

DEPARTMENT OF THE NAVY

STRATEGY FOR RENEWABLE ENERGY



1 GIGAWATT TASK FORCE
OCTOBER 2012





FOREWORD

As the demands on our national electrical infrastructure rise and that infrastructure becomes increasingly stressed and oversubscribed, power outages increase in frequency and duration. In order for our installations to be able to sustain critical missions in the face of ever-rising uncertainty regarding their electrical power, I made *security* and *independence* my two energy priorities for the Department. Developing secure and independent sources of energy for our installations, combined wherever possible with smart grid management systems and microgrid applications, will provide an unprecedented capacity for continuity of operations when the regional grid becomes unstable. Furthermore, in day-to-day operations, these sources of power will help alleviate increasing grid congestion and consumer demand, aid states in achieving their renewable energy generation goals, provide steady, reliable, sustainable, and economical power, and bring our Navy and Marine Corps into compliance with the President's and Congress's energy goals.

The purpose of the *Strategy for Renewable Energy* is to guide the Department of the Navy as we work to accomplish two of the energy goals I established in 2009: to obtain half of the Department's energy from alternative sources, and to produce at least half the shore-based energy requirements from renewable sources, such as solar, wind and geothermal. To successfully achieve these objectives, 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 Commanders and COs seeking ways to enhance their energy posture and thereby contribute to the energy goals of the Department. Our installations' missions vary, but they must all determine how to mitigate their dependence on, and vulnerability to, the commercial grid and become more energy efficient in the process. They will need support from leadership to do so.

The *Strategy for Renewable Energy* is also intended to help our state, local, and industry partners understand DON's overall energy strategy. 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.

Meeting the goals I established three years ago will make our installations and forces more secure, agile, and independent—but time is precious. While we anticipate several large-scale projects to kick-start our 1GW initiative, DON needs every installation leader and engineer to pitch in by proposing and pursuing the best projects their installations and the regional markets can support. Several of our installations have already completed successful projects; three solar photovoltaic developments in California will save an estimated \$20 million over their 20-year contracts. I am grateful for the hard work that went into these developments, and look forward to many more in the near future.

The Honorable Ray Mabus
75th Secretary of the Navy





TABLE OF CONTENTS

FOREWORD	I
TABLE OF CONTENTS	III
EXECUTIVE SUMMARY	1
I. INTRODUCTION	2
A. The Secretary's Energy Goals	2
B. The 1 Gigawatt Task Force	2
II. THE RENEWABLE ENERGY ENVIRONMENT	4
A. Department of the Navy's Energy Profile	4
B. Renewable Energy Technologies and Trends	4
C. Regional Integration of Projects with Microgrids	6
D. Energy Project Funding and Financing	6
III. 21ST CENTURY ENERGY OBJECTIVES	8
A. Energy Security	8
B. Energy Independence	8
C. Stewardship	8
D. Executing RE Projects	9
IV. IMPERATIVES AND IMPLEMENTATION	12
A. Ongoing Processes and Relationships	12
B. Implementation	13
V. CONCLUSION	15
APPENDIX: DON RENEWABLE ENERGY PROJECTS (≥1MW)	16



EXECUTIVE SUMMARY

In October 2009 Secretary of the Navy Ray Mabus promulgated five energy goals for the Department of the Navy (DON). Among these is that, by 2020, DON will produce 50 percent of its energy from alternative sources. In support of this alternative energy goal, Secretary Mabus chartered the 1 Gigawatt Task Force (1GW TF) to enable DON to procure one gigawatt (GW) of renewable energy generation capacity by 2020. Through frequent working group meetings, conferences and consultations with industry, coordination with other Federal agencies, lessons learned from recent and ongoing energy projects, and reviews of germane studies, the 1GW TF assessed renewable energy (RE) challenges and opportunities facing Navy and Marine Corps installations around the globe.

Great strides have been made in consumption reduction and efficiency improvements, and as of Q2FY12, DON produced 18.6% of its shore-based energy from renewable sources. DON must continue its efforts in reducing energy demand, however challenging renewable energy goals demand increased focus and attention on RE generation project development.

For the purposes of the 1GW TF, DON will consider all sources of renewable energy¹. Among currently available technologies, several are well suited for almost any military installation while others may only be useful at some locations. As part of their energy plans, installations and regions should carefully assess which technology or technologies will be most suitable and cost-effective in their areas. Third-party financing should be employed whenever possible, focusing on Power-Purchase Agreements (PPA) and Enhanced Use Leases (EUL).

To achieve the Secretary's goal by 2020, DON must aggressively develop opportunities with an emphasis on large-scale projects. These larger, utility scale projects will bring DON closer to its 50% goal faster and be more attractive for potential third-party investors. Small-scale projects also support the 1GW initiative and, wherever practical, should be aggregated into larger, regionalized contracts to obtain competitive financing and best use the limited manpower at each installation and region.

Each region and installation is required to build an energy plan to help achieve these goals. Navy and Marine Corps leadership must prioritize programmatic support for regions' plans and sustain them over the long term. Installations in RE resource-rich regions should facilitate projects which far exceed their own requirements in order to balance those regions where RE resources are more scarce.

The DON energy goals demand considerable effort from each command and person involved. DASN (Energy) will coordinate through the Shore Energy Policy Board for planning and governance of DON's collective efforts. Additionally, coordination with other Services, government agencies, and industry is vital to achieving our goals.

¹ DON definition of renewable energy: energy produced from solar, wind, biomass, landfill gas, ocean (including tidal, wave, current, and thermal), geothermal, municipal solid waste, or new hydroelectric generation capacity achieved from increased efficiency or additions [EPACT 2005 Sec. 203 (b)(2)]



I. INTRODUCTION

The Navy Department possesses a long tradition of leading our nation and the world in innovative uses of technology—and energy in particular. From wind to steam, coal, oil, nuclear, gas turbine, and recently hybrid propulsion, we have successfully sought and achieved new ways to exploit breakthroughs in science and engineering. Not only has this given us an edge in combat, it has also helped us manage resources within tight budgets. Energy is critical to every mission, and as such it will always present a significant vulnerability. In an era of fluctuation and uncertainty in energy markets and resource availability due to global and regional geopolitical instability as well as natural and manmade disasters, we must examine every means possible to conserve resources while simultaneously meeting the energy requirements of our forces, both ashore and afloat.

A. The Secretary's Energy Goals

To that end, in October 2009 Secretary of the Navy Ray Mabus promulgated five energy goals for the Department of the Navy (DON). Among these is that, by 2020, DON will produce 50 percent of its energy from alternative sources. Other authorities have set similar goals: the Energy Policy Act 2005 requires 7.5 percent of our electrical consumption in FY13 and beyond to come from renewable sources. 10 U.S.C. §2911 requires the Department of Defense (DoD) to produce or procure ≥25 percent of the total quantity of facility energy from renewable energy (RE) sources beginning in 2025. In December 2011, DASN (Energy) directed regions and installations to produce energy plans that would support achievement of the Secretary's goals². These directives all align toward one overarching requirement: to provide secure, reliable, and affordable energy to our Navy and Marine Corps.

B. The 1 Gigawatt Task Force

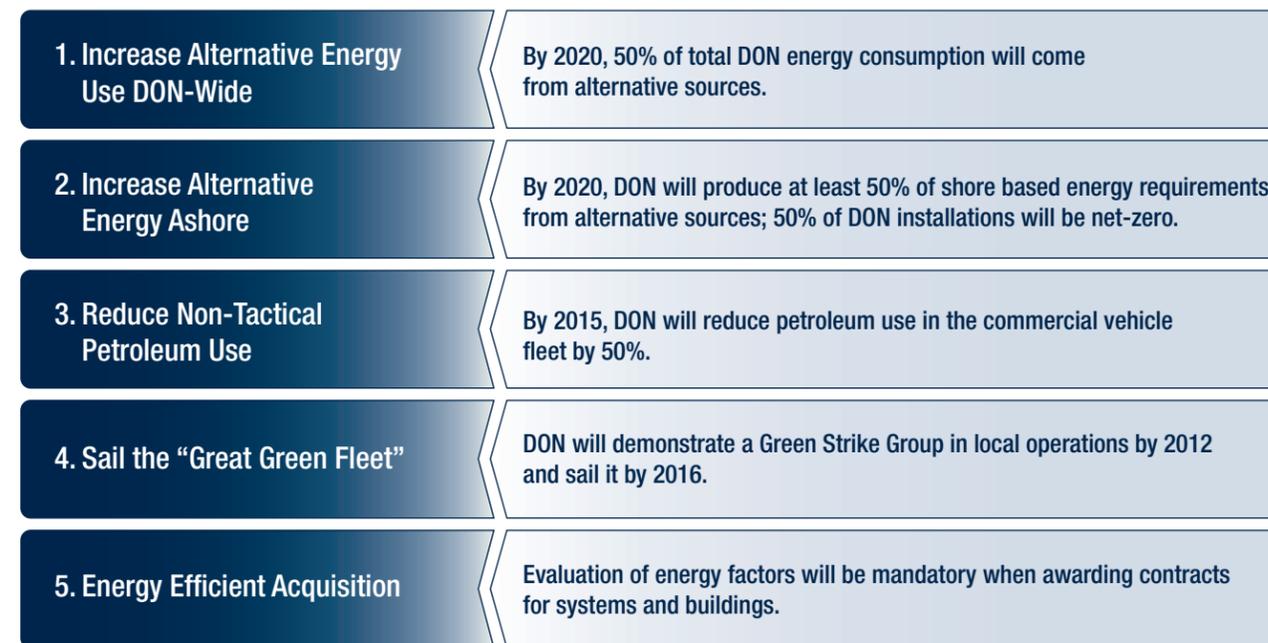
In his State of the Union Address to Congress on 24 January 2012 the President announced Navy will purchase “enough [renewable energy] capacity to power a quarter-million homes.” To address this mandate DON chartered the 1 Gigawatt Task Force (1GW TF).

Chaired by the Assistant Secretary of the Navy (Energy, Installations and Environment) (ASN EI&E), it is comprised of Secretariat, Navy, and Marine Corps leadership. Its purpose is to deliver and oversee implementation of this *Strategy*, establishing an ongoing discussion of challenges and opportunities DON must address in order to chart a course to meet these requirements.

While directly supporting the Secretary's goal to produce 50 percent of its energy from alternative sources, the 1GW initiative can be viewed as an ancillary effort focused on deploying renewable energy generation projects for Navy and Marine Corps installations. As such, it is a means to an end, and not a separate end of its own. Because the 1GW initiative is so inextricably linked to DON's other energy programs—in particular, smart grids, net-zero, and efficiencies—discussion of generation projects should be considered within the larger context of all the Secretary's goals due to the overlapping constraints of policy, budgets, and available manpower for implementation. As microgrids and smart grids are developed, RE can be integrated to provide diversified power as necessary to the installation's critical assets.

1GW of renewable energy generation directly addresses several of the mandates and goals for which DON is accountable: Executive Order 13514 greenhouse gas

Figure 1 The Secretary of the Navy's Energy Goals



reduction, the 10 U.S.C. §2911 “25 by 25” mandate (25 percent by 2025), Energy Policy Act 2005 graduated renewable energy targets, and Executive Order 13423 renewable energy consumption goals, in addition to the Secretary's departmental goals. To reach the 50 percent renewable energy generation goal (which the 1GW goal directly supports) in a cost-effective fashion, DON must purchase or facilitate the production of significant quantities of renewable energy while reducing power consumed through energy efficiencies. The overall DON energy strategy therefore includes both lines of effort: deploy RE in support of the 1GW goal and simultaneously bring the 50 percent RE generation goal closer by reducing overall energy consumption.

Through frequent working group meetings, conferences and consultations with industry, coordination with other Federal agencies, lessons learned from recent and ongoing energy projects, and reviews of germane studies, the 1GW TF assessed renewable energy challenges and opportunities facing Navy and Marine Corps installations around the globe. Further refinement of those installation assessments will guide the continual identification and execution of RE projects DON can pursue in order to achieve our energy goals. The Task Force itself and this *Strategy* are merely a beginning. Services' and installation commands' energy plans (updated annually) will continue this work, evolving and maturing until the goals are achieved—and there is no reason to stop there. Our energy future will continue to change, and we must remain agile, anticipatory, and responsive to those changes.

What Does “One Gigawatt” Mean?

Electrical power is sometimes discussed in terms of consumption (expressed in kilowatt-hours and megawatt-hours, or kWh and MWh) and generation (expressed in kilowatts and megawatts, or kW and MW). Adding to the complexity, generation has several categories including base-load, peak, and stand-by or reserve. Some renewable electricity generation falls into the peak category because of its intermittent nature; it does not produce base-load, grid-stabilizing power and frequently requires stand-by generation capacity to back it up in the event of cloud cover or insufficient wind. Others such as hydro, biomass or geothermal fall into the baseload category. A renewable energy capacity factor indicates the actual energy output over a period of time versus its nameplate generation capacity. Overall, wind and solar power produce electricity at about 30 percent of “nameplate” capacity.

According to the Energy Information Agency the average American household consumed 11,496 kWh in 2010, the latest year for which data are available. Multiplied by “a quarter-million” as the President mentioned, the amount of 24x7 generation capacity needed to meet that demand is just over 328 MW. Because DON expects most of its new renewable energy production to come from intermittent sources, 328 MW factors up to approximately one gigawatt of intermittent generation at a 30% capacity factor. This estimate is approximately the capacity of RE needed to meet the Secretary's 50% goal. As the strategy moves into implementation, higher-factor projects (e.g., geothermal, biomass, or waste-to-energy) contribute toward the 1GW goal at a rate approximately three times that of intermittent sources. Such projects also significantly enhance an installation's true energy security since the power is more often available.

² DASN (Energy) Memorandum, 1 Dec 2011, SECNAV Shore Energy Policy.



II. THE RENEWABLE ENERGY ENVIRONMENT

A. Department of the Navy's Energy Profile

DoD is the single largest energy consumer in the nation and accounts for 80 percent of the Federal government's energy consumption. DON consumes 28 percent of DoD's operational and shore energy. With a footprint of 102 installations worldwide, comprising over 90,000 buildings totaling more than 663M square feet, DON supports and operates a diverse inventory of structures including barracks, commissaries, data centers, office buildings, laboratories, shipyards, aircraft maintenance centers, and other support and recreation facilities.³

Electricity usage and RE generation on DON installations

For fiscal year 2011, DON consumed 8,850 GWh of electrical power and produced or purchased approximately 1,770 GWh of renewable energy on or near its installations.⁴ Against the 10 U.S.C. §2911(e) goal of 25 percent renewable generation by 2025, DON has attained 20.6 percent renewable generation as of Q2FY12. The delta that DON must produce or purchase to achieve the Secretary's 50 percent goal is approximately 2,655 GWh, correlating to approximately 1GW of generation from intermittent sources.

Efficiency and demand reduction

Departmental energy programs since the 1980s have focused heavily on reducing demand by improving efficiency. DON is a leader in Federal use of energy contracts (energy conservation investment program (ECIP), energy service performance contracts (ESPCs) and utility energy service contracts (UESCs)), having implemented 165 ECIPs, 70 ESPCs, and 275 UESCs since 1998. DON has implemented \$1.6B of lifecycle efficiency improvements and reduced energy intensity (energy per square foot) by 15.8 percent toward the FY11 goal of 18 percent.⁵

B. Renewable Energy Technologies and Trends

For the purposes of the 1GW TF, DON will consider all sources of renewable power. Among currently available technologies, several are well suited for almost any military installation while others may only be useful at some locations. As part of their energy plans, installations and regions should carefully assess which technology or technologies will be most economical in their areas. Multiple technologies can be combined, e.g., solar panels could be mounted in the areas around geothermal plants. The sections below discuss the principal renewable power sources.

Solar (photovoltaic, thermal, and concentrated)

Ground-mounted solar photovoltaic (PV) is very mature and compatible with most installations' missions. In the desert southwest and Hawaii they are particularly appropriate, as DON controls land areas with steady, year-round sunshine. Rooftop PV is technically feasible virtually everywhere, however these systems are typically much smaller-scale than ground-mounted PV systems. Rooftop solar water heating is also mature and compatible with many climates around the world. Concentrated solar power (e.g., parabolic troughs or mirrors with collection towers) may have a greater mission impact than PV at some installations since towers and the mirrors' glare may pose hazards to aviation, and water requirements in desert locations may be problematic. Still, CSP is worth consideration for some locations, and is making inroads into some parts of the country. The main challenge with all solar technology is its intermittency (generally yielding capacity factors of ~20 percent for thermal, ~25 percent for PV, and as much as 50 percent for CSP) and the management challenge it poses to internal and external grid stability. Energy storage is expected to mitigate that problem as it becomes economical at scale.

Wind

Though mature, in some cases land-based wind generation can pose challenges to the missions of many DON installations due to the height of the towers and the effects they can produce on various types of radars and training. In a few cases, more expensive offshore wind may be compatible in some locations if available waterspace, regulations, and market factors support it. Wind also shares the challenge of intermittency (generally yielding ~33 percent capacity factor for land-based wind—also expected to be mitigated by large-scale energy storage).

Geothermal (direct use, electrical generation, or heat pumps)

Where heat sources exist, geothermal is an excellent source of energy for DON installations, though exploration can be difficult and expensive. Geothermal has the advantage of providing full-time baseload power, unlike the intermittent energy supplied by solar and wind. The Navy's Geothermal Program Office at China Lake is actively exploring for resources in the southwest. At present, some of DON's geothermal potential exists on Department of the Interior/Bureau of Land Management (DOI/BLM) land withdrawn by legislation for military use, and future development will have to be carefully coordinated.

Biogenic or waste (biomass, biofuels, waste-to-energy, landfill gas, municipal solid waste, etc.)

In some parts of the country various types of biomass sources may be very competitive with traditional fossil or "brown" power. As with geothermal, biomass has the advantage of providing baseload power, enhancing an installation's energy security around the clock. Projects could use various sources of biomass or other waste streams, including leftover plant material (from farming, logging, etc.), animal waste, landfill gas capture, or municipal solid waste. One challenge for biomass projects is securing a long-term contract for a low-cost and locally available fuel source.

Marine (wave, tidal, ocean thermal, seawater air conditioning (SWAC))

Several variations on these technologies are in development but are not widely available at utility scale. Sea water air conditioning is ready and viable, and merits consideration for chilled water and air conditioning loads at sites with a deep water source within reasonable proximity of the military installation. DON will monitor industry maturation for potential incorporation into energy planning.

In selecting energy technologies, DON must consider several factors: impact on operations, availability of RE resource, maturity of the technology, capacity factor, lifecycle economics (including availability of tax credits and other incentives), land and water requirements, long-term operation and maintenance requirements, environmental and historic preservation restrictions, withdrawn land jurisdiction, ability to sell excess power (capacity of transmission lines and a buyer for excess power), and ownership preference (own facilities vs. purchase power). DON must comply with the National Environmental Policy Act (NEPA) or Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, as appropriate, for all actions with the potential to have significant environmental impacts. The NEPA process identifies and assesses reasonable alternatives to proposed actions to avoid or minimize adverse environmental effects.



MCLB Albany Starts Landfill Gas Power Plant

In September 2011, MCLB Albany brought a \$20 million landfill gas power generation plant online. The 1.9 MW system runs on methane and other landfill gases from a local landfill, reducing the base's greenhouse gas emissions and energy intensity. The project also serves as an energy security measure in the event of a blackout or electrical grid failure, as the generators can run on landfill gas and even natural gas, a built-in triple redundancy.

The project is expected to save the installation \$1.8 million annually for 20 years. This effort, when combined with other renewable energy projects on-base, brings Albany to 22% of its total energy consumption from renewable energy. This brings the installation nearly halfway to the DON goal of 50% by 2020.

³ DoD Base Structure Report FY 2011 Baseline
⁴ 2012 DoD Annual Energy Management Report for FY11
⁵ Ibid.

C. Regional Integration of Projects with Microgrids

In parallel with deploying renewable generation, DON must also continue the effort to pursue development of smart microgrids on our installations. Being able to generate power independently is of strategic importance, but will not significantly improve an installation's security unless the power is available during blackouts or other incidents affecting grid reliability. It is not a requirement to provide power to each and every building on a base during grid outages; we must however be able to match generation to critical demand loads to support mission-enabling infrastructure and to enable demand response techniques in response to requests from the local utility. To improve energy security, DON must evolve beyond simply providing emergency generators for individual buildings to being able to provide reliable, sustained power to designated substations with the capability to match sources to critical loads. As microgrids and smart grids are developed, RE can be integrated along with other generation sources to provide diversified power as necessary to the installation's critical assets.

D. Energy Project Funding and Financing

Planning considerations for renewable energy projects must adhere to two simple precepts: they cannot obligate funds beyond legally permitted appropriation authorizations (funds must be used consistent with their appropriations), and the project costs should be less than or equal to lifecycle costs for brown power within the regional market. Due consideration for energy security is important, though difficult to quantify or monetize.

DON energy projects can be funded in several ways. Installations have successfully executed small-scale projects using discretionary funds, military construction (MILCON), the Energy Conservation Investment Program (ECIP), the Energy Investment Program (EIP), or the Environmental Security Technology Certification Program (ESTCP). Third-party financing should be employed whenever possible, using such financing vehicles as authorized by law. Cognizance for contracting for utilities within DON resides with Naval Facilities Engineering Command (NAVFAC). NAVFAC executes contracts using various contracting and utility-related authorities. All acquisition strategies should be developed with NAVFAC to ensure full compliance with regulatory and statutory requirements, and to gain from their extensive knowledge.



MCAS Miramar Landfill Gas PPA

In June 2012, MCAS Miramar flipped the switch on a 3.2 MW Landfill Gas power plant, expected to supply Miramar with up to half of its daily power over a 15-year period.

Made possible through a long-term PPA and coordination amongst MCAS Miramar, the project developer, NAVFAC Southwest, the utility, and the city of San Diego, this project will simultaneously bring DON closer to energy independence and SECNAV's RE goals by 2020.

Power Purchase Agreement (PPA)

A PPA is a contract to purchase electricity generated from energy production facilities (for DON's purposes, these should be located on or near the installation). At the end of the contract term the contractor is responsible for removing all equipment and returning the site to its original condition; DON does not own the equipment. PPAs may be up to 10 years under Federal Acquisition Rules (FAR) Part 41, or 10 to 20 years under 10 U.S.C. §2922a (up to 30 years with approval from DoD).

In conjunction with 10 U.S.C. §2917, DON can develop or authorize the development of geothermal resources on lands under DON jurisdiction. That authority can either be combined with a PPA or with a "joint venture" project pursuant to 10 U.S.C. §2916.

Under most circumstances, a PPA will be the preferred arrangement due to its flexibility and mutual benefit for developers, financiers and installations.

Sale of electricity

10 U.S.C. §2916 permits the sale of electricity from alternative energy and cogeneration production facilities. The Secretary of a military department may sell, contract to sell, or authorize the sale by a contractor to a public or private utility company of electrical energy generated from alternative energy or cogeneration facilities which are under the jurisdiction (or produced on land which is

under the jurisdiction) of the Secretary concerned. The sale of such energy shall be made under such regulations, for such periods, and at such prices as the Secretary concerned prescribes consistent with the Public Utility Regulatory Policies Act of 1978 (16 U.S.C. §2601 et seq.).

Energy Savings Performance Contract (ESPC)

Per 42 U.S.C. §8287, ESPCs allow federal agencies to implement energy projects with no upfront capital costs. An ESPC is a contract between a consumer and an energy service company (ESCO) for the purpose of achieving energy cost savings, and may include RE generation. The ESCO guarantees the improvements will generate energy cost savings sufficient to pay for the project over the term of the contract. After the contract ends, all additional cost savings accrue to the agency. Contract terms of up to 25 years are allowed. ESPCs are in some cases more conducive than other financial authorities in aggregating resources on a regional level.

Utility Energy Services Contract (UESC)

Per 10 U.S.C. §2913, UESCs allow federal agencies to enter into a contract with servicing utilities to implement energy and water-related improvements at their facilities. The UESC must be with the servicing utility company, cost effective, for demand-side management, and include an incentive; a UESC may include RE generation. It may be funded with appropriations or the utility may arrange funding to cover the capital cost of the project, which is repaid over the contract term from cost savings generated by energy and/or water efficiency measures.

ESPCs and UESCs are limited by regulation and do not typically include large energy generation facilities. Still, they may address specific needs of many installations and should be carefully considered as part of regions' and installations' energy plans.

Enhanced Use Lease (EUL)

Lease between a federal agency and a private developer where the developer leases non-excess lands to construct commercial real estate and/or energy developments. Rental payments are provided in the form of cash or in-kind consideration that can include the provision of new construction of facilities, utility services, or real property maintenance services. An EUL may be a good option if an installation can accommodate a large project but cannot consume the energy the project would produce.



Southwest Solar Multiple Award Contract (SW Solar MAC)

In 2012, DON broke ground on three new solar projects, each made possible through long-term PPAs. Through these agreements, DON does not incur any upfront or maintenance costs for the systems, but agrees to purchase power produced from the system in exchange for use of DON land.

The largest of the three is a 13.8 MW, 118-acre solar photovoltaic array at NAWS China Lake. The project is expected to provide 30% of the installation's annual electric load, and save the installation \$13 million over the 20-year contract.

Other SW Solar MAC projects include a 1.2 MW PV solar array at MCLB Barstow and a 1.2 MW PV solar array at MCAGCC Twentynine Palms. They are expected to begin producing power in Fall 2012 and 2013, respectively.



III. 21ST CENTURY ENERGY OBJECTIVES

The Secretary of the Navy set two priorities for DON's energy program: energy security and energy independence. While many reasons exist to drive the Department toward a more modern, reliable, and efficient energy infrastructure, these two are paramount. However, with limited budgets and competing requirements, modernizing our energy infrastructure must be done responsibly.

A. Energy Security

In *Naval Energy: A Strategic Approach* (2009) the Secretary defined energy security as “protection from vulnerabilities related to the commercial electrical grid, which is susceptible to physical and cyber attack, natural disaster, and malfunction. The Navy increases shore energy security by decreasing energy consumption, increasing energy efficiency, increasing the use of alternatives, and increasing the reliability of its energy supply to critical assets.” What this means for installations specifically is that we cannot rely primarily on an aging and increasingly stressed transmission grid to deliver mission-critical power. Nor can finite, non-sustainable fuel sources reliably meet DON's needs now and into the future. Some critical attributes of energy security are the type of fuel (will it serve us economically and effectively over time?) and how the fuel is delivered to where it's needed (legacy transmission/distribution infrastructure or produced on/near the installation?).

B. Energy Independence

Energy Program for Security and Independence (2009) defines energy independence to be “achieved when naval forces rely only on energy resources that are not subject to intentional or accidental supply disruptions.” In other words, the energy itself, its transportation, and each terminus or hub along its route should remain secure from genesis to use. Market volatility, supply chain disruptions (at the source, in processing, and in delivery) due to geopolitical crises, natural or manmade disasters, or other causes mean that those sources and

technologies will not suffice. The ideal solution would encompass electrical generation capacity using locally or regionally available renewable energy sources (e.g., sunlight, wind, geothermal) on-site or adjacent whenever possible, in combination with energy storage and an energy management system to support installations' critical mission needs.

C. Stewardship

Third-party financing will provide the majority of the funding needed to develop renewable energy projects. A project must be economically competitive over its lifecycle with traditional power within the regional market. Along with our industry and government partners, we must carefully guard how we use our limited resources to identify and deploy projects. DON will integrate mission-compatible and cost-effective renewable energy sources, based on analyses of operational impacts and energy return on investment (eROI) including complete lifecycle cost analysis. The analyses will be accomplished in a comprehensive manner in accordance with the current regulations and guidelines governing renewable energy projects on military installations including all costs, such as initial planning, construction, and demolition/recapitalization costs, and operations & maintenance and construction costs on the installation as necessary to use the renewable energy.

D. Executing RE Projects

To achieve the Secretary's goals by 2020, we must aggressively pursue RE projects with much greater speed and scale (in size MW, generation MWH, and number of projects). This is the heart of the issue at hand. The process to develop a project can be long and cumbersome; DON leaders and experts must develop ways to shorten and streamline the process wherever it is legal, economical, and possible to do so. Some renewable energy project opportunities will emerge in clusters, since many DON installations are concentrated in geographical areas. Wherever possible, these opportunities should be handled collectively for several reasons: individual small projects require essentially the same manpower as large projects to assess and execute, but are less appealing to investors and disproportionately cumbersome to manage; and it may be possible to streamline not only contracting but also environmental analyses and permitting processes when projects are regionally bundled.

Table 1: Regional demand and 50% magnitude of effort. Purpose of this table is to show the level of effort required to help deploy 1GW of RE generation. This table does not take into account peak demand, which can be up to six times the average. It does not set targets nor assign minimum levels of attainment; it is merely intended to be illustrative of the large scope of effort, by region, which will be necessary to achieve the Secretary's goal. Note, the total Additional RE Capacity Required is less than 1GW because some projects have come on-line since the mandate was established.

Region	% Share of DON Annual Demand	Current RE Generation (MW)	Add'l RE Capacity Required (MW)
EURAFSWA	3.5%	2.0	35
Japan	2.9%	0.3	30
Korea	0.1%	0	1.0
Hawaii	3.1%	3	30
Marianas	3.8%	0.4	40
Mid-Atlantic	18.0%	42	180
NDW	11.4%	0.8	110
Northwest	5.6%	0	55
Southeast	15.2%	12	150
Southwest	10.9%	177 ⁶	110
Midwest	3.4%	0	30
MCI-East	11.0%	7	105
MCI-West	4.8%	20	40
MCI-Pacific	6.3%	0.2	60

Regional aggregation of projects

DON implemented a multiple-award contract (MAC) in the Navy Region Southwest area in 2011. Three PPAs came out of that MAC, saving DON an estimated \$20M over the 20-year life of the agreements. It may be more effective to combine several modest projects into a single, larger contract in order to attract competitive financing and best use the limited manpower each installation, region, and NAVFAC office has available.

A regional approach makes sense from the planning perspective as well. Some installations may (and should) sponsor projects that will produce excess power above the needs of that installation; other installations may find it difficult to deploy any project simply due to market or other factors unique to their circumstances. Therefore, the regional energy plan may be able to compensate for these imbalances and reach its energy goals by exploiting the best opportunities in order to mitigate other locales' difficulties. Table 1 shows percentage of aggregate average electricity demand by region, from which each region's 50-percent level of effort can be considered.

Aggregating and streamlining environmental reviews

Wherever renewable energy projects may be possible within a region, environmental conditions and considerations may be similar from site to site. Local microcosms will certainly exist, but the same broad environmental compliance responsibilities may be germane across a given region. To the extent possible (and legally permissible), the required environmental analysis should be combined to cover multiple sites for renewable projects, economizing time and manpower.

Transmission permitting

Partnering with state and local agencies and with industry is essential in the necessary planning for projects that will trigger transmission upgrades in order to connect to the commercial grid. Because of the length of time to acquire any interconnecting agreement, NAVFAC must coordinate their long-term planning to ensure the best, most efficient use of time and shortest path toward official approval to move forward.

⁶ 170 MW of the 177 MW total comes from Coso Geothermal plant at NAWA China Lake, which is diminishing by ~2% per year in generation capacity.



“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 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.”

— *President Barack Obama*

“Changing the way we get and use energy is a priority for the Navy because energy security is critical to our national security. One gigawatt of renewable energy produced from sources like solar, wind, and geothermal could power a city the size of Orlando, Florida, while increasing the security and flexibility of the energy grid.”

— *Secretary of the Navy Ray Mabus*





IV. IMPERATIVES AND IMPLEMENTATION

Having examined DON's energy goals, the energy landscape, our present and future use of energy, and the ways and means available to reach our objectives, it is now necessary to identify specifically what must be done. There are ongoing activities that should continue, and concrete steps that must occur.

A. Ongoing Processes and Relationships

Intragovernmental coordination

The energy landscape is complex and wide-ranging. DON is a customer—a consumer of power in most cases. As DON becomes a provider or an independent participant, it is necessary to understand and work with the federal and other state and local agencies that regulate, control, or provide policy and oversight. Under the guidance of the Council on Environmental Quality and the Department of Defense, ongoing collaboration with the Departments of Energy, Interior, and Agriculture must continue and increase. Such collaboration will help to develop a whole-of-government approach to the issues and challenges that we collectively face. Ongoing collaboration with the Army and Air Force will help all three Departments execute their gigawatt initiatives (following the State of the Union Address, Army and Air Force have joined the Navy and Marine Corps in the pursuit of renewable energy deployment).

Department of Energy

DOE oversees national energy policy and specific agencies that regulate, control, and conduct research and development of energy in the US, including the Federal Energy Management Program (FEMP), the Federal Energy Regulatory Commission (FERC), and several of the national laboratories. This collaboration helps DOE understand and oversee evolving federal energy requirements and helps DoD and DON keep abreast of changing policy and regulation as well as developments in technology implementation.

Renewable energy assessments

Commander, Naval Installations Command (CNIC) and Marine Corps Installations Command arranged with the National Renewable Energy Laboratory (NREL) to conduct an initial screening of each installation regarding its ability to achieve net-zero energy usage. NREL completed their initial pilot screening for 10 sites and is now analyzing groups of installations in greater detail based on the findings of the first screening. DON must continue to work with subject-matter experts at NREL and elsewhere to develop and refine energy plans. This effort is the best path forward to help select and prioritize candidate RE projects.

Aligning with industry and utilities

DON is fortunate to have many smart, hard-working engineers and planners applying their skills to energy and other projects around the globe. To make the most of these assets, DON must also incorporate the capabilities of industry experts to help us find the best solution to meet our Navy energy goals. When considering projects to meet the needs of an installation or region, we must carefully and completely define our requirements and conditions, then seek the best proposals from industry experts, whose livelihoods depend on building successful, economical projects. Depending on the scope and nature of a given situation, that might mean promulgating a carefully crafted request for information (RFI) sufficiently descriptive of the requirements but not overly prescriptive of the project—thus allowing creativity and innovation to bring solutions to the forefront that might not otherwise have surfaced. A major factor for industry participation is the financial benefits of project financing: tax credits, accelerated depreciation, and a long-term revenue stream.

A healthy, productive, two-way relationship with industry will improve DON's energy posture while supporting American enterprise.

B. Implementation

The DON energy goals demand considerable effort from each command and person involved. DASN (Energy) will coordinate through the Shore Energy Policy Board for planning and governance of DON's collective efforts. Figure 2 summarizes the following tasks and illustrates initial and cyclic reporting periodicities.

Programming

Navy and Marine Corps must identify resources (funding and manning) to support RE project identification, assessment, and development to provide accurate funding requirements for programming purposes. This will likely include a manpower augmentation; having gained limited experience with renewable energy projects to date, DON must develop the expertise and capacity to handle the workload required to meet the Secretary's goals by 2020. Associated tasks:

— TASK 1

Navy and Marine Corps requirement and resource sponsors adjust programming guidance to provide adequate prioritization of renewable energy project development. Brief ASN (EI&E) prior to submitting sponsor program proposals (SPPs). DASN (Energy) monitor throughout each budget cycle. Lead: Navy and Marine Corps. Support: CNIC, MCICOM, NAVFAC.

— TASK 2

With suitable programmed support prioritized and protected, DON must develop a comprehensive, long-term energy plan for all installations. The plan shall incorporate all pertinent mandates (50 percent alternative energy, 50 percent net-zero by 2020, as well as other federal and departmental directives). The plan must include a timeline explaining how the Services will achieve the balance of the 1GW initiative by 2020. Present the plan to ASN (EI&E) within three months of the publication of this strategy; provide progress reports quarterly to DASN (Energy) and annually to ASN (EI&E). Lead: CNIC, MCICOM. Support: DASN (Energy), Navy, Marine Corps, NAVFAC. Note: plans being prepared in response to DASN (Energy) letter of 1 Dec 2011 and ASN (EI&E) letter of 10 Aug 2012 will fulfill this Task.

Identify large-scale RE projects

DON must quickly identify the best opportunities for large renewable energy projects wherever possible and economically feasible. While Navy and Marine Corps leadership must develop plans for overall deployment of RE production capacity, those plans should task each region to facilitate the development of RE projects as appropriate based on analysis of opportunities and constraints. Large projects will by definition produce the most progress toward the 1GW initiative; the principal reason to identify them now is that they may take the longest time in terms of environmental assessments, permitting, and contracting. Large projects merit the resources (manpower and funding) they will require and therefore should take precedence. It is important to remember that projects must still be economical; regional electricity markets are the main drivers for projects' feasibility. DON-funded projects must have a positive lifecycle cost in order to be funded and PPAs must provide power at a cost below the market price of "brown" power.

Several large⁷ projects are currently in various stages of development (see Appendix). The total generation capacity of "awarded" projects is less than 100MW, leaving a significant shortfall from 1GW. Clearly, several more large projects are needed to approach the requirement. Associated task:

— TASK 3

Navy and Marine Corps each identify (i.e., conduct a business-case analysis for) new large-scale renewable generation projects as part of their annual energy plans and provide progress reports to ASN (EI&E) via the Shore Energy Policy Board (SEPB). The SEPB will also perform an annual review of large-scale projects previously declared uneconomical to determine if viability status has changed. Active RE projects will be reviewed at quarterly meetings to track current progress and overall project status. Lead: Navy and Marine Corps. Support: DASN (Energy), CNIC, MCICOM, NAVFAC.

Incorporate smaller projects into energy plans

Meanwhile, installations and regions cannot defer identifying additional, smaller projects. The Secretary's energy goals apply to the whole department; therefore each command should strive to help meet the goal. Only through fostering the development of many generation projects can we deploy 1GW of RE and have 50 percent of our installations achieve the DON net-zero goal. NAVFAC possesses the expertise and "owns" the overall process

⁷ FERC defines large-scale as 20MW and larger. This is a useful description for DON purposes; nonetheless, projects should be as large as the available land and regional electricity market can support.

for identifying, assessing, and facilitating the development of renewable energy projects (large and small); guidance is available to help understand the details of the process. No project can be undertaken without NAVFAC's involvement. Associated task:

TASK 4

Navy and Marine Corps direct regions and installations to identify renewable generation projects less than 20 MW in their energy plans and provide updates through the renewable energy plan annual update (see Tasks 2 and 3) to ASN (EI&E) via the SEPB. DASN (Energy) monitor annually. Lead: Navy and Marine Corps. Support: CNIC, MCICOM, NAVFAC.

Regional aggregation of projects to streamline efforts.

While some projects currently under consideration are quite large and very attractive to developers and financiers, others are not of a sufficient scale to draw the same attention. Where possible, individual projects in the same region should be aggregated into a single contract and presented in a request for proposals (RFP) that seeks

one developer to handle all those projects. This differs from a multiple-award contract (MAC) in that each project or task order under a MAC might be awarded to a different developer. With a regionally aggregated RFP, one developer would seek financing to back projects on several sites within a region. This has the potential to streamline DON contracting, environmental, and legal efforts while presenting an appealing opportunity for industry. Furthermore, there may be opportunities to partner with Army and Air Force projects on bases near ours, as they too seek similar goals. Associated tasks:

TASK 5

NAVFAC develop proposals to address optimum regional contract structuring, including potential to partner with other Services. Brief ASN (EI&E). Lead: NAVFAC. Support: AGC (EI&E).

TASK 6

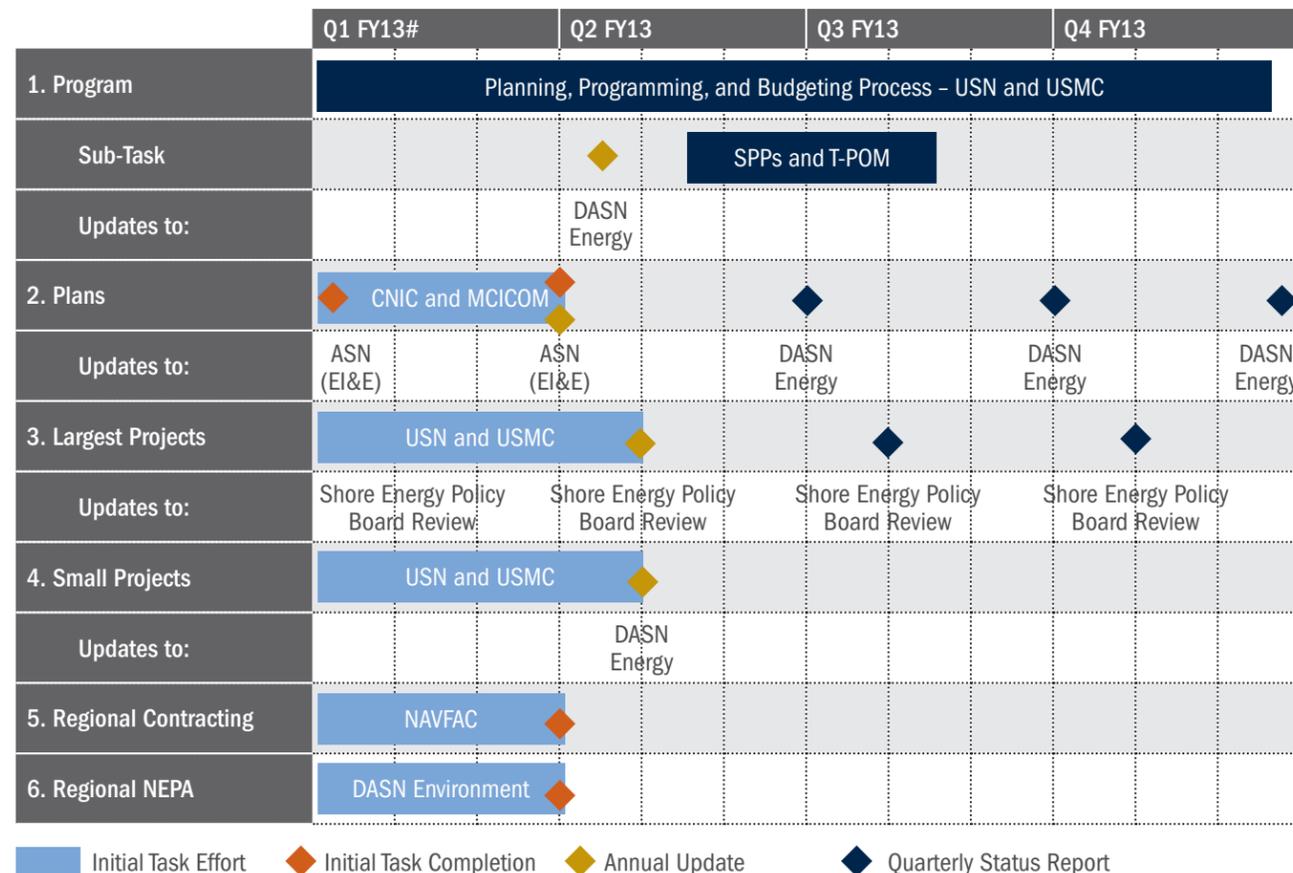
Develop proposals to address regionalization of environmental assessments; brief ASN (EI&E). Lead: DASN (Environment). Support: AGC (EI&E), NAVFAC



V. CONCLUSION

The Secretary's goal to provide at least 50 percent of shore-based energy from alternative sources and have 50 percent of installations achieve net-zero by 2020 requires considerably more large-scale renewable energy generation capacity than the Department has developed to date. This requirement is the genesis of the 1GW Task Force. The 1GW renewable energy generation initiative is the principal means of achieving the 50 percent alternative energy goal. Each region and each installation is required to build an energy plan to help achieve these (and related) goals. Leaders and planners must consider the 50 percent level as a minimum "going-in" target for their energy plans; net-zero remains the full goal. Where possible, installations should support projects which far exceed their own requirements; these will help with the overall departmental aggregate 1GW number but will not be enough on their own. Navy and Marine Corps leadership must prioritize programmatic support for regions' plans and sustain them over the long term—2020 and beyond.

Figure 2: Implementation Plan Tasks



APPENDIX: DON RENEWABLE ENERGY PROJECTS (≥1MW)

The projects listed below include existing projects that produce power today (“completed”), projects to which DON is financially committed (“awarded”), and other projects being considered but not yet funded, formalized, or initiated (“planned”). The total for group 3 is hypothetical. These levels could be realized only if every project listed were developed at its expected capacity. In reality, many of the projects in group 3 will never reach construction and those that do may not attain full theoretical capacity. Furthermore, group 3 is very much a living document, subject to frequent and significant change.

Site	Type	Size (MW)
1. COMPLETED PROJECTS		
Joint Base Pearl Harbor-Hickam, HI	PV	2.3
NAVSTA Norfolk, VA	PV	2.2
NAS Jacksonville, FL	PV	1.3
NAS Corpus Christi, TX	PV	1.2
NAVBASE Coronado, CA	PV	2.7
NAVBASE Ventura Cty, CA	PV	1.4
NAWS China Lake, CA	PV	1.6
SPAWAR San Diego, CA	PV	1.2
MCB Camp Lejeune, NC	PV	2.6
MCRD San Diego, CA	PV	1.7
MCB Camp Pendleton, CA	PV	10
MCAGCC Twentynine Palms, CA	PV	4.6
NSA Souda Bay, Crete	PV	2.0
NAVSTA Guantanamo Bay	PV	1.0
MCLB Barstow, CA	Wind	1.0
NAWS China Lake, CA	Geothermal	170*
Naval Shipyard Norfolk, VA	WTE	40
MCLB Albany, GA	WTE	1.9
MCAS Miramar, CA	WTE	3.2**
Other projects (≤1MW):		15.6
Total MW producing:		271

* The Coso Geothermal Plant at China Lake produced 270MW at its peak but the heat source has diminished and now loses capacity at a rate of ~2% per year.

** MCAS Miramar Landfill was the first project completed after the 1GW TF was chartered and therefore counts toward the 1GW goal (at a x3.3 factor due to 24x7 production), as will the projects listed below if and when they come to fruition.

Site	Type	Size (MW)
2. AWARDED PROJECTS		
AUTEC Bahamas	Wind	1
NAVBASE Coronado, CA	PV	1.3
NAWPNSTA Seal Beach, CA	PV	1.9
NAWS China Lake	PV	13.8
MCB Camp Lejeune, NC	PV	8.2
MCB Camp Pendleton, CA	PV	8.1
MCLB Barstow, CA	PV	1.2
MCAS Yuma, AZ	PV	1.5
MCAGCC Twentynine Palms, CA	PV	1.2
Other projects (≤1MW):		10.2
Total MW awarded:		48
3. PLANNED PROJECTS		
NAVSTA Rota, Spain	PV	3.6
NAVSTA Rota, Spain (2nd)	PV	2
Hawaii Solar MAC	PV	28+
MCB Hawaii, Kaneohe Bay, HI	Biodiesel	30
JBPHH (Peaker)	Biodiesel	50
JBPHH - West Loch Luaualei EUL	PV	5
JBPHH - Waipio EUL	PV	5
Joint Base Pearl Harbor-Hickam, HI	PV	2.5
PMRF Barking Sands, Kauai, HI	WTE	1.4
NAVSTA Newport, RI	Wind	9
NAVSTA Guantánamo Bay	WTE, PV	10
NAVBASE Ventura Cty, CA	Wind	1.2
NAVBASE San Diego, CA	WTE	20
MCRD San Diego	PV	1.9
NAF El Centro, CA	PV	1
NAF El Centro, CA (exploration)	Geothermal	10-30
NAS Lemoore EJV	PV	60-200
NAWS China Lake (Section 16)	PV	70-100
NAS Fallon, NV (exploration)	Geothermal	10-50
NAS Corpus Christi, TX	PV	1.1
MCLB Albany GA (2nd)	WTE	1.9
MCB Hawaii, Kaneohe Bay, HI	PV	3.3
MCB Camp Lejeune	Bio or PV	25
MCFR New Orleans, LA	PV	2
MCB Camp Pendleton, CA	PV	20-40
MCAS Yuma (Goldwater Range) EUL	PV	100-250
CMAGR Chocolate Mtns, CA	Geothermal	10-30
MCAGCC Twentynine Palms, CA	PV	5-50
MCAS Miramar Landfill (add'l)	WTE	1.5-3
Total MW planned:		485-950
Factored for 24x7 projects' capacity:		820-1500
Factored total for awarded and planned projects:		850-1560MW



United States Department of the Navy
Deputy Assistant Secretary of the Navy (DASN) Energy Office
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