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The Navy's recently adopted strategies and projects to produce renewable energy on its shore installations meet or exceed executive and legislative requirements, are strategically important, and the economic benefits provided by their creative financing structures and partnerships with private businesses result in attractive savings and returns on investment. Moreover, while Navy leadership stresses large scale (>1MW) renewable power generation projects to gain efficiencies in command and control efforts for contract management, opportunities should be capitalized upon to standardize and institutionalize the energy ethos promoted by the Navy's installation renewable energy policies.

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MASTER OF MILITARY STUDIES

**Greening the Fleet: Navy Shore Installation Renewable Energy Strategies, Methods,
and Opportunities**

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

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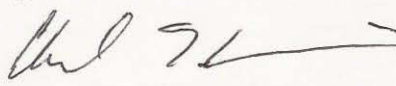
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28 MAR 2016

Executive Summary

Title: Greening the Fleet: Navy Shore Installation Renewable Energy Strategies, Methods, and Opportunities

Author: Lieutenant Commander Curt V. Montano, United States Navy

Thesis: The Navy's recently adopted strategies and projects to produce renewable energy on its shore installations meet or exceed executive and legislative requirements, are strategically important, and the economic benefits provided by their creative financing structures and partnerships with private businesses result in attractive savings and returns on investment. Moreover, while Navy leadership stresses large scale (>1MW) renewable power generation projects to gain efficiencies in command and control efforts for contract management, opportunities should be capitalized upon to standardize and institutionalize the energy ethos promoted by the Navy's installation renewable energy policies.

Discussion: To comply with the executive and legislative requirements for renewable installation energy, and to convert them into actionable steps for the Navy, Secretary of the Navy Ray Mabus has mandated five renewable and alternative energy goals for the Navy: (1) by 2020, at least 50% of total Navy energy consumption will come from alternative sources; (2) by 2020, at least 50% of shore based installation energy requirements will be met with alternative sources, and at least 50% of ashore installations will be net-zero energy consumers by using solar, wind, ocean, and geothermal power generated on base; (3) by 2016 sail the Great Green Fleet composed of a carrier strike group of nuclear and bio-fueled ships, and bio-fueled aircraft - achieved in January 2016 with the deployment of the John C. Stennis Strike Group; (4) by 2015 reduce non-tactical petroleum use in the commercial vehicle fleets by at least 50%; and (5) evaluate energy factors when awarding systems and building construction contracts. The shore installation requirements embedded in goals (1), (2), and (5) are the focus of this analysis, and they exceed requirements from higher directives.

Conclusion: The SECNAV renewable and alternative energy goals are legislatively, economically, and strategically important; furthermore, the Navy can standardize and institutionalize the energy ethos promoted by its goals through the implementation of a few relatively simple but impactful actions.

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Table of Contents

	Page
EXECUTIVE SUMMARY.....	i
DISCLAIMER	ii
TABLE OF CONTENTS.....	iii
LIST OF ILLUSTRATIONS.....	iv
INTRODUCTION	1
PRESIDENTIAL, LEGISLATIVE, AND DEPARTMENTAL RENEWABLE ENERGY REQUIREMENTS.....	3
STRATEGIC IMPERATIVES FOR INSTALLATION ENERGY PRODUCTION	6
ECONOMICS AND CONTRACT STRUCTURES OF ON-SITE RENEWABLE POWER PRODUCTION.....	9
STANDARDIZING AND INSTITUTIONALIZING ENERGY ETHOS.....	15
CONCLUSION.....	20
ENDNOTES	21
BIBLIOGRAPHY.....	23

List of Illustrations

Figure 1	10
Figure 2	10

INTRODUCTION

The Department of the Navy (DON) must effectively manage energy consumption and lead in energy innovation to assure superiority in the execution of its national defense mission. Ashore this will require the provision of reliable, resilient, and redundant energy sources for task critical assets...DON installations must reduce vulnerabilities to the electric grid by lowering their energy dependence and integrating security technologies which enable greater control of distribution.¹

SECNAVINST 4101.3, Department of the Navy Energy Program for Security and Independence Roles and Responsibilities

In 1987, the first of nine geothermal power plants at the Coso geothermal field onboard Naval Air Weapons Station China Lake California started supplying power to Southern California Edison power utility. The China Lake geothermal project was record setting in size and scale: the installation's size at 1700 square miles is larger than the state of Rhode Island, represents 85% of all Navy land holdings, and the peak power production of 270 megawatts (MW) at the Coso field makes it the largest geothermal power plant ever built in the United States.² The China Lake geothermal plant now has a maximum capacity of 170MW since the site is losing about 2% production capacity per year due to natural geothermal resource decline. Combining private financing and long-term power sales agreements between the Navy, Southern California Edison electric utility, and other private power plant construction and operations firms, China Lake was an innovation that could have heralded a burst of Navy and other Defense Department renewable energy projects. However, for several reasons including fossil fuel economics, conflicts in the Middle East, varying executive and legislative branch priorities, and renewable energy inefficiencies, China Lake remained in many ways a radar blip in the Navy's installation renewable energy portfolio for the next twenty-five years.

In August 2015, a Navy renewable energy project was announced that approaches the scope of China Lake: the Navy / Western Area Power / Sempra Gas & Power partnership for 210 MW of solar generating capacity to be deployed across fourteen Navy and Marine Corps installations in the American southwest. The southwest solar project highlights a reinvigoration of the Navy's priority to produce on-site renewable energy, is the largest and latest in a string of renewable energy projects for the Navy, and is expected to save the Navy over \$90 million over its lifetime.³ The Navy's current renewable and alternative energy goals apply to both its shore installations (ports, naval bases, air stations, weapons facilities, test ranges, submarine bases, and other land-based facilities) and to the operational fleet (ships, aircraft, or deployed sailors and marines and their associated equipment). These categories match those of the Department of Defense (DoD), which recognizes operational energy as that which is used to support military deployments across the full spectrum of missions and to support training in support of unit readiness for military deployments, while installation energy refers to those permanent facilities both in the continental United States and overseas.⁴

Over the last five years, the Navy has ramped up its information campaign to promote installation renewable energy projects like the 210 MW solar project, and operational energy efforts like the Great Green Fleet (an homage to Roosevelt's Great White Fleet), comprised of an aircraft carrier strike group to be powered by renewable and alternative energy sources. This paper will show that the Navy's recently adopted strategies and projects to produce renewable energy on its shore installations meet or exceed executive and legislative requirements, that these strategies and projects are strategically important, and that the economic benefits provided by their creative financing structures and partnerships with private businesses result in attractive savings and returns on investment. Moreover, while Navy leadership stresses large scale

(>1MW) renewable power generation projects to gain efficiencies in command and control efforts for contract management, opportunities should be capitalized upon to standardize and institutionalize the energy ethos promoted by the Navy's installation renewable energy policies.

PRESIDENTIAL, CONGRESSIONAL, AND DEPARTMENTAL RENEWABLE ENERGY
REQUIREMENTS

I'm directing my administration to allow the development of clean energy on enough public land to power 3 million homes. And I'm proud to announce that the Department of Defense, working with us [the federal government of the United States], the world's largest consumer of energy, will make one of the largest commitments to clean energy in history – with the Navy purchasing enough capacity to power a quarter of a million homes a year.⁵

President Barack Obama, 4th State of the Union Address, 24 January 2012

More than speech soundbites about the importance of energy to mission accomplishment, or election season bumper-sticker rhetoric touting the benefits of energy independence, the legislative and executive branches have mandated action over the last several decades that compel federal agencies to act, and it is important to understand the details of the most impactful federal requirements to assess how they shape the Navy's current renewable energy goals. In response to the oil crises of the 1970s, Congress passed the first modern set of energy regulations in the National Energy Conservation Policy Act and its embedded Public Utility Regulatory Policies Act (PURPA) in 1978. Both Acts have been amended periodically over the years, and, along with the Energy Independence and Security Act of 2007, require percentages of total federal energy to be produced domestically, to be from renewable sources, and to be reduced progressively over time. Renewable energy is defined as energy from solar, wind, biomass, landfill gas, ocean, geothermal, solid waste, or hydroelectric by the Environmental Protection Act of 2005 section 203; not included in this definition are energy sources such as nuclear,

compressed natural gas (CNG), or hydrogen which are more appropriately labeled as alternative energy sources.⁶ For example, fossil fuel energy consumption is to be reduced 80% by 2020 and 90% by 2025, relative to 2003 levels.^{7 8} In the 1970s and 1980s, hydro and geothermal produced electricity were the country's primary sources of renewable energy, making the 1987 China Lake geothermal project a logical inaugural large scale Navy renewable energy project.

The Energy Policy Acts of 1992 and 2005 mandated many energy and resource savings steps for federal entities that shape the Navy's current goals, including⁹

- Energy savings performance contracts to entice third-party investment in federal building efficiency upgrades (the details of these and other public-private partnerships will be described in greater detail later in this paper)
- Metering of federal buildings for supervisory control and data acquisition (SCADA)
- Low flow toilets, limiting their maximum flow to 1.6 gallons per flush
- A minimum of 7.5% of the total federal facility electricity consumption for fiscal years (FY) 2013 and beyond must be renewable energy

As for requirements levied directly on the DoD, title 10 of the United States Code, section 2911(e) requires the DoD to produce or procure facility energy from renewable sources whenever the sources support energy performance goals and service or installation master plans.¹⁰ These master plans are in turn reviewed through each service, with the Under Secretary of Defense for Energy, Installations, and the Environment (USDEIE) giving final approval. In section 2852 of the John Warner National Defense Authorization Act (NDAA) of 2007, Congress and President George W. Bush mandated the DoD procure 25% percent of its energy from renewable energy by 2025. Therefore, in United States Code 2911(e) and the 2007 NDAA, the federal government recognizes and prioritizes renewables as an energy source of choice for

the DoD. The flexibility to determine if renewables are actually cheaper for specific projects is left to the USDEIE, but for the government overall, renewables are increasingly becoming a desired source.

A final category of high-level direction for the Navy's renewable energy goals comes via Presidential Executive Orders, the most pertinent of those being

- Executive Order 13423 – Strengthening Federal Environmental, Energy, and Transportation Management, 24 January 2007, requiring 3% annual reduction in energy intensity through the end of FY2015 or 30% by the end of FY2015 relative to FY2003; at least half of renewable energy consumed is to come from newly constructed renewable sources; preference is given for renewable energy generation projects on agency property for agency use.¹¹
- Executive Order 13514 – Federal Leadership in Environmental, Energy, and Economic Performance, 05 October 2009, requiring new federal buildings designed in 2020 or later to be net zero energy consumers.¹²
- Executive Order 13693 – Planning for Federal Sustainability in the Next Decade, 19 March 2015, requiring federal agencies to reduce facility energy intensity (measured in British thermal units per square foot) by 2.5% annually through fiscal year 2025 relative to a FY2015 baseline; and requiring renewable or alternative sources to provide 10% of facility energy in FY2016, increasing to 25% by FY2025.¹³

To comply with the executive and legislative requirements for renewable installation energy, and to convert them into actionable steps for the Navy, Secretary of the Navy Ray Mabus has mandated five renewable and alternative energy goals for the Navy: (1) by 2020, at least 50% of total Navy energy consumption will come from alternative sources; (2) by 2020, at least

50% of shore based installation energy requirements will be met with alternative sources, and at least 50% of ashore installations will be net-zero energy consumers by using solar, wind, ocean, and geothermal power generated on base; (3) by 2016 sail the Great Green Fleet composed of a carrier strike group of nuclear and bio-fueled ships, and bio-fueled aircraft - achieved in January 2016 with the deployment of the John C. Stennis Strike Group; (4) by 2015 reduce non-tactical petroleum use in the commercial vehicle fleets by at least 50%; and (5) evaluate energy factors when awarding systems and building construction contracts. The shore installation requirements embedded in goals (1), (2), and (5) are the focus of this analysis, and they exceed requirements from higher directives. For example, while the 2005 Energy Policy Act required 7.5% of facility energy to be renewable, and Executive Order 13693 of 2015 required a minimum of 10% in FY2016, increasing to 25% by 2025, Navy Secretary Mabus set a goal of 50% by 2020, double the percentage and five years sooner than the most stringent federal requirement. Therefore, recognizing that federal renewable energy requirements have become more constrictive with successive legislation, and to establish a more aggressive energy posture, the DoN goals surpass requirements and reduce the Navy's overall energy demand, decrease its reliance on foreign oil, and increase its use of alternative energy.¹⁴

STRATEGIC IMPERATIVES FOR INSTALLATION ENERGY PRODUCTION

One primary energy challenge the DoD faces is that critical missions at military installations are vulnerable to commercial power outages and inadequate backup power supplies. Fixed installations are 99% dependent on the commercial power grid and other infrastructures. Power at military installations is based on assumptions of a more resilient grid than exists, and much shorter outages than occur, and is not sized to accommodate new Homeland defense missions. Installations now serve as base of operations to coordinate the full range of national relief and recovery services.¹⁵

More Fight, Less Fuel, Report of the Defense Science Board Task Force on DoD Energy Strategy, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, February 2008

With over eighty-one installations worldwide, supporting 272 ships, 3700 aircraft, and 530,000 personnel, the Navy fulfills significant mission requirements from its shore facilities.¹⁶ As a traditional Navy base function, installations provide husbanding services for berthed ships by supplying shore electric power and water. These shore services allow the ship's gas turbines, nuclear reactors, and other primary power plants to be shutdown, saving their fuel (which is more expensive than that used for installation energy) for underway operations, and minimizing run-time and resultant maintenance costs. The cost savings to the Navy from securing (Navy term for "shutting down") organic power production and water purification equipment is magnified since atmospheric control equipment, air conditioning plants, air purifiers, coolers, and other supporting equipment can be secured when not needed to support the primary power plants. For public risk management reasons, nuclear powered Navy ships are to minimize the operation of their reactors inport. However, the plants require continuous monitoring by a team of watchstanders, and the monitoring equipment is powered exclusively from off-hull unless a grid interruption requires the ship to use its back-up power sources. Furthermore, many installations maintain sensitive nuclear or weapons material that requires constant environmental controls and monitoring, all dependent on the installation power system.

Beyond their traditional support for berthed-ships, or providing office space and housing for sailors and marines, Navy installations perform a variety of active mission support roles. With increasing demands for near-instantaneous and high bandwidth telecommunications, deployed ships and units depend heavily on shore installation power sources to transmit communications. As military installations become involved in homeland defense, emergency response, and humanitarian relief, their dependence on installation power grows. For example, during Hurricane Sandy, *USS Wasp (LHA-1)*, *USS San Antonio (LPD-17)*, and *USS Carter Hall*

(LSD-50) were positioned off the New York and New Jersey coasts supporting disaster relief with personnel, high-volume water pumping equipment, medical supplies, and construction teams and material.¹⁷ While the ships supplied their own power, they were only able to receive updated information about weather conditions, relief needs, and logistics resupplies from operational commanders at Norfolk Naval Station to the extent that the installation and surrounding power grids could keep shore-based communications gear operational. Another example of a growing mission performed at military installations that has direct and real-time battlefield impact is operation of remotely piloted aircraft (RPA). RPA missions are controlled from installations sometimes thousands of miles from the operational area, and are highly dependent on the base power supplies.

But perhaps the strongest strategic justification for installation energy independence fueled from renewable sources is the need to communicate with the most survivable leg of the country's nuclear triad, the deployed ballistic missile submarine (SSBN) force. The country's fourteen SSBNs are powered by nuclear reactors when underway, with diesel generator and electric battery backups. They patrol vast ocean areas, thousands of miles from shore, ready to launch upon the receipt of valid, authentic, and authorized orders from the President or other designated national command authorities. Nuclear weapons command and control procedures prevent the SSBN from unilaterally launching its missiles. The SSBN must receive launch orders that provide decipher codes for critical interlocks in the firing circuits onboard ship, and the circuit cannot be completed without those codes. To receive launch orders, the SSBN maintains a complex suite of communications gear in operation 100% of the time it is in an alert status. Those launch orders, along with the regular operational message traffic from higher headquarters, are transmitted to deployed SSBNs simultaneously from multiple (for redundancy)

Navy installations that require continuous power. So while the SSBNs themselves are assured constant power because of organic power-production equipment, the DoD's shore installations that would need to direct the SSBNs to complete their mission are 99% dependent on a complex and off-site grid, making the system much more vulnerable than one where distributed, on-site power is produced using renewable sources. To the point that installation suffer frequent and costly power outages, the 2014 DoD Annual Energy Report highlights that DoD components experienced 114 utility outages of eight or more hours in FY2014, costing approximately \$246,000 per day.¹⁸

ECONOMICS AND CONTRACT STRUCTURES OF ON-SITE RENEWABLE POWER

PRODUCTION

*42 million gallons of oil are saved annually at Norfolk Naval Shipyard in Portsmouth Virginia because of a waste-to-energy facility. Managed by Southeastern Public Service Authority, the plant provides steam and electricity to the shipyard; the excess energy is sold to Dominion Power.*¹⁹

Power Surge, How the DoD Leverages Private Resources to Enhance Energy Security and Save Money on US Military Bases, Pew Charitable Trusts, January 2014

DoD installation energy use is significant: with a FY2014 price-tag of \$4.2 billion, the DoD accounted for 1.2% of total US energy consumption, and 20% of total federal energy consumption. The Navy's installation energy bills comprise the single largest cost for Navy installations, reflecting about 28% of DoD's installation energy consumption, equating to \$1.2 billion (Figure 1 and Figure 2).²⁰

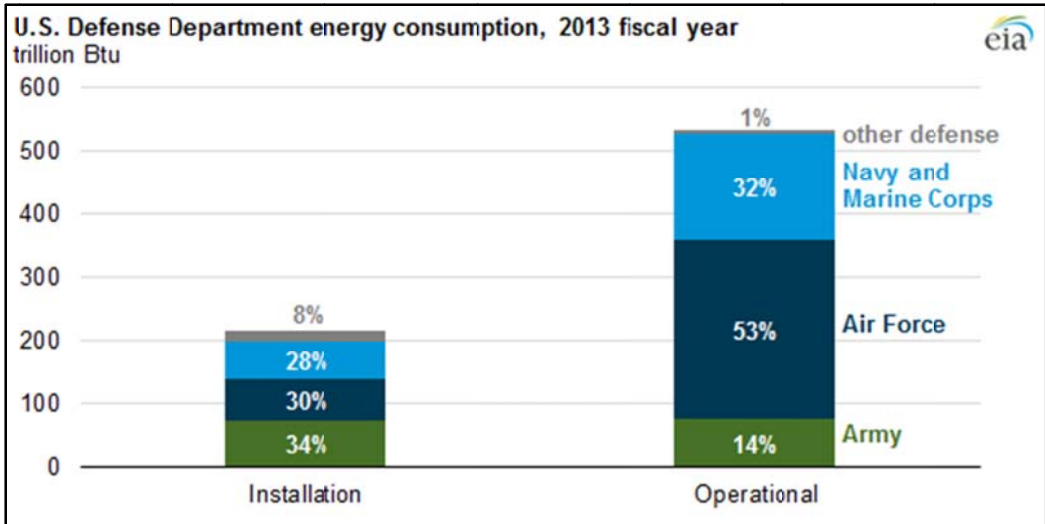


Figure 1: DoD Energy Consumption FY2013, source: US Energy Information Administration²¹

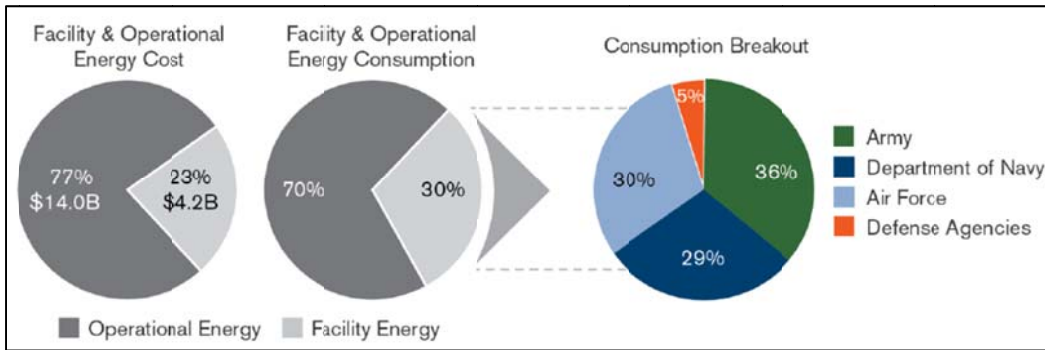


Figure 2: DoD FY2014 Facility Energy Consumption and Cost, source: DoD Annual Energy Management Report²²

To meet its legal mandates, address its significant energy demand, and mitigate the vulnerabilities associated with its grid-dependent installations, the Navy has undertaken a number of on-site renewable energy projects. At least twenty renewable energy projects producing over 465MW of power are managed across the Navy’s eighty-one installations. These projects range in scale from the massive Southwest/Sempra 210MW photovoltaic solar electric complex and the 170MW (present capacity) China Lake geothermal facility, down to 87 kilowatt (kW) rooftop thin-film photovoltaic parking garage electric lighting systems at Naval Base Ventura County California. An interesting and telling feature about the Navy’s installation renewable power production portfolio is that the overwhelming majority of generating capacity

is installed in California. In fact only 54.5MW of the total 465MW of on-site renewable power is produced outside of California, equating to 11% of the total.²³ Two important reasons for California's dominance in the Navy's renewable portfolio are the strength of solar and geothermal resources in the state, and the favorable contract and rate structures offered by the state to entice private party investments. While the suitability of an area for renewable energy is primarily based on the resource strength of the area, the contract structures available to the Navy and private industry also play a significant role in determining which installations develop onsite energy.

A deeper dive into the contract structures used by the Navy for its renewable projects is warranted, as it provides insight into where and how the projects are undertaken. Traditionally, the most common approach to fund on-site renewable power production projects has been direct funding from congressional appropriations. Several budgetary accounts have funded these efforts, typically at smaller scales, including the military construction program (MILCON); the Sustainment, Restoration, and Modernization Program; the Energy Conservation Investment Program (ECIP); and the Defense Working Capital Fund. Navy utilities contract management is performed by Naval Facilities Engineering Command (NAVFAC), who coordinates with the various utility authorities to consider local and regional rules and pricing structures on behalf of the government. The common factor in these funds and programs is that the Office of the Secretary of Defense awards the allocation to the service, who in turn manages all aspects of the project. Furthermore, in these structures the DoD uses either fixed-price contracts for deliverables according to specifications per an agreed timeline, or uses multiple-award task order contracts (MATOC) with multiple contractors for an indefinite quantity of goods and services over an unspecified time.²⁴

To reduce upfront capital investment, to minimize risk associated with command and control of long-term contracts, to leverage subject matter expertise from civilian industries, and to further the federal government's goals for more widespread use of renewable energy, the DoD employs third-party financing and contract structures to partner for the construction and operation of energy efficiency projects and renewable power generation on its installations. Under the energy efficiency category, Utility Energy Service Contracts (UESC) and Energy Savings Performance Contracts (ESPC) allow the Navy to enter into contracts with energy service companies or utilities with no upfront capital outlays. The third party assesses the facility and offers efficiency improvements through building insulation upgrades, smart power use systems (automatic features that turn loads off when not in use), and water use reduction (which translates directly to facility cost savings). A cost savings value is guaranteed by the third-party, which pays for the project over the contract term; when the contract is paid off, the federal agency retains the efficiency upgrades and its associated cost-savings. Limits exist with these efficiency upgrade contracts in terms of length (twenty-five years maximum), and purpose (they typically do not include provisions for renewable energy production) per the PURPA of 1978.

To generate on-site renewable energy using third-party financing and facility management, the Navy undertakes enhanced use leases (EUL) and power purchase agreements (PPA). PPAs are contracts allowing construction of electricity production facilities on federal land, with the private industry party or public utility owning and holding responsibility for the construction and operation of the facility for the life of the contract; the government does not own the equipment. The attractiveness for the private party is in the tax benefits offered for renewable energy production facilities, since only parties that pay taxes can receive the

investment tax credit and federal production tax credit that offset the costs of the facility. As a tax-free land holder, the Navy would not receive these tax credits and would pay full cost for the projects. The Navy has the option to buy the energy produced on its installation at a fixed or reduced price for as long as 30 years. These PPAs have proved useful over the last few years in western states where the bulk of the Navy's land holdings reside, with the Navy undertaking the military's first PPA in 2012 at Naval Station China Lake for a 13.8MW solar project.²⁵ As PPAs are a fairly new concept involving complex legal and contracting terms, they have resulted in prolonged negotiations upwards of two years as the Navy and private industry work through the issues. Experts project that the time to finalize such contracts will be reduced as familiarity is gained, and Navigant Research Corporation (a subcontractor of the Pew Charitable Trusts) estimates that 80% of future DoD renewable energy projects could be financed with PPAs.²⁶ EULs are similar to PPAs in that they allow the Navy to offer land to private industry for the purpose of renewable energy generation, but typically the EUL is used in situations where the installation can accommodate a large project but cannot consume the energy produced by the project.²⁷

While complex, contract structures used by the Navy are only one of several factors that must be considered when evaluating installation energy projects. Local, state, regional, and federal regulations governing renewable energy, tax incentives, net metering, sale of electricity, interference with military or civilian flight operations, and a host of other considerations also complicate the situation. A review of two other considerations, how the military evaluates energy generation projects for interference with military operations, and how the military sells electricity generated on its installations, will round-out this overview of the major economic considerations.

Renewable energy facilities like wind turbines, solar towers, and large area solar photovoltaic arrays can impact Navy operations, flight programs, radar systems, training, and testing through their physical location, glint/glare effects, or electromagnetic sensor interference. To evaluate these and other pertinent factors, the DoD Siting Clearinghouse evaluates and manages encroachment risks using a Mission Compatibility Evaluation process. Performed by the Office of the Assistant Secretary of Defense for Energy, Installations, and the Environment, the evaluation process reviews geographic location, details of structures (number of structures, height, and arrangement), power line heights and arrangements, electromagnetic emissions, and substation locations. The Clearinghouse is staffed by representatives from all services, to promote compatibility between the services, and to ensure a consistent process as all services work to meet the legislative and executive obligations described earlier. Reflective of the US government's priority to promote renewable energy production on its installations, in 2011 Congress mandated more transparent and continuous communications between the Clearinghouse and external stakeholders (power production firms, state and regional legislative bodies, investors), and significantly raised the bar for when and how DoD may object to project proposals. The overriding policy of the Clearinghouse is to work with private parties, state and local entities, and the military to approve projects unless there is an unacceptable risk to national security, as reflected in the clearance of 2,332 out of 2,594 proposals (90 %) in CY 2014.²⁸

As the Navy progresses with its on-site renewable generation projects, an inviting option is to sell excess power generated on base to the local utility. Title 10 of US code, section 2916 permits the sale of electricity from alternative energy and cogeneration production facilities produced on military installations. The Secretary of the Navy may authorize the sale, either directly from the military branch or through a contractor, to a public or private utility company.

Energy sold in this fashion must meet regulations codified in the Public Utilities Regulatory Policies Act of 1978.²⁹

STANDARDIZING AND INSTITUTIONALIZING ENERGY ETHOS

*Our Service leadership (Navy and Marine Corps), regional commanders, and installation commanding officers must make renewable energy a programmatic priority. This strategy is an aid for Commanding Officers seeking ways to enhance their energy posture and thereby contribute to the energy goals of the Department... Many opportunities exist nation-wide to develop projects on or near DON installations; we cannot fully realize this potential without the expertise and ingenuity of our neighbors and fellow citizens. We look forward to furthering our mutually productive and critically important collaboration.*³⁰

DoN Strategy for Renewable Energy, October 2012

In many respects, DoN maintains a forward-leaning and reasonably well publicized campaign to promote its renewable and alternative energy goals. DoN's Energy, Environment, and Climate Change website at <http://greenfleet.dodlive.mil/> contains links to Navy and Marine Corps instructions, news announcements, and video clips. Each quarter DoN publishes *Currents* magazine, serving as the Navy's Energy & Environmental Magazine, with such relevant articles as "Being Energy Smart Creates More Combat Capability" and "Office of Naval Research Program Evaluates Emerging Energy Technologies at Naval Facilities."³¹ Fully embracing the concept that good ideas may not always come from the front office or the Commanding Officer's stateroom, DoN also solicits energy efficiency ideas from military and civilian employees through their interactive Navy Energy Innovation webpage, where ideas are submitted, posted for public review and comment, and then responded to by official DoN staff.³²

Aside from large scale projects and complex contracts, and in addition to the public affairs campaign discussed above, opportunities exist to institutionalize and standardize the ethos inherent in the Navy's renewable and alternative energy objectives. One far-reaching action the

Navy would benefit from is the assignment of a Unit Energy Manager (UEM) at all commands. The UEM would serve as a primary point of contact to collect information on energy usage, formalize training and information dissemination to the command, and advise the chain of command on related activities and recommendations. While UEMs are currently assigned to monitor the energy usage and policy compliance at large DoN installations, they are not required to be assigned at each of the smaller or tenant commands on the installations, even as a collateral duty. The practice of assigning collateral duties is proven military-wide, with coordinators such as Sexual Assault Prevention Representative (SAPR), Drug and Alcohol Prevention Awareness (DAPA) Coordinator, and Safety Coordinator acquiring a relative subject matter expertise at the command and keeping the commander informed of requirements from higher authority.

Other services have recognized the importance of a unit-level energy point-man. The Marines mandated UEMs on 09 March 2015 with the standup of Energy Ethos Campaign and UEM Program.³³ The Commandant of the Marine Corps requires commands to identify an energy manager at the unit level to coordinate unit and tenant involvement and actions as part of the installation's overall energy program. Consistent with other unit-level programs, the UEM receives training on governing instructions and tools to be used in performance of his duties, promulgates information to the command, and bridges the gap between the unit team members, the unit chain of command, and the base or installation energy managers. According to the Marine Corps Communication Playbook of 08 October 2015, "[The UEM program] promotes end-user awareness and behavior change in individual Marines by helping them understand their daily impact on the energy and water footprint and how they can improve their use habits."³⁴ The unit-level energy program manager is accessible to each command member and the leadership team, and is in contact with other similarly tasked managers from other tenant and

supervisory commands at the installation. Rather than each individual Marine being expected to educate themselves on energy policies or standards, and then try to implement them for his command on an individual basis, the UEM can work with the command leadership to implement command-wide expectations and achieve unity of effort. The Navy would do well to adopt the Marine model and mandate a UEM at each command within the DoN.

Another institutional change that would support the Navy's renewable and alternative energy goals would be the incorporation of training and certification on the goals and methods to implement as part of the installation command team qualification process (installation Commanding Officer, Executive Officer, and Senior Enlisted Advisor). The Navy operates over eighty-one installations globally, generally commanded by an O-6 Navy Captain who has completed a successful tour as a Commanding Officer of a deployable ship, submarine, aircraft squadron, or otherwise operational or tactical unit. To then move on to command one of the Navy's shore installations, the officer would be expected to either complete qualifications as delineated by Commander, Navy Installations Command Instruction (CNICINST) 1412.1 *Qualification for Command Ashore-Installations* dated 06 May 2013, or to receive a designation as Qualified for Ashore Command from their parent community (submarines, surface, air, special warfare, etc.). Two aspects of this command qualification flow path impact how the installation will meet DoN goals. First, while CNICINST 1412.1 requires training and certification for the prospective Commanding Officer (PCO) on multiple personnel and equipment management programs, very little of the process focuses on the DoN's installation-specific energy objectives. The instruction requires the PCO to "understand the importance of Building Energy Monitors with regards to the installation energy program", and offers "the Energy Policy Act" as one of over 300 instructions in the "References and Study Aids" section

of the instruction.³⁵ It does not, however, ensure familiarity with the Navy's five energy goals, the multiple Navy and DoD energy requirements (not to mention legislative and executive mandates), or the Navy's Energy Return on Investment (eROI) tool which used to evaluate the suitability of renewable energy project proposals on shore installations.³⁶ While much of the instruction does prepare the PCO to understand the environmental, air, water, and pollution control issues he will face, not forcing the study and understanding of Navy renewable and alternative energy goals, techniques, and governing instructions puts the installation PCO at a disadvantage.³⁷

While CNICINST 1412.1 may ensure some renewable and alternative energy training and certification, most PCOs do not complete the requirements of the instruction. Commander Navy Installations, which approves all Navy shore installation Commanding Officer appointments, bases their approval on the recommendation of the officer's parent community. While each community does have a qualification process for command at-sea, command ashore designations are based on the officer's performance, and not on a unique ashore-command process. It is not a stretch to recognize the similarities in commanding personnel afloat or ashore, or how electrical systems operate on a ship as compared to a building, but the real difference lies in how the installation CO directly influences the energy management and construction choices on the base as compared to an afloat CO who manages the pre-built and mostly unalterable ship. For example, a prospective submarine CO would have completed a rigorous qualification process demanding expertise in communications equipment, counter-detection considerations, damage control actions for fires or flooding, weapons employment tactics, enemy submarines and surface warships, and a long list of other topics pertinent to operating a multi-billion dollar national sea-going asset. He would likely never have studied the

Navy installation eROI, an electronic data analysis tool used to evaluate projects, and he would likely have not reviewed the Navy's *Strategy for Renewable Energy* and its SECNAV energy goals and contracting options to achieve those goals.³⁸ Consequently, the Navy would better prepare their installation CO's, and make progress towards achieving its goals by taking two actions in regards to CNICINST 1412.1: update the instruction to include current renewable and alternative energy doctrine/instructions and operational tools such as eROI that the installation CO will be expected to oversee and manage, and require all installation PCOs to complete the updated qualification process instead of qualifying the officer (no doubt capable and proven) based on his at-sea or otherwise operational performance.

In keeping with the Navy's model for promulgating information fleet-wide, another recommendation to ensure deck-plate understanding of the SECNAV energy goals and their importance would be the development and publication of a Navy Knowledge Online (NKO) training module on the subject. The Navy requires annual training on a myriad of topics such as Alcohol and Drug Awareness, Sexual Assault, and Cyber-Security, and offers multiple other topics on NKO for the motivated Sailor and Marine to grow their knowledge. While Energy Consciousness and Renewable Energy may not necessitate an annual training event for all Sailors when considering the training demands already placed on their time, publishing a training module highlighting the requirements from the Chief of Naval Operations, Secretary of the Navy, and higher authorities would ensure the deck-plate Sailors understand the importance of these goals. Furthermore, the training should stress actions that Sailors and Marines should take to meet these goals, such as minimizing ghost loads from unused electronics, conserving water and electricity during daily operations, and looking for ways to help the command be more energy conscious overall.

CONCLUSION

The Navy's adoption of renewable and alternative energy goals is an important contribution to the federal government's energy management strategies. While the Congress, the President, and Navy leadership have repeatedly refined their expectations for energy use and sources over the last few decades, the common theme is to be more energy efficient, and to use less fossil, non-renewable fuels in favor of renewable sources. Moreover, Congress has offered the service Secretaries many attractive contracting models to maximize the on-site production of renewable energy. While the Navy is making admirable progress in achieving its five energy goals, and while information from the Navy's official energy website (<http://greenfleet.dodlive.mil/>) and its associated Currents magazine portend to these goals be achieved on schedule, opportunities exist for the Navy to standardize and institutionalize the energy ethos promoted by its goals.

ENDNOTES

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- ⁵ President Barack Obama State of the Union Address, 24 January 2012, <https://www.whitehouse.gov/the-press-office/2012/01/24/remarks-president-state-union-address>
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- ⁷ Federal Building Energy Efficiency Standards, USC section 6834, chapter 81 Energy Conservation and Resource Renewal, <http://uscode.house.gov/view.xhtml?hl=false&edition=2012&req=granuleid%3AUSC-prelim-title42-section6834&f=treesort&fq=true&num=0>
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