to identify fuel reduction as a priority for making a significant investment of resources.

3. **Lack of visibility and accountability.** DOD's current organizational framework does not provide the department visibility for fuel demand issues at its forward-deployed locations. We found that information on fuel demand management strategies and reduction efforts is not shared among locations, military services, and across the department in a consistent manner. Moreover, DOD guidance does not designate any DOD office or official as being responsible for fuel demand management at forward-deployed locations, and we could not identify anyone who is specifically accountable for this function through our interviews with various DOD and military service offices. The Duncan Hunter National Defense Authorization Act for Fiscal Year 2009 requires DOD to establish a Director of Operational Energy Plans and Programs, an operational energy strategy for DOD, and military department-level operational energy officials.[7] DOD has not yet established a director or strategy for operational energy. In meeting the requirements, DOD has an opportunity to improve visibility and accountability for fuel demand management at forward-deployed locations.

GAO Recommends That DOD Take Actions to Improve Fuel Demand Management at Forward-Deployed Locations

We recognize that it may not be practical for DOD to decrease fuel usage at every forward-deployed location and that base commanders must place their highest priority on meeting mission requirements. However, DOD's high costs, operational vulnerabilities, and logistical burdens in sustaining forward-deployed locations that depend heavily on fuel-based generators underscore the importance for the department to give systematic consideration to incorporating fuel demand into construction, maintenance, procurement, and other policy decisions for forward-deployed locations. In the report that we publicly released today, we make several recommendations that would facilitate the widespread implementation of DOD's fuel reduction initiatives and sustained attention to fuel demand issues at its forward-deployed locations. In summary, we recommend that:

- the combatant commanders and the military services establish requirements and guidelines on fuel demand management at forward-deployed locations;

[7]The act defines operational energy as the energy required for training, moving, and sustaining military forces and weapons platforms for military operations; it includes energy used by tactical power systems, generators, and weapons platforms.

- the Joint Staff incorporate fuel demand considerations into its initiative to develop joint standards of life support at DOD's forward-deployed locations;
- DOD designate the new, congressionally-mandated director of operational energy as the department's lead proponent of fuel demand management at forward-deployed locations and that the director, in establishing a departmentwide operational energy strategy, address the shortcomings related to managing fuel demand at forward-deployed locations that I have highlighted in this statement; and
- the military departments' senior energy officials be assigned, among their other duties, responsibility for overseeing fuel demand management at forward-deployed locations within their respective services.

DOD generally concurred with all of our recommendations. However, in its response to our draft report, the department did not provide specific actions or time frames within which it would address the issues we raised.

Mr. Chairman and Members of the Subcommittee, this concludes my prepared statement. I would be happy to answer any questions that you may have at this time.

Contacts and Acknowledgments

For further information regarding this testimony, please contact William Solis at (202) 512-8365 or solisw@gao.gov. In addition, contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. Individuals who made key contributions to this testimony are Assistant Director Thomas Gosling and Alissa Czyz.

WITNESS RESPONSES TO QUESTIONS ASKED DURING THE HEARING

MARCH 3, 2009

RESPONSE TO QUESTION SUBMITTED BY MR. ORTIZ

Mr. SHAFFER. The combatant commander has the decision authority, in coordination with the Services, in securing lines of communication. The Services and the combatant command have developed guidelines and policies for the use of private security for convoys and they allow subordinate commanders, in coordination with national level providers, flexibility in meeting mission requirements.

The Defense Energy Support Center currently accomplishes all first destination delivery of fuel in the Central Command Area of Responsibility using contractors. Currently, no military escorts are provided in Afghanistan. Contractors provide varying degrees of convoy security based on their assessment of risk. In order to use armed private security companies, contractors must submit security plans and receive approval from Combined Joint Task Force 101 through the Defense Logistics Agency and Central Command in accordance with the current policy on the use of armed contractors. There is no set number of escorts for contractor provided security.

Military escorts are provided to convoys operating inside of Iraq and the number varies based on the overall insurgent threat. [See page 31.]

RESPONSES TO QUESTIONS SUBMITTED BY MR. TAYLOR

Mr. SHAFFER. On a base or in a region, minimizing the amount of fuel used without affecting operational capability is the responsibility of the Commander. The Department has improved training future commanders to include fuel in their decision-making process by recently incorporating energy considerations into wargames.

Within the DoD, we estimate that about 68 million gallons of fuel are used each month in Iraq and Afghanistan. You asked if we can quantify how the 26 million gallons of fuel consumed each month in generators is partitioned among functions such as providing hot water. Unfortunately, the short answer is that we don't have this capability. We find no factual data or capability to measure the amount of energy that is allocated to heating water, or for partition of fuel usage among the variety of functions for which generators are used. [See page 13.]

Mr. SHAFFER. The Department does measure overall consumption at forward-deployed locations, but does not currently have the capability to delineate energy use by function. We have confirmed with the Army Petroleum Center that there is no data available to confirm the percentage of energy used to heat water but to do so would take quite a bit of excess measurement equipment. We agree that it would be useful to have a finer breakdown of fuel usage at these locations. [See page 14.]

RESPONSES TO QUESTIONS SUBMITTED BY MS. GIFFORDS

Mr. SHAFFER. You wanted us to find out why we are not expanding the use of spray-foam in hot weather areas like Arizona. Spray-foam insulation is a proven way to reduce demand. It is safe (national, state and EPA certified), and has been used in the U.S. construction industry for decades. Expanding the use would require funds from one of several potential sources, depending upon the circumstances—operation and maintenance (O&M) or Energy Conservation Investment Program (ECIP). Each has some limitations. A request to produce and install spray-foam insulation with O&M funds would need to compete with other training and operations funding requirements. ECIP could work but the requirements for measure and validation and large documentation trail makes use of ECIP funds slow. These types of projects are not funded centrally, so greater use will take time. As we show clear savings potential, I anticipate greater use. [See page 20.]

Mr. SHAFFER. The feedback within in DoD concerning benefits of the Commander's Emergency Response Program (CERP) is consistent with last summer's findings of the GAO (GAO-08-736R Military Operations).

Multiple commanders told the GAO that they feel the Commander's Emergency Response Program is effective. However their opinions are anecdotal because there are no definitive performance indicators.

Some commanders informally tracked direct fire attack, indirect fire attack, and use of improvised explosive devices in the vicinity of CERP projects. Those that tracked these items felt attacks usually decreased. Again anecdotally, commanders reported a sense of greater cooperation from the nearby Iraqi people. Nonetheless there is no certainty that the positive changes in behavior of the local population, if real, were a direct consequence of the CERP projects. Nor that the behavior will be sustained.

We have helpful information about the dollars and information giving insight into CERP projects. The Iraq Reconstruction Management System tracks relief and reconstruction projects in Iraq. It reflects hundreds of CERP projects whose total cost is on the order of $3 billion. The most usual order of magnitude of the cost of individual projects ranges from $1 thousand to $10 million.

You asked about CERP project involving technology. Searching the IRMS for electricity projects reveals hundreds of projects, each with a title and geographic location. We have included the websites below:

GAO report: http://www.gao.gov/new.items/d08736r.pdf

The Iraq Reconstruction Management System (http://www.sigir.mil/reports/pdf/audits/08-021.pdf) is intended to track relief & reconstruction projects in Iraq. [See page 21.]

RESPONSE TO QUESTION SUBMITTED BY DR. FLEMING

Mr. SHAFFER. The original $95 million spray-foam contract in Iraq was written to spray-foam 9.5 million sq ft (base year) with two options for 2 million sq ft each. The Government terminated the contract for the convenience of the Government. Changing of Government priorities caused several delays and the colder, wetter weather was a further reason for the termination. Although the proper foam formulation can be sprayed in freezing weather, only a "summer formula" was shipped to Iraq. The Government wanted to wait until the colder, wetter weather was past to resume foaming operations. The Government has already sent the vendor intent to re-start foaming operations to consume the supplies that have been purchased and shipped. The exact start date is still to be determined. [See page 23.]

RESPONSES TO QUESTIONS SUBMITTED BY MR. JOHNSON

Mr. SHAFFER. TGER was an early proof-of-principle prototype, not a mature or deployable system. Consequently it was not surprising that there were many "bugs" identified in real-world testing. When the TGER worked, it worked well—considering it was not a fully optimized system. Unfortunately, for numerous reasons, there was more down-time than mission time. The TGER prototype deployment was a success when measured against the intended goals. However, there remain significant technological challenges to fielding a reliable, maintainable tactical garbage-to-energy system. In the end, we believe waste-to-energy offers potential for installations, FOBs, and tactical forces but additional work is required to ensure we are meeting true user needs, particularly for the tactical forces. [See page 24.]

Mr. SHAFFER. The two TGER units are not in operation at this time. They were deployed in Iraq from May to August 2008 for a 90-day evaluation. [See page 25.]

Mr. SHAFFER. The TGER deployment was a prototype contract. Determining cost effectiveness of the TGER prototype was not a major goal of the 2008 deployment; obtaining a solid cost estimate will require further maturation and testing. [See page 25.]

Mr. SHAFFER. The Department continuously investigates the economic viability of multiple renewable energy sources. Landfill gas (LFG), a form of renewable thermal energy, can be among the most cost effective, but project cost is directly proportional to the distance between the gas source and the point of consumption. The Energy Policy Act (EPAct) of 2005, section 203 defines "renewable energy" as "electric energy generated from solar, wind, biomass, landfill gas, ocean (including tidal, wave, current, and thermal), geothermal, municipal solid waste, or new hydroelectric generation capacity achieved from increased efficiency or additions of new capacity at an existing hydroelectric project." Under this definition, landfill gas that is not converted to electricity, does not count toward the Department's EPAct 2005 renewable energy goal, lessening the incentive to pursue such projects. The project economics of converting landfill gas to electricity are less often viable, but that is not always the case. There are a handful of such projects supporting DoD:

- Hill AFB, UT—2.3 MW electrical generation plant constructed through an Energy Savings Performance Contract (ESPC) in January 2005 using LFG from an offbase source.
- Fort Huachuca, AZ & Fort Knox, KY—commercially purchases electricity from landfill gas plants
- Fort Sill, OK—pursuing a 3-4 MW electrical generation plant through an ESPC.
- MCAS Miramar, CA—pursuing expansion of an existing plant that supplies electricity to San Diego Gas and Electric. The expansion would generate 3 MW directly for the installation.
- MCLB Albany, GA—pursuing 1.6 MW of electrical generation from an off-base landfill through an ESPC.
- Navy Region Hawaii—pursuing a privately owned 1.5 MW landfill gas project at the Pacific Missile Range Facility on Kauai.

Finally, the opportunity to do projects on military installations using LFG produced by on-base sources is limited as we primarily rely on off-base municipal landfills for waste disposal and our older military owned landfills do not generally produce adequate methane. However, the Department is pursuing RDT&E projects aimed at utilizing waste streams at forward operating locations. As some of the projects develop, there is a distinct possibility of adapting them to fixed installations as well. [See page 26.]

Mr. SHAFFER. The Department of Defense has a long history of recycling. In 1972, the Defense Property Disposal Service (DPDS) was established to centralize surplus property disposal and Defense Property Disposal Offices (DPDO) were located worldwide on or near a military installation. Then in 1976, DoD issued solid waste management procedures governing the sales of recyclable materials. Seven years later, DPDS initiated their Resource Recovery and Recycling Program which allowed installations around the world to participate in a disposal and recycling program where they would receive proceeds from the sale of recyclable materials they generated. These regional facilities are now called the Defense Reutilization and Marketing Offices.

The DoD's recycling program further developed under DoD Instruction 4715.4, "Pollution Prevention," June 18, 1996. This DoD Instruction requires DoD Components establish procedures for a cost-effective waste reduction and recycling program. Several Executive Orders through the years have reinforced our commitment to maximize our recycling opportunities. They were combined into Executive Order 13423 (2007) which encourages all Federal agencies to increase diversion of solid waste and maintain cost-effective recycling programs. In 1992, DoD recycled 0.5 million tons of waste material. In 2008, the DoD Components recycled over 4.3 million tons which is a 65% recycling rate of the solid waste generated. This surpasses the Environmental Protection Agency's national recycling goal of 35%.

We also issued an integrated solid waste management policy in 2008. Under this policy, installation solid waste and recycling managers must make every effort to maximize non-hazardous solid waste diversion to optimize reduction in both the volume of solid waste disposed and overall cost of non-hazardous solid waste management. This requires a thorough understanding of the composition of the waste stream, available options for waste diversion or disposal, and associated costs (or costs avoided). Today many installations have their own recycling program and continue to work with the Defense Reutilization and Marketing Offices to develop opportunities for further solid waste diversion from landfills. [See page 31.]

QUESTIONS SUBMITTED BY MEMBERS POST HEARING

MARCH 3, 2009

QUESTIONS SUBMITTED BY MR. ORTIZ

Mr. ORTIZ. The American Recovery and Reinvestment Act of 2009 provides $300 million to the Department of Defense for energy research and development projects. This funding can be used for projects that impact energy use for military installations or for operational forces. In your view, should greater priority be given to projects that benefit operational forces or installations? Please provide a list of the investments to be made with the $300 million provided in the American Recovery and Reinvestment Act of 2009 that will address operational energy use generally, and a list of investments that will address energy use at forward deployed locations specifically. In addition, your testimony states that the fiscal year 2009 request included $1.3 billion for energy-related projects. For the record, please provide us with a summary of projects included in that estimate and their funding allocations.

Mr. SHAFFER. Consistent with the intent of the American Recovery and Reinvestment Act of 2009, the Department developed a balanced investment portfolio for the $300 million added investment in Energy R&D. We did not specifically prioritize the investment for operational or installation projects, but rather sought a balance that seeks to meet the needs of the Department in both areas. We sought projects that can benefit the Department and obligate funds expeditiously. The list of projects is attached.

[The list of projects is retained in the committee files and can be viewed upon request.]

Mr. ORTIZ. DOD initiated a pilot program in 2007 to determine the fully burdened cost of fuel for three weapon systems. What is the status of the pilot program and what types of benefits, challenges, and lessons learned has DOD collected based on the pilot program? Is the Department on track to meet the implementation timeline of three years required by the 2009 defense authorization act? Has the Department undertaken any estimates of the fully burdened cost of fuel delivery in Iraq or Afghanistan? If so, what were the results?

Mr. SHAFFER. In 2007, the Department commissioned a study of the three pilot programs for the purpose of developing guidance for how future acquisition programs should apply the fully burdened cost of fuel. The study examined the types of trade analyses that could be conducted, how energy considerations are represented, and how the use of the Fully Burdened Cost of Fuel (FBCF) could be applied to acquisition decisions.

The study identified a number of challenges and lessons learned. For example, there is currently no analytical organization within the Department, within either OSD or the Services, with all the data or tools necessary to calculate the FBCF based on scenario-specific wartime requirements. Further, because DOD acquisition costing methodologies have been based for decades on peacetime assumptions, calculating FBCF to include wartime "tail" cost factors is challenging. The pilot study did lead to a recommendation against assigning the responsibility to individual programs offices because of the need for methodological consistency and common data sources across programs. The study did confirm that the FBCF "number" will usually vary by program, to reflect the varying demand for fuel logistics for each individual platform (i.e. each acquisition program).

The first program to apply fully burdened cost of fuel will be the Joint Lightweight Tactical Vehicle (JLTV) Program. The Analysis of Alternatives (AoA) guidance developed by the Director, Program Analysis and Evaluation and approved by the USD(AT&L) required the development and use of the FBCF. The JLTV study team is building their approach into their AoA study plan, and the Army is considering how best to organize to support the requirement to calculate the FBCF. The Departments of the Navy and the Air Force have formed task forces to develop implementation plans for the FBCF.

Based on progress to date, the Department is on track to achieve the three year implementation deadline established by law. As new AoAs and programs are established, they will be required to develop and apply FBCF estimates in their program AoAs.

Mr. ORTIZ. According to GAO's report, DOD plans to begin procuring new fuel-efficient generators in 2010. Is this too late to deploy these units as a part of the

buildup in Afghanistan? What steps will DOD take to ensure that the new fuel-efficient generators are deployed to locations, such as Afghanistan, where DOD would benefit the most from reducing its high fuel demand?

Mr. SHAFFER. The Department of Army expects to deploy Advanced Medium Mobile Power Sources (AMMPS) as part of the build up in Afghanistan by 2011. AMMPS will be fielded in accordance with Army fielding priorities and deploying units will be first to be equipped with AMMPS.

Mr. ORTIZ. DOD concurred with GAO's recommendation that the Joint Staff incorporate fuel demand considerations into its initiative to develop joint living standards at forward-deployed locations. Please elaborate on what steps DOD intends to take to ensure that fuel demand is appropriately considered in this effort.

Mr. SHAFFER. DOD reduced the demand for fuel at selected forward area bases by applying insulating spray foam to the outside of the tents. This foam reduces the amount of energy required for heating and air conditioning by 40 to 70 percent. We are also developing a "smart micro grid" for use in forward area bases which will generate only the power required at any given time, as opposed to generators running constantly at less than optimal efficiency. For new procurement, the Department will use the fully burdened cost of fuel (the cost of the fuel and the cost to deliver it to the forward area bases) in life cycle cost estimates. These estimates will be a component of the Energy Efficiency Key Performance Parameter for major systems. These measures should reduce the number of fuel convoys required and reduce the force protection requirement. Ultimately, these considerations have been—and will continue to be—injected into the Senior Warfighter (SWarF) Joint Standards of Life Support and standing Joint Expeditionary Basing-Working Group (JEB-WG) deliberations. Ultimately, the team will balance fuel demand implications of any new standard applied to forward deployed locations if the new standard drives an increased power load (and subsequently fuel requirements).

Mr. ORTIZ. GAO's report provides fuel usage profiles at several individual forward-deployed locations. The data show that large amounts of fuel are being consumed for base support functions, such as air conditioning or refrigeration, as well as for ground and air missions. However, the GAO report also notes that locations collected and categorized their fuel usage differently, which places limitations on the utility of the data. How does DOD intend to address the issue of measuring fuel consumption at its forward-deployed locations to ensure that consistent, accurate data are collected and reviewed to inform energy policy decisions while at the same time ensuring that base commanders and service members are focused on meeting mission requirements? What efforts has DOD made to develop methods to automatically measure fuel consumption at forward-deployed locations so that information can be quickly and consistently collected and relayed to the department?

Mr. SHAFFER. The Services and DOD do measure overall consumption at a forward-deployed location, but do not currently delineate between base support consumption and weapon system/vehicle consumption. The current daily average for energy usage in Iraq for petroleum products is 1.3M US gallons of jet fuel; 396,000 US gallons of diesel; and 90,000 US gallons of motor gasoline.

The Defense Energy Support Center observation concerning policies for fuel usage at each individual forward-deployed location varies based upon operations being conducted and types of equipment being used or supported. The DOD agrees that managing fuel demand in addition to requirement generation should become a consideration in forward-deployed location sustainability. However, DOD believes the combatant commander must be the decision authority for when reduction efforts begin being tracked and what conservation measures are employed in order to avoid detraction from tactical operations. We believe the Services and Combatant Commands should develop the guidelines that address energy efficiency considerations in base construction, maintenance, and procurement policies. It is our experience that guidelines regarding policy will be general in nature and allow combatant commanders flexibility. We do, however, support the initiative to have the fuel demand considerations and requirements be incorporated into the development of joint standards of life support at both fixed and forward-deployed locations. An accounting procedure will be developed in coordination with the services that is suitable for a deployed environment.

Mr. ORTIZ. Why should DOD focus its attention on fuel demand at forward-deployed locations that are not permanent, such as those in Iraq or Afghanistan? Would the department make more effective use of its resources by focusing on permanent locations?

Mr. SOLIS. While we recognize that base commanders must place their highest priority on meeting mission requirements and that it may not be practical for DOD to decrease fuel usage at every forward-deployed location, DOD faces high costs, operational vulnerabilities, and logistical burdens in sustaining forward-deployed lo-

cations, such as those in Iraq and Afghanistan, that depend heavily on fuel-consuming generators. For current operations, DOD's long truck convoys moving fuel to forward-deployed locations have encountered enemy attacks, severe weather, traffic accidents, and pilferage. Furthermore, the ongoing Global War on Terrorism may require DOD to sustain many of its forward-deployed locations supporting current operations for longer than initially anticipated. For example, during our visit to Djibouti, Navy officials referred to Camp Lemonier as an "expeditionary" camp even though it had been existence for about 6 years at that time. In October 2008, Camp Lemonier was transferred under the newly established Africa Command, which suggests that the camp will endure for the foreseeable future. In the case of Afghanistan, DOD may need to establish new forward-deployed locations or enhance existing ones as it increases troop levels in that country. Factoring fuel demand considerations into decision-making processes as forward-deployed locations are established and maintained could help DOD achieve its goals of reducing its reliance on petroleum-based fuel, the risks associated with delivering large amounts of fuel to its forward-deployed locations, and operational costs.

QUESTIONS SUBMITTED BY MS. GIFFORDS

Ms. GIFFORDS. According to a January 26th "Stars and Stripes" article, "American forces have long relied" on solar technology to power Iraqi streetlights and now use solar panels to power medical clinics and sewage pumps. We have used CERP funds to install solar arrays in Iraq including nearly two dozen in Baghdad alone. Are we utilizing similar arrays at our forward locations?

Mr. SHAFFER. Some forward operating base (FOB) locations do have some solar street lights installed; this meets the lighting requirements of the area where there is no power grid as well as reducing the overall power requirements. However, Army Central Command is not aware of any large scale installations of solar power systems in any of our FOBs. Because the FOBs are not enduring, they are focused on meeting the power requirements for operational needs. The cost of purchasing, installing and maintaining a solar system makes it unfeasible for non-enduring types of installations. Plus, in areas where the enemy is lobbing mortar shells into the compound, one mortar shell in a field of solar panels could damage very expensive solar panels. There are no solar streetlights or large-scale solar projects installed in Afghanistan. Again, because of the high initial cost and temporary nature of the FOBs, Army Central Command does not think there will be a large installation of solar technology at FOBs.

Ms. GIFFORDS. According to the GAO Report, the Net Zero Plus Joint Capability Technology Demonstrator will be demonstrated over a 3-year period. Can you go into additional detail about the demonstration project and will it be conducted in-theater?

Mr. SHAFFER. The Net-Zero Plus (NZP) Joint Capability Technology Demonstration (JCTD) provides improved energy efficiency to forward operating bases (FOB), thus reducing loss of life to hostile fire incurred during current fuel delivery operations. It achieves these energy efficiencies by leveraging energy technologies to provide efficient structures, alternative power generation and smart distribution systems for a Forward Operating Base.

The capabilities/technologies that the NZP JCTD will demonstrate are:

1) Energy Efficient Structures—external applied insulation referred to as "Eskimo" as well as non-permanent, lightweight and transportable structures incorporating energy efficient materials and technology.
2) U.S. Marine Corps developed Deployable & Renewable Energy Alternative Module (DREAM)—a tactical deployable system using solar power.
3) Pyrolysis Waste Disposal System—a thermal, deployable, destruction of waste with energy recovery.
4) Smart power distribution using the Defense Logistics Agency (DLA) developed Electronic Power Control and Conditioning unit.

Each technology will be assessed for a 12–18 month period at the U.S. Army National Training Center (NTC), Ft. Irwin, CA during the period from Oct. 2008 to Sept. 2010. The NZP JCTD is not conducting capability demonstrations in the U.S. Central Command theater, but is instead using the NTC because it replicates the current theater of operation without placing risk on warfighter operations.

The Operational Sponsor is U.S. Central Command. The lead service is the U.S. Army. The planned completion will be in Fiscal Year 2010.

Ms. GIFFORDS. According to a January 26th "Stars and Stripes" article, "American forces have long relied" on solar technology to power Iraqi streetlights and now use solar panels to power medical clinics and sewage pumps. We have used CERP funds to install solar arrays in Iraq including nearly two dozen in Baghdad alone. Did you have an opportunity during your investigations to examine any of these projects either in person or anecdotally?

Mr. SOLIS. While our report highlights several efforts under way or planned by DOD components to reduce fuel demand at forward-deployed locations, we did not specifically review solar technology efforts funded by the Commander's Emergency Response Program (CERP). DOD funded three solar-related projects in Iraq in 2008 using CERP—specifically, $165,000 to provide a Baghdad clinic with solar power, $3.7 million for solar power street lamps in Baghdad, and $5.8 million for solar lights in Fallujah—but we did not evaluate these projects. However, GAO has conducted prior work on other aspects of CERP. In June 2008, for example, we reported on the extent to which DOD has established selection criteria, coordinates with other U.S. Government agencies and with the government of Iraq, and exercises oversight of CERP projects in Iraq (see GAO-08-736R). Our work found, for example, that DOD has broad selection criteria for CERP projects, which gives significant discretion to commanders in determining the types of projects to undertake. Thus, it is important that DOD and commanders at all levels have the information needed to determine whether projects are meeting the intent of the program, assess program outcomes, and be better informed about their funding requests. In addition, we have reported on U.S. efforts to rebuild Iraq's electricity sector as part of its reconstruction projects, most recently in March 2009 (see GAO-09-294SP). Restoring the electrical infrastructure is critical to reviving the Iraqi economy and ensuring productivity of the oil sector; however, demand has grown substantially and continues to outstrip capacity. For 2008, supply met around 52 percent of demand, even with increased electrical power generation. As a result, Iraq continues to experience electrical shutdowns despite billions of dollars invested. According to the State Department, at the end of November 2005, average hours of power per day were 8.7 hours in Baghdad and 12.6 hours nationwide; by the end of November 2008, Baghdad averaged 15.4 hours and the rest of the country averaged 14.6 hours. The Iraqi Ministry of Electricity estimated in its 2006–2015 plan that it would need $27 billion over the next 6 to 10 years to provide reliable electricity across Iraq by 2015. However, U.S. Government officials working with the ministry estimate twice that amount will be needed for power generation, transmission, distribution, and other infrastructure. Based on U.S. and United Nations reporting, inadequate operating and maintenance practices, as well as the lack of skilled technicians, inhibit an effective electrical infrastructure.

Ms. GIFFORDS. Your study seems to indicate that there is a coordination problem within the Department and across the services on managing Operational Energy. If the Administration appointed a Director of Operational Energy Plans & Programs and fully implemented Section 902 from last year's Defense Authorization Act, do you believe that could solve some, or even all, of the coordination problem?

Mr. SOLIS. In meeting the requirements of the Duncan Hunter National Defense Authorization Act for Fiscal Year 2009 to establish a Director of Operational Energy Plans and Programs and an operational energy strategy, we believe that DOD has an opportunity to improve communication and coordination of fuel reduction efforts at forward-deployed locations as well as establish visibility and accountability for fuel demand management. Furthermore, a director of operational energy would provide DOD with an executive-level official who sets the direction, pace, and tone to reduce operational energy demand across the department. While DOD components have efforts under way or planned that show potential for achieving greater fuel efficiency, we found that DOD faces difficulty achieving its goals to reduce its reliance on petroleum-based fuel and minimize the logistics "footprint" because managing fuel demand at forward-deployed locations has not been a departmental priority and its fuel reduction efforts have not been well coordinated or comprehensive. Specifically, we found that information on fuel demand management strategies and reduction efforts is not shared among forward-deployed locations, military services, and across the department in a consistent manner. As our report noted, DOD guidance does not designate any DOD office or official as being responsible for fuel demand management at forward-deployed locations, and we could not identify anyone who is specifically accountable for this function through our interviews with various DOD and military service offices. Without establishing visibility and accountability over fuel demand management at forward-deployed locations, DOD is not well positioned to address the shortcomings we identified in our report—including the lack of fuel reduction guidance, incentives, and a viable funding mechanism for initiatives to decrease demand. Thus, DOD cannot be assured that good fuel reduction

practices are identified, shared, prioritized, resourced, implemented, and institutionalized across locations in order to reduce the costs and risks associated with high fuel demand.

QUESTIONS SUBMITTED BY MR. LAMBORN

Mr. LAMBORN. In your prepared testimony, you note the Air Force has initiated a biomass-derived aviation fuel certification program. Can you provide further details regarding this Air Force initiative to test Algae and other bio-mass energy feedstocks? Do the other Services (Army, Navy, Marines, Coast Guard) have similar programs to certify algae and biomass-derived synthetic fuels?

Mr. SHAFFER. The Air Force is conducting research and development on alternative fuels produced from biomass. The Air Force has obtained samples produced by industry and academia, as well as test samples produced as part of the Defense Advanced Research Projects Agency's research program. As a follow-on to first generation certification of synthetic fuels derived via the Fischer Tropsch process, the most promising second generation biomass candidates are fats and oils that are hydroprocessed into a hydrotreated renewable jet (HRJ) fuel; samples of which have been produced from algae, seed crops, and animal waste. The Air Force has also worked with the commercial airline industry, Boeing, and biomass fuel producer UOP [Universal Oil Products] to analyze HRJ/petroleum fuel blends used in recent flight demonstrations by Continental Airlines and Japan Airlines; a small portion of these fuels was derived from algae oil. HRJ fuels are chemically similar to the Fischer Tropsch-derived synthetic kerosene fuels currently undergoing certification by the Air Force and lessons learned from these certification efforts should streamline HRJ fuels certification. In addition, the Air Force is also analyzing third generation biofuels produced from halophytes, cellulosic material, and waste products. The technology to produce fuels from these resources is less mature than the fats and oils used to produce HRJ fuels, but these feedstocks offer significant promise in terms of availability and cost.

The Air Force is planning to conduct a flight demonstration "pathfinder" test as the first step in the certification process of HRJ fuels. The current plan is to competitively procure two biomass candidates and conduct a comprehensive evaluation to make sure they are fit-for-purpose for use in military aircraft. Once the chemical and physical similarity to petroleum-derived fuels is assured, the flight test program will start. In addition, the Air Force is conducting analyses of alternative fuels to determine their life cycle greenhouse gas footprint from "field to wake," is collaborating with the U.S. Department of Agriculture to assure sustainability, and is evaluating the potential for commercial production and estimating costs.

To the best of our knowledge, the Army, Navy, and Coast Guard have not initiated biomass-derived certification programs at this time. The Air Force is collaborating with its sister Services on the opportunities to jointly certify common platforms for alternative fuel use.

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