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HOUSE SUBCOMMITTEE ON
ENERGY AND MINERAL
RESOURCES

STATEMENT OF

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BEFORE THE

HOUSE SUBCOMMITTEE

ON ENERGY AND MINERAL RESOURCES

ON

THE ROLE OF THE FEDERAL GOVERNMENT AND FEDERAL LANDS

IN FUELING THE FUTURE OF RENEWABLE AND ALTERNATIVE

ENERGY IN AMERICA

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Thank you for inviting me to brief the subcommittee on the Department of Navy's Renewable Energy program. As Deputy Assistant Secretary of Navy (Installations and Facilities), I am responsible for the Navy and Marine Corps shore energy program. The Department of Navy is committed to implementing a balanced energy program that meets the goals of the Energy Policy Act of 2005, emphasizes reduced overall energy consumption, increased energy reliability, and reduced petroleum and natural gas fuel dependence. The Department of Navy energy program has reduced energy consumption by 30% per square foot since FY85, reducing energy expenditures by $400M. Department of Navy's successful energy program is recognized as a leader in the energy industry by the federal government and private sector. Department of Navy has received presidential and federal energy awards, as well as the Alliance to Save Energy "Star of Energy Efficiency" award and the Platts "Global Energy Award for Leadership."

Our goal is to use renewable energy where cost effective, and foster development of renewable energy technology when it does not detract from our mission. We partner with industry to facilitate public private ventures and Energy Savings Performance Contracts that build renewable energy systems on our installations; we purchase renewable electricity when it is cost effective to do so; we use proven technology developed by industry, universities and Department of Energy, and we encourage renewable technology development in ocean environments. Renewable energy is a key component of our comprehensive energy program. The Department of Navy is a leader in developing innovative approaches to the construction of renewable generation within the fence line of our installations including wave power and ocean thermal energy conversion plants. In FY05, including both renewable energy consumed by Department of Navy and renewable energy generated on Department of Navy lands and sold to the electric

grid, Department of Navy produced the equivalent of 10.6% of our installation electricity needs from renewable sources.

I made a distinction regarding the locations of the renewable generation. The Department has the choice these days to construct renewable generation within the base or purchase renewable power, or renewable energy credits from private entities off the base. We made the decision a number of years ago to concentrate on placing the generation on base. We took this position for several important reasons. First, by locating large renewable energy generation plants on base, we ensure an increased degree of energy security and decreased demand on our nation's electric grid. Of course some renewable technologies, such as wind and solar will be subject to periods when, and locations where, the renewable energy is not available. Others such as geothermal, wave, biomass, and ocean thermal energy are always available. A second important reason for choosing to locate renewables on base is that for every kilowatt-hour (kwh) of electricity produced, we reduce the amount of oil or natural gas burned as well as the associated emissions released to the local area. A third reason is that renewable energy is of great interest to our sailors, marines and their families. By seeing these installations up close we find that their awareness in overall energy utilization is increased. This interest is often demonstrated at work and at home through increased energy efficiency and conservation.

The first step in increasing the use of renewable energy is to assess the resource potential. Recently, the Department of Defense completed a assessment of renewable energy alternatives at or near military installations (Senate Report 107-68). The assessment was led by the Air Force with assistance from each of the Services, the U.S. Department of Energy (DoE) and

representatives of DoE national laboratories, and the renewables industry. Resources studied were wind, geothermal, and solar (including photovoltaic [PV], solar thermal, daylighting and transpired heat collection). The study reviewed installation resources, purchasing strategies for commercial sources, energy security impacts and the environment. Regarding these specific technologies, the study found that:

- There is potential for wind projects where utility rates are high or where power is generated at remote sites and a wind-diesel hybrid can be developed.
- Geothermal energy provides high-density power and there are a few potentially viable resources on DoD property.
- Solar photovoltaic (PV) is still very expensive but could be economical where there are very high utility costs, , where state and Federal rebates and tax incentives are in effect, and/or where there are state mandates requiring utilities to provide power from PV.
- The best solar potential is in daylighting, transpired heat collection, and solar thermal applications.

Department of Navy is developing a renewable energy strategy to implement many of the findings of the DOD assessment. In the remainder of my testimony, I will discuss what we have done and are doing to further the use of renewable energy in Department of Navy.

The earliest and most successful of our renewable plants is the 270 MW geothermal power plant at the Naval Air Weapons Station China Lake, California. Awarded in 1979, one plant produced 180 MW from Navy lands and another produced 90 MW capacity from Bureau of Land Management lands. The Navy's plant provides enough capacity to power the requirements of

120,000 homes. This is a public/private venture where the government provides land and the geothermal steam resource while the contractor provides the investment funds, and owns, operates and maintains the plant. The project is unique, being the only geothermal power plant of its type on DOD lands. Its uniqueness is more startling when you consider that 166 wells, 200,000 linear feet of piping and four power plants are operating on one of the Navy's busiest weapons and test ranges surrounded by Native American cultural sites.

The biggest concern in attracting industry to participate in geothermal partnerships is the risk involved in committing to a long-term contract with the government when the scope and extent of the geothermal energy is unknown. To reduce this risk the Navy has adopted the "farm out business model" which is used extensively by the oil industry. The Navy performs the preliminary investigations up to and including drilling test wells to prove the resource. With proven test results and a hot well which can be instrumented, industry is more willing to partner in what is still a risky enterprise.

The Navy does not take ownership of the electric power generated from this "facilitated" project. The electricity produced, to date over 45 million mega-watt-hours, is owned by the contractor and sold to the grid. The Navy receives as compensation for the land and geothermal resource, a share of the contractor's revenue, as authorized by 10 USC 2867. The amount of compensation is typically based upon an increasing percentage over time, a small percentage in the early years when the contractor's risk and investment is higher, and a larger percentage to the Navy when the investment is recovered and the plant, resource and operations are more stable. The majority of the revenue received is used to fund the Department of Navy's shore energy program and

meet Energy Policy Act goals. Annual revenue is used to validate and transfer technology into broad Department of Navy use, to install energy efficient lighting, heating, air conditioning, motors and other energy systems, provide program quality control and standardization, educate and involve all personnel in our efforts to reduce consumption, recognize and share success, and develop new renewable resources.

We are pursuing other geothermal partnerships at other locations in our role as DOD lead service for geothermal energy. We awarded a geothermal power plant project last year at Naval Air Station, Fallon, Nevada. This 30 MW plant could ultimately grow to 160 MW. We are exploring geothermal resources at Naval Air Facility El Centro, California while helping the Department of Army explore geothermal opportunities at Hawthorne Army Depot, Hawthorne, Nevada.

Department of Navy is also heavily invested in the opportunities provided by Congress. In FY06 and FY07, the Energy Conservation Investment Program (ECIP) will fund five solar photovoltaic projects valued at a total of $4.1M. Three of these projects will validate the performance of thin film solar roof top technology as requested by Congress in the Fiscal Year 2006 House of Representatives Report 109-95 accompanying the Military Construction Appropriations Act, 2006. If the technology proves to be more cost effective than conventional photovoltaics, Department of Navy will expand its use in other locations. Each year, the Department allocates at least 10% of ECIP funding to renewable projects.

While fuel cells are not cost effective yet, Department of Navy is gaining experience with the technology and facilitates industry's fuel cell development by providing sites for validating fuel cell performance. The Navy is completing an evaluation of 20 proton exchange membrane fuel cells in cogeneration applications at selected Department of Navy sites. The fuel cells offset a total of 60 kW of electric demand and were projected to generate 400,000 kWh and 600 MBTU in thermal recovery by the close of the demonstration period at the end of FY05. The fuel cells release negligible emissions.

Past fuel cell demonstrations include 32 proton exchange membrane (PEM) fuel cells in similar applications as the current ones. From FY02 to FY04 they provided 500,000 kWh and 2300 MBTU of thermal recovery and offset a total of 80 kW of electric demand. While installed costs per kilowatt were high ($30,000/kw) and reliability low (less than a year before the fuel stacks required replacement), cost is coming down and reliability improving.

Utilizing private sector and Navy expertise, Department of Navy developed an innovated project to combine solar technology with fuel cells and design, manufacture, and test a prototype regenerative solar/hydrogen fuel cell system at NAWS China Lake in FY04. The photovoltaic modules through electrolysissplits water into hydrogen and oxygen. The hydrogen is stored, and the oxygen is released to the atmosphere. The hydrogen runs a PEM fuel cell that produces power . The prototype unit was 1 kW and was evaluated for 1 year. In FY06, Congress appropriated $1.2M to further this technology and validate it in field applications. In addition, Department of Navy is validating the performance of new PEM fuel cells (ten 1 kW units in FY06) and molten carbonate fuel cells (two 1 MW units in FY06) as requested by Congress in

the National Defense Appropriation Act of 2005. The molten carbonate fuel cells are appropriate for Department of Navy installations because they are larger in capacity thus are more suited current Navy electrical loads. Molten Carbonate fuel cells also generate more heat for use in cogeneration applications, making them more efficient than PEM technology.

Energy Savings Performance Contracts (ESPC) are a critical tool for building, operating and maintaining renewable energy systems on Department of Navy installations. These contracts take advantage of private sector expertise and financing to meet EPAct goals with minimal up front government investment. Contractors often maintain the installed technology so that equipment efficiency is maintained and long term savings are realized. The savings generated more than pay for the project's life cycle cost. Without ESPC, these same funds would instead be spent paying utility bills generated by consumption of inefficient systems that do nothing to reduce dependence on foreign oil.

Using the ESPC legislative authority, Department of Navy constructed the two largest federal photovoltaic projects in the U.S. The two systems are a 1.1 Megawatt (Mw) photovoltaic power generating plant at the Marine Corps Base (MCB) at Twenty Nine Palms California and a 750 Kilowatt (kW) photovoltaic parking structure at Naval Base Coronado, North Island, CA. Together, these systems generate electricity equivalent to the need of 1,200 homes, avoid burning 6,000 barrels of crude oil and save $620K annually. These two systems also avoid an estimated 567 metric tons of greenhouse gases annually.

Department of Navy is participating in a pilot ESPC project with Department of Defense and Department of Energy, to fast track implementation of transpired solar collectors, photovoltaics and daylighting technology at multiple DOD installations. This replication effort will implement recommendations in the DOD renewable assessment mentioned earlier. Contract award is expected in FY06.

Department of Navy also builds using ESPC funds a 3.8 MW wind farm at Naval Station Guantanamo Bay, Cuba. The wind farm, thought to be the world's largest wind/diesel hybrid system, is expected to generate 7500 MWh (25% of the Station's power requirements) and save $1.2 million dollars in energy costs annually. Nearly 15% of the electricity now produced on the Naval Base Coronado San Clemente Island, CA. is generated by wind turbine technology. The quiet and smog-free 675-kilowatt wind farm is taking advantage of the island's 13 mile-per-hour average winds. Together the two wind projects avoid 14,900 barrels of fuel oil annually and provide enough capacity to power 2,900 homes.

I mentioned earlier that Department of Navy focus on renewable energy is primarily to construct on-site generation. Where cost effective, we also purchase energy generated from renewable sources. At Naval Shipyard, Portsmouth, VA, we are purchasing steam and electricity generated from biomass. Nearly 115,000 Mwh and 379,000 Mbtu of energy are purchased annually from this facility. We continually monitor the price of renewable electricity, and aggregate loads to maximize our purchasing power in this expanding market.

The Department of the Navy has been a world leader in innovative energy reduction initiatives. We have partnered with industry to deploy innovative technologies such as wave and ocean thermal energy conversion. The Office of Naval Research (ONR), Naval Facilities Engineering Command and the Marine Corps Base Kaneohe Bay, Hawaii are leveraging the Small Business Innovative Research (SBIR) Program to test the first of a series of wave power buoys. The SBIR program goals are to evaluate the economic and technical feasibility of converting wave energy into reliable electrical power for Navy applications. In the spring of 2004, the first buoy was deployed with a design capacity to produce 20 Kilowatts in an environmentally friendly manner. Subsequent buoys are expected to increase efficiency, and operate 24 hours a day. The Wave Energy Project objectives are to: 1) maximize the efficiency of the wave energy conversion process; 2) demonstrate system reliability; and 3) minimize deployment, operation and maintenance requirements. In meeting these key objectives, the Navy will gain the capability to deploy a unique renewable energy system, taking advantage of the Navy's close ties to the sea, and applying renewable energy where traditional systems are not cost effective or technically feasible.

We are also advancing technology to convert the oceans thermal gradients to electricity and potable water, reducing our dependency on fossil fuel, and increasing our energy security while supporting critical DOD missions.

We partnered with industry using SBIR to develop a computer model to evaluate the feasibility of integrating Ocean Thermal Energy Conversion (OTEC) at military installations on tropical islands. The model was applied to seven DoD island installations. Model results indicated Naval

Support Facility Diego Garcia has the greatest potential energy savings followed by Guam and Kwajalein atoll.

We completed the on-site verification of ocean bathymetry, on shore integration requirements, and utility consumption and production levels at Diego Garcia. This information is being used by the SBIR contractor to develop a preliminary OTEC design and environmental study to support United States and United Kingdom concurrence of a privately funded OTEC system. Preliminary design and environmental study reports are due April 2006. The proposed OTEC facility will be designed to provide 7 MW of electrical power and 1.25 million gallons of potable water per day for the island. Once fully operational, the Diego Garcia OTEC facility will use the authority of Title 10 US Code 2394 and engage into a Power Purchase Agreement - resulting in an expected annual cost avoidance of $2M.

The U.S. Army asked Navy to review the feasibility of OTEC at the Kwajalein Atoll/Reagan Test Site. We are working closely with the Army and Department of Energy Federal Energy Management Program to ensure that lessons learned at Diego Garcia are applied to the Kwajalein Atoll/Reagan Test Site.

The Navy is also focused on reducing the petroleum requirements of automobiles by using biodiesel fuels and partnering with local communities and industry. Biodiesel is a clean burning alternative fuel, produced from domestic, renewable resources such as spent restaurant vegetable oil. Biodiesel contains no petroleum, but it can be blended at any level with petroleum diesel to create a biodiesel blend. DoD currently approves the use of B20, which is a blend of 20% biodiesel and

80% petroleum diesel for non-tactical vehicles. The Department of the Navy used more that 2 million gallons of alternative and biobased fuels in 2005, using ethanol at 8 fleet locations. Marine Corps installations are now using biodiesel at over 85% of primary fleet locations. In 2005, we replaced 2,600 conventional vehicles with alternative fuel vehicles and hybrids.

At Marine Corp Base Camp Pendleton, California we are partnering in a demonstration of hydrogen fuel cell infrastructure and vehicles. The project includes installation of a hydrogen fueling system that will be used to test and evaluate fuel cell vehicles. The fuel cell vehicles get 26 miles per gallon and the only exhaust is pure water.

At the Naval Facilities Engineering Service Center (NFESC) in Port Hueneme, California we are conducting a biodiesel production facility demonstration/validation effort executed under a Cooperative Research and Development Agreement (CRADA). The effort is funded by the Navy Pollution Prevention Equipment Program. NFESC has completed the testing on the 400-gallon batch processing and preparing to test a 1-3 million gallon per year full production unit. The economic model of biodiesel production predicts small-distributed production facilities that the Navy would implement via public private ventures. Other applications also under investigation include biodiesel as a tactical vehicle fuel and small containerized production facilities for remote applications.

I look back on the Department of Navy's energy program’s achievements over the past 20 years with pride and I have confidence that the Navy and the Marine Corps will excel at meeting the energy challenges of the 21st century. Our energy management program, with high profile solar, wind and geothermal projects as well as more traditional technologies has proven to save

energy and make our nation more secure. By our contributions in renewable energy discoveries and reduction of petroleum usage, the Department of the Navy's energy program will continue to apply innovative solutions to a national problem. We are saving energy and taxpayer dollars in support of the Energy Policy Act and the President's Advanced Energy Initiative. We cannot meet the threats of tomorrow by simply maintaining today's readiness and capabilities of our physical plant. We must continue to transform and recapitalize for the future without jeopardizing readiness. With our partners in industry, the acquisition community, and the continuing support of the Congress, the Department of Navy will build and maintain installations that are properly sized, balanced -- and priced for tomorrow.