



Memorandum

DATE: June 7th, 2011

TO: INTERESTED PARTIES

FROM: Bracken Hendricks, Daniel J. Weiss, Lisbeth Kaufman, Center for American Progress

SUBJECT: Sustaining DOD Leadership on Energy Security and Innovation

Background

As the United States confronts great challenges to our national security and economic competitiveness, Department of Defense leadership on energy security is perhaps more vital than at any time in our history. This memo outlines how department efforts to meet energy security challenges are already reducing risks for military personnel, safeguarding America's global strategic interests, and cost effectively ensuring troop readiness. DOD commitments to research, development, and deployment of innovative energy technologies are equally critical to the growth of jobs and civilian industries. Therefore, at this moment of tight budgets and tough choices, preserving America's commitment to energy security must remain a top priority for our national defense and the health of our economy.

Today, energy security has risen to the highest level of defense priorities. The 2010 Quadrennial Defense Review identified energy security concerns as one of four key priorities for reforming Department of Defense operations.¹ For continued progress on this issue, the DOD must sustain its commitment to existing programs that are working within the branches of the military to sustain energy innovation, and Congress and the administration must ensure ongoing support for key policies.

The DOD has already made great strides in advancing energy security through operational improvements to the department's installations, which cover 29 million acres, and include 539,000 buildings and structures valued at more than \$700 billion.² With so many facilities, DOD's investment in energy efficiency and renewable technologies can greatly influence the cost and market for advanced energy technology.

The DOD has a history of developing key technologies like the Internet, GPS, and robotics systems, all of which later had significant commercial application. Clean energy and energy efficiency technologies represent an important new wave of advanced technologies that DOD deploys, which will speed commercial applications of tremendous economic importance. In recent years, the DOD has made great progress in improving procurement, R&D, and deployment of advanced renewable and efficient energy technologies in both installations and operational theaters. These efforts have clearly improved military readiness while cutting the cost of vital services, and helping to create

jobs and grow domestic industries. In an era of constrained budgets and high unemployment, the cost cutting and job creating effects of these efforts remain crucial to economic recovery.

There is a long bipartisan tradition of support for Defense related technology innovation. In 2007 President George Bush signed into law the Energy Independence Security Act, or EISA. Section 526 of EISA requires any federal agency to consider the lifecycle greenhouse gas emissions associated with the production and combustion of alternative and synthetic fuels and ensure that they are “less than or equal to such emissions from the equivalent conventional fuel produced from conventional petroleum sources.”³

This legislative requirement has spurred the DOD to focus on reduction of oil use through the development of more efficient vehicles, aircraft, and vessels, as well as the production of cleaner advanced biofuels. Unfortunately the House recently passed the National Defense Authorization Act, H.R. 1540, which would exempt DOD from restrictions on using fuels dirtier than conventional ones.⁴ Enactment of this provision could slow or halt the development of cleaner fuels, and put the military under tremendous pressure to use dirty coal over liquid-and tar sands-based fuels.

Similarly, the Department of Defense has used its procurement powers to reduce the strategic vulnerability of its installations and personnel, not just through reductions in oil dependence, but through a broad commitment to energy conservation and development of domestic renewable electricity and advanced materials. The branches of the military are empowering front line soldiers with new energy technology that reduces strategic vulnerability, and deploying “net-zero energy” bases at home that produce more energy than they consume through the use of secure microgrids and energy efficient and renewable energy generation.

These efforts are supported through the work of DOD initiatives like the Environmental Security and Technology Certification Program, the Energy Conservation Investment Program, the Strategic Environmental Research and Development Program, and numerous partnerships with universities and federal agencies. Through these efforts, DOD has sustained vital research and early phase deployment efforts that sustain the growth of domestic technologies and U.S. companies. While these efforts are not directly threatened by repeal of the EISA’s clean energy provisions, the administration and congress must remain vigilant that such essential programs receive robust and sustained support through tough economic times.

This memo highlights the existing legacy of success within the Department of Defense resulting from these highly effective efforts, and outlines the military and strategic case for a redoubled commitment to such energy security investments within the DoD in coming years.

Meeting energy security objectives to support DOD’s strategic mission

Clean and efficient energy are essential for troop readiness. Military planners have underscored that energy efficiency is a force multiplier. It increases the range and endurance of forces in the field while reducing the number of combat forces diverted to protect energy supply lines from attacks and disruptions.

Energy security means providing assured access to reliable supplies of energy, and the ability to protect and deliver sufficient energy to meet operational needs., “Crafting a Strategic Approach to Climate and Energy” is highlighted in the Quadrennial Defense Review as one of the four highest-tier requirements for improving energy security and reforming how the U.S. military does business.⁵

The QDR further notes that pursuing energy security and economic stability are inextricably linked. Ending dependence on oil, for example, has both profound security and economic dimensions. Secretary of the Navy Ray Mabus says that the U.S. military should “take the lead” on ending oil dependence.⁶ He believes that “the Navy can be a market” for biofuels use, which will help speed the development and commercialization of advanced biofuels for both military and civilian use.

Similarly, the Army notes that a military investment in clean energy technologies “creates new products, new business opportunities for a ready market” and “reduces R&D cost and risk of entry for commercial businesses.” And early adoption of these technologies by the Defense Department provides certainty to investors that there will be a market for new products.⁷

DoD has outlined a number of strategic energy security objectives that are central to the defense of the nation. These include:

1. **Securing reliable energy access to meet operational needs.** DOD has set a goal of “incorporating geostrategic and operational energy considerations into force planning, requirements development, and acquisition processes.”⁸ DOD must fully implement these measures as a top priority to ensure operational readiness and reduce long-term operating costs.
2. **Continuing to upgrade energy technology at DOD domestic facilities.** Grid instability and the vulnerability of military installations to energy supply disruptions threaten the readiness of US forces. DOD has undertaken a coordinated energy assessment and assessment of critical assets, including prioritization of investments in energy efficiency, renewable electricity production, and smart grid distribution. These efforts protect critical installations from power outages caused by natural disasters, accidents, or terrorist attacks, and have been identified as key to national defense.
3. **Expanding procurement of renewables, efficiency, and smart grids.** DOD has become a leader in building the market for innovative energy efficiency and renewable energy technologies developed by the private sector and U.S. Department of Energy laboratories. The Environmental Security and Technology Certification Program, which is the DOD’s environmental technology demonstration and validation program, has been central for demonstrating key technologies in military installations. The Energy Conservation Investment Program which focuses on projects that save energy or reduce Defense energy costs, has also been instrumental in deploying innovative energy projects. The DOD should also continue to partner with academia, other U.S. agencies, and international partners to research, develop, test, and evaluate sustainable energy technologies.

4. **Ensuring sufficient resources to meet energy and sustainability goals.** In an era of constrained budgets it is important to preserve support for key programs for energy efficiency, advanced bio fuels, and renewable energy generation to reduce oil dependence and avoid price volatility. DOD should further investigate alternative concepts for improving operational energy use, including creating an innovation fund administered by the director of operational energy that would enable installations to compete for funding of projects that advance integrated energy solutions.
5. **Responding to a changing operational environment.** According to the QDR, climate change and natural resource development pressures threaten to increase “demands for defense support to civil authorities for humanitarian assistance or disaster response both within the United States and overseas.” The DOD should aggressively support environmental security cooperative initiatives across agencies and with other national governments. DOD should prioritize domestic support for the Strategic Environmental Research and Development Program—a joint project of DOD, DOE, and the EPA—to develop climate change assessment tools. DOD should also increase investment in the Defense Environmental International Cooperation Program to promote cooperation on environmental security and adaptation.
6. **Securing the operational readiness of U.S. military facilities.** The National Intelligence Council has determined that more than 30 U.S. military installations already face elevated risk levels due to rising sea levels. Because DOD’s operational readiness depends on reliable access to its facilities, the department should complete a comprehensive assessment of the potential impacts of climate change on all installations and the ability to fulfill its missions and adapt when necessary, as recommended in the QDR.

DOD leadership on energy security, a record of accomplishment

Both the Department of Defense as a whole and each of the military branches have taken strong leadership in setting ambitious goals for energy independence and in deploying innovative energy technology to meet those targets. Major steps have been taken across the department to develop and implement new energy solutions using renewable fuels, renewable electricity, energy efficiency, energy storage, and smart and secure microgrids for electricity. These strategic investments are cutting costs for the treasury, reducing strategic vulnerability, and creating jobs in emerging industries across the U.S. economy. These efforts should be sustained, supported, and enhanced in coming years.

Reducing oil dependence

- The DOD has set a goal of reducing petroleum use by 20 percent by 2015. DOD is currently on track to meet this goal, and has cut fleetwide petroleum use by 6.6 percent since 2005.⁹
- By 2016, the Air Force plans to cost-competitively acquire 50 percent of its domestic aviation fuel via an alternative fuel blend that is cleaner than conventional petroleum fuel.

It is “testing and certifying alternative aviation fuels to help improve energy security posture by providing domestic alternatives to foreign oil.” Air Force testing and standard setting on alternative fuels also creates opportunities for the larger commercial aviation sector to follow.¹⁰

- The Department of Navy has set aggressive goals to decrease fossil fuel afloat all vessels 50 percent by 2020 and reduce petroleum use in nontactical vehicles by 50 percent by 2015¹¹.
- On Earth Day 2010, the Navy tested an F/A-18 fighter jet at supersonic speeds powered by a biofuel blend, and since then has successfully tested helicopters and riverine combat boats.
- The Navy has commissioned the USS Makin Island, its first electric-drive surface combatant. Over the ship’s more than 30-year lifespan the reduction in fossil fuel use will save up to \$250 million in fuel costs. The Navy is also retrofitting our destroyers with similar technology.
- The Department of Navy has partnered with other federal departments, industry leaders, and academia on alternative energy research and development, including a partnership with the state of Hawaii, and the U.S. Departments of Agriculture and Energy to develop a new biofuel industry to benefit local farmers and create locally produced fuel for the Pacific fleet.
- A Marine Corps Experimental Forward Operating Base in Twenty-Nine Palms, California, is testing alternative energy technologies under combat conditions.
- The Third Battalion, Fifth Marines, who are deployed in a tough fight in Sangin, Afghanistan, have relied on advanced biofuels to cut fuel use by 25 percent to 90 percent and decrease logistical support requirements.
- The Army has more than 2,700 hybrid electric Non-Tactical Vehicles, or NTVs, in its fleet of 70,000, and is adding hybrids, Low-Speed Electric Vehicles, and other electric vehicles to replace gasoline-powered NTVs as their leases expire.
- The Army is advancing operational capabilities to decrease reliance on fossil fuel through funding and developing new fuel systems. These include the first-of-its-kind Tactical Fuels Manager Defense to track fuel consumption down to the vehicle level; the Advanced Medium Mobile Power Sources, a 5kW to 60 kW generator that will provide an average of 20 percent reduction in fuel consumption; and the Advanced Affordable Turbine Engine for the UH-60 and AH-64 helicopter to improve energy efficiency by 12 percent.
- Currently, 70 percent to 80 percent of the resupply weight for logistical convoys in Afghanistan is for fuel and water. The Army alone spent \$2.7 billion in FY 2010 on operational fuel costs, with 70 percent going in theater. In addition, approximately 15 percent of U.S. casualties are related to ground resupply. Investments to reduce the

military's reliance on oil will both help save money and save lives.

- Department of the Army is also looking to decrease petroleum use by 20 percent for Non-Tactical Vehicles using advanced technologies.

Improving energy efficiency

- DOD has set a goal of reducing energy intensity by 30 percent by 2015. In 2010, the department cut energy use by 11.2 percent over 2003 levels—short of its interim 15 percent goal. Efforts must be expanded to meet the 2015 target.
- By 2020, half of all Department of Navy installations will be "net-zero" energy bases producing more energy than they consume. A key element of this effort began last year with the Navy's advanced metering initiative, which when complete will have placed 27,000 smart meters on its installations worldwide. These meters will enable facilities to use electricity much more efficiently.
- The Army also has a net-zero energy installation goal to ensure that facilities are able to produce as much energy as they consume. To accomplish this goal, the Army implemented the highest building standard in the federal government with the American Society of Heating and Refrigerating and Air-Conditioning Engineers, or ASHRAE Standard 189.1, "Standard for the Design of High-Performance Green Buildings." The Army is now piloting "net-zero" energy bases¹² in Fort Detrick, Maryland; Fort Hunter Liggett, Park Reserve Forces Training Area and Sierra Army Depot, California; Kwajalein Atoll, Marshall Islands; and West Point, New York. The Oregon Army National Guard volunteered to go net zero—on energy, waste, and water—across the state, as did Fort Bliss, Texas and Fort Carson, Colorado. The Army plans to add 25 more bases in each net zero category in FY 2014.
- Currently all new Navy buildings must be constructed to LEED silver standards. Last year nearly half of all new constructions rated at LEED gold— with one building reaching the highest standard of LEED platinum. In May, Secretary Mabus announced that starting in 2013, LEED Gold will be required for every single new applicable Navy and Marine Corps military construction project. The Navy will do this without using any new funds.

Deploying renewable electricity and increasing grid security

- DOD set a goal of providing 26 percent of its energy from renewable sources by 2020. It is currently using 11.3 percent renewable energy, and is on track to meet its 26 percent goal if efforts continue, according to OMB.
- By 2020, half the Navy's total energy consumption ashore will come from alternative sources. A few examples of Navy renewable energy projects include 270 MW of geothermal power online in China Lake, California, 100 MW of solar power coming online this year, and plans for 26 MW of landfill gas power. The Navy also has the nation's only grid-connected

“wave buoy” to generate electricity from waves off the Hawaiian coast. DON has also planned 15 MW of wind to be deployed.

- With a single \$40 million dollar investment in renewable energy, the Marine Corps will save \$40 million a year by deploying four combat-proven alternative energy technologies: solar blankets for battery charging, 300-watt solar powered generators, energy efficient shelter liners, and LED lights. When widely implemented, these technologies will reduce the number of resupply flights by 450 and will take 180 trucks off the road.
- The Army currently has 126 renewable energy projects in operation, and hopes to leverage \$7 billion in private capital to increase large-scale renewable projects by 2020. For example, the Army is planning a 500 MW solar energy plant at Fort Irwin, California. It continues to drill test wells for a 30 MW geothermal power plant at Hawthorne Army Depot, Nevada, and has begun construction of a 1 MW solar system at Fort Hunter Liggett, California, which will supply about one-third of the base’s energy demand.
- The secretary of the army signed a directive to create an Energy Initiatives Office that will invest in large-scale renewable energy projects and add \$7 billion in private investment for these projects over the next 10 years.
- Soldiers of the 1-16 Infantry Battalion recently deployed to central Afghanistan prepared to use a suite of advanced “soldier power” capabilities such as rechargeable batteries, networking devices, and solar and fuel cell chargers that will help to reduce the volume and weight of their load. One example of renewable power generation supporting operational needs is the Rucksack Enhanced Portable Power System, which has 100 units currently delivered in theater with up to 725 by the summer of 2011.
- Currently DOD and DOE are working closely under a Memorandum of Understanding to develop opportunities to build model microgrid and smartgrid systems at the base level. The Army alone has 30 microgrid initiatives underway that include studies as well as physical grids being tested.
- Department of Energy labs are partnering with the Army to capitalize on DOE's innovation and Army's operational capability in areas such as advanced vehicle technology, energy storage, high-efficiency buildings, soldier power, microgrids, and other critical energy technologies.

Supporting the policies that drive energy security and innovation

This record of accomplishment did not take place by accident. It was the result of sustained strategic commitment on the part of both military and civilian leadership to lay a foundation of policies to support energy innovation. As the administration and Congress face tough decisions in a constrained budget environment, it is important to recognize the key legislative rules, agency initiatives, and executive actions that have provided this sound policy framework to cut long-term

costs for the department while improving the readiness of our fighting men and women. It is essential that moving forward, policymakers in Washington D.C. support the Department of Defense's commitment to enhancing national security through domestic, renewable, and efficient energy technologies. Key measures are discussed below.

Key existing agency programs

The Environmental Security and Technology Certification Program has been central for demonstrating key technologies in military installations. The Energy Conservation Investment Program has also been instrumental in deploying innovative energy projects. Commitment to these programs should be supported and enhanced.

DOD should also prioritize domestic support for the Strategic Environmental Research and Development Program—a joint project of DOD, DOE, and the EPA—to develop climate change assessment tools. DoD should also increase investment in the Defense Environmental International Cooperation Program to promote cooperation on environmental security and adaptation.

Energy Independence Security Act of 2007¹³

Section 526 of the EISA requires all federal agencies to limit alternative fuels purchases to those that have lower or equal life cycle CO₂ emissions compared to conventional petroleum fuels. This has spurred the military and civilian industry research, develop, and deployment of advanced drop-in biofuels that are cleaner than petroleum.

Section 844 of the House-passed National Defense Authorization Act, H.R. 1540, would exempt DOD from Section 526. There are also proposals to give the services the ability to sign 20-year fuel procurement contracts. The combination of these two measures would make it economical to develop coal-to-liquid fuels for military purposes, which produce twice the pollution compared to conventional fuels. This would dramatically increase pressure on the services to jettison cleaner advanced biofuels in favor of dirty coal or tar sands-based fuels.

Defense Production Act of 2009¹⁴

The mission of the Defense Production Act Title III Program is to "create assured, affordable, and commercially viable production capabilities and capacities for items essential for national defense [defined to include energy production]." ¹⁵ The Defense Production Act Title III has spurred the DOD to develop drop-in advanced biofuels and other alternative energy sectors.

National Defense Authorization Act for Fiscal Year 2010 Section 2911(e)(A)

NDAA Section 2911(e)(a) requires all DOD branches to produce or buy at least 25 percent of their electricity from renewable sources beginning in 2025.

Long-term contracts for energy and fuel for military installations (§ 2922a)

This section of U.S. Code of Law facilitates an easy process for approving long-term, renewable energy Power Purchasing Agreements, or PPAs.¹⁶ Under this provision, service secretaries may enter into contracts for installation energy for up to 30 years with approval from the secretary of defense. Long-term PPAs are a powerful tool for facilitating the development of large-scale renewable energy projects on DOD installations. This authority was requested and granted for the first time this year for a Navy landfill gas project with a 15-year PPA.

The Defense Venture Catalyst Initiative for alternative energy

The Defense Venture Catalyst Initiative, or DeVenCI, focuses on educating and informing senior DOD leadership on emerging commercial technologies developed by nontraditional DOD procurement sources that may have military applications. It also connects DOD needs and requirements to these sources of innovative technology.¹⁷

Potential new legislation for advanced biofuels contracting

The DOD would benefit from legislation that would lift the five-year limit on federal purchase agreements for advanced biofuels and instead allow the military to sign long-term contracts of up to ten years for advanced biofuels. This would provide more certainty to manufacturers, making it much easier to secure financing for their large-scale production facilities. Any changes to allow longer contracts should meet the following criteria:

- The longer contracts should only apply to the purchase of advanced biofuels as currently defined by the Clean Air Act.
- Section 526 of EISA must remain intact. This means that fuels must have lower lifecycle pollution than conventional petroleum fuel.
- A 10-year purchase contract is sufficient to provide certainty to investors. Longer contracts should be prohibited.

Executive Order 13423: Strengthening Federal Environmental, Energy, and Transportation Management¹⁸

E.O. 13423, signed by President Bush on January 24, 2007, instructs federal agencies to reduce energy intensity by 3 percent annually through the end of FY 2015, and by 30 percent by the end of FY 2015, relative to each agency's baseline energy use in FY2003. It mandated 34 percent reduction of greenhouse gases by 2020 relative to a 2008 baseline and 13.5 percent reduction of scope 3 greenhouse gases, including both upstream and downstream indirect emissions, by 2020 relative to a 2008 baseline.

The E.O. also reduces petroleum consumption in fleet vehicles by 2 percent annually through 2015, and increases alternative fuel consumption at least 10 percent annually. It also increases purchasing of alternative fuel, hybrid, and plug- in hybrid vehicles when commercially available

Furthermore, the order requires more widespread use of Environmental Management Systems as the framework in which to manage and continually improve these sustainable practices. It is supplemented by implementing instructions, issued on March 29, 2007 by the Council on

Environmental Quality (CEQ).

Executive Order 13514: Federal Leadership in Environmental, Energy, and Economic Performance ¹⁹

The goal of this executive order, signed by President Obama on October 5, 2009, is “to establish an integrated strategy towards sustainability in the Federal Government and to make reduction of greenhouse gas emissions (GHG) a priority for Federal Agencies.” By doing this, the federal government can create major demand stimulating clean energy industries across the economy and creating jobs across the country.

The EO requires all agencies to reduce petroleum consumption and water use by 2 percent per year, totaling 26 percent by 2020. And, it requires 95 percent of all new contracts to require products and services that are energy efficient, water efficient, bio-based, environmentally preferable, non-ozone depleting, and use recycled content, nontoxic, or less-toxic alternatives.

Appendix 1

Response to the Rand Corporation’s “Alternative Fuels for Military Applications” [study and recommendations](#):²⁰

1. The report recommends the use of a process perfected by the Germans during World War II to convert coal to liquid transportation fuels. The study acknowledges that the production and use of such fuels are twice as dirty as conventional fuels:

For the FT coal-to-liquids method in the absence of management of greenhouse gas emissions, each gallon of alternative fuel yields lifecycle greenhouse gas emissions about double those associated with conventional petroleum-derived fuels (Bartis, Camm, and Ortiz, 2008; NAS, 2009). Nearly all of the lifecycle greenhouse gas emissions are carbon dioxide, one half associated with combusting the fuel in a vehicle or aircraft engine and the other half emitted from the coal-to-liquids production facility.

Nonetheless, the report concludes that “Fischer-Tropsch fuels are the most promising near-term options for meeting the Department of Defense’s needs cleanly and affordably.” (p. xi)

When making this conclusion, however, Rand did not evaluate the amount of water required to produce this level of alternative fuels, or the amount of wastewater that would be created. It did not assess the discharge of this contaminated water, or protection of surface or ground waters.

In fact the F-T method consumes enormous amounts of water:

In the 1990s, Bechtel performed a series of studies for DOE in which they evaluated a variety of coal liquefaction schemes for indirect liquefaction (Bechtel 1998) and determined the following water needs:

For eastern coal 7.3 gal of water/gal F-T liquid
For western coal 5.0 gal of water/gal F-T liquid

In the report, “Emerging Issues for Fossil Energy and Water,” the National Energy Technology Laboratory states, “Before coal liquefaction can make a significant contribution to meeting the demand for liquid fuels, it will be necessary to ensure that sufficient water resources are available at proposed plant sites.”²¹

The Rand study does not conduct such an assessment.

2. James Bartis, a co-author of the Rand report, testified before the House Energy and Commerce Committee on June 3, 2011.²² He recommended an:

... amendment to Section 526 that would allow the government to target purchases of alternative fuels derived from fossil fuel resources (such as coal, natural gas, or oil shale) if 90 percent of greenhouse gases produced during the alternative fuel production process are captured and sequestered.

As best we can ascertain, however, there are no coal-to-liquid facilities in the world today that capture “90 percent of greenhouse gases produced” during the production of liquid fuel. It is unclear how much the deployment of this technology would inflate the price of F-T fuel.

3. In that same testimony, Bartis recommended amending Section 526 to allow the purchase of fuels made whose lifecycle pollution is greater than conventional fuels. He said Congress should allow the military to purchase alternative fuels “if lifecycle greenhouse gas emissions that are no more than five percent above the lifecycle greenhouse gas emissions of their petroleum counterparts.”

This recommendation would lead to dirtier fuels and ignores the growing warnings from scientists that we must promptly reduce global warming pollution. In practice, this provision would allow the use of Canadian tar sands as a feedstock for aviation and vehicle transportation fuels. The production and use of such fuel would increase global warming pollution, thereby increasing an identified military “threat multiplier.”

The National Academy of Sciences warned just last month:

The risk of dangerous climate change impacts is growing with every ton of greenhouse gases emitted into the atmosphere.

The committee deemed the risks of sticking to “business as usual” to be a much greater concern than the risks associated with a strong response.²³

Given this warning from America’s scientists, it does not make sense to use federal tax dollars to produce fuels that have *greater* greenhouse gas emissions than the ones that are employed today:

Greenhouse gas emissions from world energy generation in 2010 were the highest in history, according to the latest estimates from the International Energy Agency, released today. The burgeoning emissions push the global climate closer to the danger point for catastrophic effects - more extreme weather, rising sea levels, glacier melt, floods, drought, wildfire, species extinctions and the spread of tropical diseases.²⁴

U.S. CO₂ pollution grew in 2010 and is expected to grow in 2011, according to the Energy Information Administration.²⁵

4. At the June 3 hearing, Tom Hicks, deputy assistant secretary for the Navy, testified in opposition to the Rand recommendation that F-T fuels were the best alternative fuels option. Although the Rand study suggests that in theory a combination of coal and biomass could be used as feedstock to reduce emissions, this is not likely to occur in practice. Hicks notes that:

Biomass as a long-term feedstock is typically not considered practical. More often than not, coal is viewed as the primary, if not exclusive, feedstock. As a result, in addition to requiring large, new sources of coal, it requires enormous quantities of water, \$5 to \$10 billion in capital per plant to provide a fuel result that has more than twice the carbon emissions of petroleum.²⁶

Instead, Hicks and the Navy recommend continuing investments in advanced biofuels made from camelina, algae, or other similar feedstock:

From the Navy's perspective, there is a better way. ... unlike the proposed "near term" solution discussed above, the feedstocks and the refineries needed to produce advanced biofuels to power the Fleet or our aircraft can literally be made in all fifty states. The camelina grown in Florida and Montana, the algae grown in New Mexico, Hawaii or Pennsylvania, for example, can be turned into fuels blended in existing infrastructure in the Gulf or on the East or West coast to power the Fleet.

Hicks also rebuts the Rand assertion that there is unlikely to be adequate capacity to produce the necessary quantity of biofuels to meet the Navy's needs:

The U.S.-based companies comprising the advanced biofuels industry that are currently producing or will soon be producing fuels across a spectrum from the tens of thousands of gallons to the tens of millions of gallons per year.

¹ Quadrennial Defense Review: <http://www.defense.gov/qdr/>

² U.S. Department of Defense website <http://www.defense.gov/bios/biographydetail.aspx?biographyid=225>

³ Energy Independence and Security Act http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:h6enr.txt.pdf

⁴ H.R. 1540 <http://www.gpo.gov/fdsys/pkg/CRPT-112hrpt78/pdf/CRPT-112hrpt78.pdf>

⁵ Quadrennial Defense Review: <http://www.defense.gov/qdr/>

⁶ <http://www.nationaldefensemagazine.org/blog/Lists/Posts/Post.aspx?ID=400>

-
- ⁷ *National Defense*, <http://www.nationaldefensemagazine.org/blog/Lists/Posts/Post.aspx?ID=400>, April 27, 2011
- ⁸ Quadrennial Defense Review: <http://www.defense.gov/qdr/>
- ⁹ DOD scorecard - Website: <http://www.denix.osd.mil/sustainability/upload/Final-Jan-2011-OMB-Scorecard-DOD-public-version-4-14-11.pdf>
- ¹⁰ Quadrennial Defense Review: <http://www.defense.gov/qdr/>
- ¹¹ Navy goals (Navy and Marine Corps) were set out by Secretary Mabus in October 2009: http://www.navy.mil/features/Navy_EnergySecurity.pdf
- ¹² <http://www.geni.org/globalenergy/library/technical-articles/generation/policy/sustainable-business/army-going-net-zero-on-environmental-impact/index.shtml>
- ¹³ Energy Independence and Security Act http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:h6enr.txt.pdf
- ¹⁴ Defense Production Act Reauthorization of 2009, <http://www.govtrack.us/congress/bill.xpd?bill=s111-1677>
- ¹⁵ Defense Production Act Title III Homepage, <http://www.acq.osd.mil/ott/dpatitle3/>
- ¹⁶ U.S. Code § 2922a. Contracts for energy or fuel for military installations, http://www.law.cornell.edu/uscode/uscode10/usc_sec_10_00002922---a000-.html
- ¹⁷ Defense Venture Catalyst Initiative, <http://devenci.dtic.mil/>
- ¹⁸ Executive Order 13423 “Strengthening Federal Environmental, Energy, and Transportation Management,” <http://www.fedcenter.gov/programs/eo13423/>
- ¹⁹ Executive Order 13514 “Federal Leadership in Environmental, Energy, and Economic Performance,” <http://www.fedcenter.gov/programs/eo13514/>
- ²⁰ James T. Bartis and Lawrence Van Bibber, “Alternative Fuels for Military Applications” (2011), available at http://www.rand.org/content/dam/rand/pubs/monographs/2011/RAND_MG969.pdf.
- ²¹ National Energy Technology Laboratory, *Emerging Issues for Fossil Energy and Water* (Department of Energy, 2006), available at <http://www.netl.doe.gov/technologies/oil-gas/publications/AP/IssuesforFEandWater.pdf>.
- ²² James T. Bartis, “The Roadmap for America’s Energy Future,” Testimony before the House Energy and Commerce Committee, June 3, 2011, available at http://www.rand.org/content/dam/rand/pubs/testimonies/2011/RAND_CT363.pdf.
- ²³ National Academies, “Action Needed to Manage Climate Change Risks; U.S. Response Should Be Durable, But Flexible,” News release, May 12, 2011, available at <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=12781>.
- ²⁴ Environment News Service, “Global Greenhouse Gas Emissions Jump to Record Levels,” May 30, 2011, available at <http://www.ens-newswire.com/ens/may2011/2011-05-30-02.html>.
- ²⁵ “U.S. Carbon Dioxide Emissions Growth (change from previous year),” available at <http://www.eia.gov/steo/gifs/fig26.gif>.
- ²⁶ Tom Hicks, Statement before the House Subcommittee on Energy and Power, June 3, 2011, available at <http://republicans.energycommerce.house.gov/Media/file/Hearings/Energy/060311/Hicks.pdf>.