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Moving Military Energy "Behind the Fence:" Renewable Energy Generation on U.S. Defense Lands

Cameron E. Tommey*

Abstract

"The [Department of Defense] uses over 30,000,000 MegaWatt Hours ("MWH") of electricity per year, at a cost of over $2 billion a year. Almost 98 percent of the electricity supplied to [Department of Defense] installations comes from the civilian market, which also makes it highly susceptible to the increasing spate of large-scale outages (caused by accidents, over-demand, as well as cyber-attack). Indeed, the Defense Science Board described the national power grid as 'fragile and vulnerable,' and noted that the reliance placed on it by the [Department] put 'critical military and homeland defense missions at unacceptable risk of extended outage.'"

Fueling the Balance, Brookings Institute[1]

The United States Department of Defense stands as the world's single largest consumer of energy—domestic consumption alone

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1. JERRY WARNER & P.W. SINGER, THE BROOKINGS INSTITUTION, FUELING THE "BALANCE:" A DEFENSE ENERGY STRATEGY PRIMER 3 (2009).

by the Department amounts to nearly one percent of the United States' total energy consumption and nearly eighty percent of the energy consumed by the Federal Government. Although a cadre of statutes, Executive Orders, and agency priorities set high goals for the introduction of renewable energy into the Department's portfolio, it has historically failed to meet both its target for reducing facility energy use and its target for renewables integration. This Note suggests moving the Department's energy production "behind the fence," fixing technology to place to increase security and reduce environmental and economic impacts. To do so, however, a mountain of challenges will have to be overcome, including federal permitting restrictions on new energy projects, high capital costs for increased generation, a number of technological challenges with emerging renewable energy sources, and the existing contracts with traditional energy producers. Ultimately, a comprehensive and expansive initiative that couples site-specific technologies with agency-wide coordination will help the Department both meet its statutorily mandated targets for energy efficiency and production and also effect positive change in the environmental impact of our nation's single largest energy consumer.

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I. Introduction

The Department of Defense ("DOD") currently represents the world's single largest consumer of energy, with a larger energy footprint from its daily activities than any public or private entity and more than 100 countries.[2] Not only does this represent a significant expenditure for our nation's defense budget, but it also highlights a sweeping opportunity to alter the face of energy consumption and conservation on a mass scale in the United States.[3] Pursuant to federal legislation, executive orders, and DOD policies and practices, the U.S. military has made steps toward developing more robust renewable energy standards for the agency as a whole and for individual military branches.[4]

With the roll out of the President's Climate Action Plan in the summer of 2013, the military became a key piece of our nation's shift towards cleaner, greener energy while also advancing energy security in an increasingly politically unstable global environment.[5] In highlighting the nexus between energy consumption and a changing climate, the Climate Action Plan noted that "climate change is no longer a distant threat – we are

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2. *See id.* at 2 (describing the energy usage of the DOD in relation to the entire federal government).

3. *See id.* (comparing the excessive energy usage of today's military to the energy usage issues presented in the Civil War).

4. *See infra* Part II and accompanying text.

5. *See* WARNER, *supra* note 1, at 2 ("The long-term implications of this energy consumption on national security as a whole are manifold, from bolstering illiberal regimes that control oil reserves and indirectly financing terrorist groups to driving climate change that endangers global stability and the American economy.").

already feeling its impacts across the country and the world."[6] This Note argues that the Department of Defense installations and bases represent the key piece of the puzzle in advancing a program of renewable energy sources for electricity generation and acquisition.

In Part I, this Note reviews where the Department of Defense has focused its time and funding with regards to renewable energy to date.[7] It then assesses where it could go with the remaining term of a President eager to integrate renewable technologies into the operations of the federal government.[8]

Part II reviews the various legislative, executive, and agency actions that place special requirements upon the DOD to consider a transition to renewable energy sources.[9] Part III summarizes the clear and significant benefits of renewable energy integration by the DOD, including increased mission security, positive environmental impacts, and economic incentives.[10] After reviewing the progress of the DOD to date in Part IV, Part V considers the myriad benefits of decentralizing energy systems.[11] Special attention will be paid to the untapped opportunity to use locally sourced and regionally appropriate renewables technologies[12]—in conjunction with Smart Grid and other developing transmission uses—to create a large-scale renewable energy portfolio for the federal military through use of small-scale generation.[13]

Finally, Part VI will highlight some of the major challenges to a rapid transition from traditional energy sources to

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6. *See* EXECUTIVE OFFICE OF THE PRESIDENT, THE PRESIDENT'S CLIMATE ACTION PLAN 4, *available at* http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf (July 2013) [hereinafter CLIMATE ACTION PLAN] (adding the Department of Defense's new goals and mechanisms for attaining renewable energy use across the Department, including wind, solar, biomass, and geothermal) (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

7. *See infra* Part II and accompanying text.

8. *See infra* Part II and accompanying text.

9. *See infra* Part II and accompanying text.

10. *See infra* Part III and accompanying text.

11. *See infra* Part V and accompanying text.

12. *See infra* Part V for discussion of particular renewable electricity generation technologies that take advantage of regionally abundant resources to increase efficiency and decrease transportation costs.

13. *See infra* Part V and accompanying text.

more renewable forms of electricity generation and acquisition.[14] Given the current funding opportunities, the private sector interest in renewables investment, and developing federal permitting structures to favor renewables, the time to capture the DOD's renewable energy opportunity is now.[15]

Ultimately this paper endeavors to highlight the particular opportunity for "behind the fence" electricity generation—that is, electricity generated and used within the physical boundaries of a military installation.[16] As later Parts discuss, however, a number of challenges stand in the way of facilitating this significant departure from historical and current practice; the transition to a renewable energy portfolio for our military will neither be instant nor simple.[17]

A. Background

The Department of Defense's energy footprint makes it the world's largest single consumer of energy—more than any other public or private entity and more than one hundred individual countries.[18] Looking only at domestic energy consumption—both electricity and other fuels and uses—this amounts to nearly one percent of the United States' total energy consumption and nearly eighty percent of the energy consumed by the Federal Government.[19] To put this in perspective, "the Department of Defense burns 395,000 barrels of oil per day—about as much as the entire country of Greece."[20]

The same pattern of considerable energy consumption happens at the installation and base level as well. "The DoD uses over 30,000,000 MegaWatt Hours ("MWH") of electricity per year, at an [annual] cost of over $2 billion."[21] Significantly, as recently as 2010, "[a]lmost 98 percent of the electricity supplied to [DOD]

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14. *See infra* Part VI and accompanying text.
15. *See infra* Part VI and accompanying text.
16. *See infra* Part VI and accompanying text.
17. *See infra* Part IV and accompanying text.
18. *See* WARNER, *supra* note 1, at 1 (noting the duel issues presented by such massive energy demands: environmental and security).
19. *See id.* at 2 (adding that energy consumption per person in the United States has increased 57 percent in the last four decades).
20. *Id.*
21. *Id.* at 3.

installations comes from the civilian market," leading to high susceptibility to large-scale outages resulting from accidents, weather events, increased demand, and new threats of cyber-attack.[22] Recognizing the risks involved in procuring nearly 100 percent of its electricity needs from the civilian grid, the Defense Science Board described the national power grid as "fragile and vulnerable" and noted that "critical national infrastructure places critical military and Homeland defense missions at an unacceptably high risk of extended disruption."[23]

Although much of this consumption falls within the broader categories of strategic defense, both internal and external studies of the Department of Defense's energy use reveal that energy efficiency and a lack of comprehensive energy consumption plans are just as important as problems of electricity acquisition and generation.[24] This Note endeavors to focus on the latter of these problems: the sources of energy acquisition by the U.S. military and the opportunities for the incorporation of renewable sources[25] to positively shift the strategic, environmental, and economic impacts of energy use.[26]

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22. *See id*. (characterizing the military's "exceptional appetite for energy, which is becoming untenable for our future security.").

23. 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 3–4 (2008), *available at* http://www.acq.osd.mil/dsb/reports/ADA477619.pdf [hereinafter MORE FIGHT, LESS FUEL] (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

24. *See* WARNER, *supra* note 1, at 4 (noting that while energy self-sufficiency for bases is a worthy aim, the DOD's approach has been ad hoc and does not address energy consumption by vehicles and operations); *see also* DEPARTMENT OF DEFENSE, OFFICE OF THE DEPUTY UNDER SECRETARY OF DEFENSE, INSTALLATIONS AND ENVIRONMENT, 0-3C82BA1, ANNUAL ENERGY MANAGEMENT REPORT, FISCAL YEAR 2012 (2013) [hereinafter 2012 ANNUAL ENERGY REPORT] (containing a detailed analysis of energy use by the Department of Defense in 2012 as well as a comprehensive assessment of energy initiatives across the Department).

25. *See* 2012 ANNUAL ENERGY REPORT, *supra* note 24, at 35 (stating that currently, the DOD recognizes seven main technologies for renewable electricity generation: geothermal, ground source heat pumps, biomass, solar thermal, solar photovoltaic (PV), and wind).

26. *See* WARNER, *supra* note 1, at 1 ("This is not just a matter of recognizing the energy and climate issue on the threats side of the ledger. In order to drive actual programming and yield resources, a defined and realistic

This area shares the criticism of lacking comprehensive oversight and coordination.[27] Despite a strong increase in activity related to energy efficiency and consumption in the military, the overall impact remains "spotty and lacks a broad, cohesive strategy that cuts across the [DOD] as a whole. The programming tends to be ad-hoc and often focused on the lowest-hanging fruit."[28]

Spending billions of dollars annually on energy acquisition, the DOD has the potential both to reduce these costs substantially through resource-neutral renewable sources[29] as well as infuse huge investments into new and developing technologies.[30] History has shown that military research and development can lead to breakthroughs in technology, in part because of the formidable budgets and research and development resources of the DOD.[31] The challenge, however, lies in creating a targeted and sweeping program that ensures the efficacy of this

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target finally needs to be enunciated for the Department of Defense in the energy usage realm.").

27. *See* 2012 ANNUAL ENERGY REPORT, *supra* note 24, at 5 (calling for "Department-wide integration of energy-informed analyses into decision-making and business processes."); *see also* WARNER, *supra* note 1, at 6 (suggesting that the DOD designate a "point person" to research and compile an annual report for the Secretary of the DOD and Congress, reviewing progress towards annual and long-term goals and standardizing the reporting mechanisms).

28. WARNER, *supra* note 1, at 4 (noting that plans to push military bases to operate as "net zero," for example, producing all energy necessary for base consumption, has to date only reached a small fraction of the total domestic installations).

29. *See* OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, U.S. DEPARTMENT OF ENERGY, 2012 RENEWABLE ENERGY BOOK 120 (2013) [hereinafter RENEWABLE ENERGY BOOK] (defining renewable energy sources and qualifying resource methods). Renewable electric energy sources are naturally replenishing but flow-limited. *Id.* They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. *Id.* Renewable energy resources include biomass, hydropower, geothermal, solar, wind, and ocean energy. *Id*.

30. *See* WARNER, *supra* note 1, at 6 (stating that the DOD has developed revolutionary technology in response to adversity in the past).

31. *See* Jeremy S. Scholtes, *On Point for the Nation: Army and Renewable Energy*, 34 ENERGY L.J. 55, 61 (2013) (noting that the various military branches have "acted as a crucible for social and technological advancement many times since their very inception.").

research and development and facilitates technology flow to agencies and parties outside of the DOD.[32]

Myriad external factors at play push the Department to embrace renewable technologies domestically, including "acknowledgment of evolving cyber-attack capabilities across the globe that could impact [military] operations at installations . . . [and] the need to develop operational plans and sound infrastructure that will endure through changing environmental conditions."[33]

Furthermore, the structure and reach of the Department of Defense makes it perhaps the most well positioned federal agency to move for sweeping changes in energy management.[34] With more than 500 permanent installations overseas and in the United States, military lands "contain more than 300,000 buildings and 2 billion square feet of space."[35] That means [the DOD's] footprint is 4 times that of Wal-Mart and 10 times that of the General Services Administration ("GSA")."[36] Together, these installations, comprising nearly 20 million acres, offer a "clear target for [the DOD] to promote energy efficiency and reduce energy costs," often through alternative energy sources.[37] Each

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32. *See id.* at 101 (identifying Navy and Army practices which make a unified energy initiative difficult to create).

33. *Id.* at 61.

34. *See* WARNER, *supra* note 1, at 7 (providing reasons why the DOD is in a unique position among entities to effectuate a cleaner and more environmentally friendly energy policy).

35. *See Energy Management and Initiatives on Military Installations Before the H. Readiness Subcomm. Of the H. Comm. On Armed Services*, 111th Cong. 4 (2010) (statement of Dr. Dorothy Robyn, Deputy Under Secretary of Defense for Installations and Environment, U.S. Department of Defense) (outlining the size of the military complex).

36. *See id.* (stating that this analogy to the GSA is an important indicator of the relative size of the Department of Defense compared to the remaining entirety of the Federal Government).

37. *See* U.S. DEPARTMENT OF DEFENSE, OFFICE OF THE DEPUTY UNDER SECRETARY FOR INSTALLATIONS & ENVIRONMENT, BASE STRUCTURE REPORT, FISCAL YEAR 2010 BASELINE (A SUMMARY OF DOD'S REAL PROPERTY INVENTORY) 36–78, *available at* http://www.acq.osd.mil/ie/download/bsr/bsr2010baseline.pdf [hereinafter DOD'S REAL PROPERTY INVENTORY] (cataloguing all Department of Defense's owned and managed lands in each state and territory) (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT); *see also* 2012 ANNUAL ENERGY REPORT, *supra* note 24, at 6 (calling facility energy management a "force multiplier" in the support of military readiness).

DOD base or installation presents the unique opportunity to act as a lab of hyper-local technologies, using resources in regionally specific contexts.[38] With all of these factors at the forefront of the minds of DOD leadership, steps have already been taken to coordinate among the military branches.[39]

B. Politically Opportune

The increase in attention given to environmental and climatic issues since President Obama took office could lead to the assumption that these are inherently Democratic issues; executive actions alone have led to some of the most significant advances in government sustainability in recent years.[40] A broader perspective of these issues, however, reveals strong bipartisan recognition of the threats—strategic, environmental, and economic—of waning fossil fuel resources and increasing global political complexity.[41] Given this political climate in Washington and a President keen on setting a legacy of environmentalism, the Department of Defense sits poised to initiate new measures now to set into motion long-term

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38. *See infra* Part V for a discussion of regionally specific renewable sources, including case studies.

39. *See* WARNER, *supra* note 1, at 6 ("Part of achieving success is having the metrics on hand to implement measurable standards across the [Department] and know what type of progress (or not) is being made in usage on an annual basis."); *see also* 2012 ANNUAL ENERGY REPORT, *supra* note 24, at 9–13 (listing high level officials in each military branch along with their respective titles and subordinate governance structure with regards to energy management).

40. *See* EXECUTIVE OFFICE OF THE PRESIDENT, THE PRESIDENT'S CLIMATE ACTION PLAN 4, available at http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf (July 2013) [hereinafter CLIMATE ACTION PLAN] ("In 2009, President Obama made a commitment to reduce U.S. greenhouse gas emissions in the range of 17 percent below 2005 levels by 2020.") (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT); *see also infra* Part II and accompanying discussion of Executive Orders and Memoranda.

41. *See* WARNER, *supra* note 1, at 5 ("When asked to name a key issue to solve, the one commonality between GOP, swing, and Democratic primary voters in the 2008 election was to cut America's dependency on foreign oil.").

investment in developing energy technologies and establish renewable energy standards.[42]

Indeed, the White House Climate Action Plan released in the summer of 2013 directly highlights the incorporation of renewable energy into Department of Defense strategies and the DOD's own Annual Energy Management Report singles out renewables as one of the four core principles of a balanced, secure energy plan.[43] With new federal regulations attacking some forms of fossil fuel-based energy generation, such as forthcoming Environmental Protection Agency ("EPA") limits on carbon emissions from coal facilities, the DOD will advantage itself by finding alternative sources to replace these fuels relative to the cost of retrofitting into compliance.[44]

II. Federal Action on Renewable Energy

The renewable-friendly political climate discussed above has led to a spectrum of actions—legislation, executive orders, and agency initiatives—to position the federal government as a laboratory for the development and promulgation of renewable energy technologies.[45] Many of these federal initiatives, in

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42. *See* CLIMATE ACTION PLAN, *supra* note 40, at 5 (recognizing the numerous steps already taken by President Obama's administration by "highlight[ing] progress already set in motion by the Obama Administration to advance these goals and set[ing] forth new steps to achieve them.").

43. *See id.* at 7 (summarizing the aggressive renewable goals of the Department and the significance of these goals given the Departments position as "the single largest consumer of energy in the United States . . . ."); *see also* 2012 ANNUAL ENERGY REPORT, *supra* note 24, at 6 (summarizing the four core principles as: reducing demand, expanding supply, enhancing security, and advancing new technologies).

44. *See EPA Proposes Carbon Pollution Standards for New Power Plants/ Agency takes important step to reduce carbon pollution from power plants as part of President Obama's Climate Action Plan*, U.S. ENVIRONMENTAL PROTECTION AGENCY NEWSROOM (Sept. 20, 2013), http://yosemite.epa.gov/opa/admpress.nsf/0/da9640577ceacd9f85257beb006cb2b6!OpenDocument (announcing the new rulemaking with a mission to "cut carbon pollution from new power plants in order to combat climate change and improve public health") (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT); *see also* CLIMATE ACTION PLAN, *supra* note 40, at 5 (heralding "tough new rules to cut carbon pollution" in line with the Administration's goals).

45. *See* Congressional Research Service, *Renewable Energy and Energy Efficiency Incentives: A Summary of Federal Programs,* 1–2 (Mar. 22,

tandem with a collection of state initiatives, have created an environment in which public-private partnerships can thrive.[46] For example, the Department of Energy's Office of Renewable Energy and Efficiency ("DOE-OREE") and the National Renewable Energy Laboratory ("NREL") cultivate private sector appetite for renewable energy development.[47] DOE-OREE supports deployment of new renewable technologies and encourages energy efficiency initiatives.[48] Similarly, NREL, another division of the Department of Energy ("DOE"), acts as the government's main laboratory for new and emerging renewable energy technologies.[49]

These various agencies work together to develop renewable energy solutions for the federal body and beyond.[50]

2013) (discussing numerous actions toward the modern federal approach to renewable energy technology) (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

46. *See* NAT'L RENEWABLE ENERGY LAB., DEP'T OF ENERGY, §1603 TREASURY GRANT EXPIRATION: INDUSTRY INSIGHT ON FINANCING AND MARKET IMPLICATIONS, at iii (June 2012) ("The §1603 Program entitled project developers to receive 30% of a project's capital cost in the form of a cash payment, thus freeing developers of having to rely on tax equity investors to monetize the tax credits.").

47. *See* NAT'L RENEWABLE ENERGY LAB., DEP'T OF ENERGY, *Leadership* (last visited Feb. 13, 2015), http://www.nrel.gov/about/leadership.html (identifying NREL as a sub-unit of the DOE-OREE) (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT); *see also infra* notes 49–50 and accompanying text (discussing the aligned roles of NREL and the DOE-OREE).

48. *See* OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY, DEP'T OF ENERGY, *About Us*, http://energy.gov/eere/about-us (last visited Apr. 12, 2014) (noting that DOE-OREE "accelerates development and facilitates deployment of energy efficiency and renewable energy technologies and market-based solutions that strengthen U.S. energy security, environmental quality, and economic vitality") (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

49. *See* NAT'L RENEWABLE ENERGY LAB., DEP'T OF ENERGY, *About NREL* (last visited Apr. 12, 2014), http://www.nrel.gov/about/overview.html (describing its work as developing "renewable energy and energy efficiency technologies and practices, advance[ing] related science and engineering, and transfer[ing] knowledge and innovations to address the nation's energy and environmental goals") (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

50. *See* NAT'L RENEWABLE ENERGY LAB., DEP'T OF ENERGY, *National Laboratory Impact Initiative Team* (last visited Apr. 12, 2015), http://energy.gov/eere/national-laboratory-impact-initiative-team (outlining a DOE-OREE program to "[i]ncrease and enhance laboratory-private sector

The following sections will look at specific legislative and Executive actions that have pushed for further renewable energy integration and now set goals—some mandatory, others aspirational—applicable to the Department of Defense.

A. Legislation

A collection of legislative actions has created various goals for Federal agencies in terms of sustainability and integration of renewable energy.[51] The result is a somewhat confusing array of definitions and benchmarks.

The Energy Policy Act of 2005 ("EPACT05")[52] directs federal agencies to consume three percent of their electrical energy from renewable sources for the years 2007 through 2009, increasing progressively to seven and one-half percent in 2013.[53] According to EPACT05, progress towards these goals should proceed as "economically feasible and technically practicable."[54] Adding to this, the Energy Independence and Security Act of

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relationships[s]," "[i]ncrease and streamline access to national laboratory capabilities[,]" and "[d]emonstrate the value of lab-developed science and technology") (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT); *see also* NAT'L RENEWABLE ENERGY LAB., DEP'T OF ENERGY, *Missions and Programs* (last visited Apr. 12, 2015), http://www.nrel.gov/about/mission-programs.html (identifying NREL as "the only federal laboratory dedicated to research, development, commercialization, and deployment of renewable energy and energy efficiency technologies") (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

51. *See* OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY, DEP'T OF ENERGY, *Laws and Requirements* (last visited Apr. 12, 2015), http://energy.gov/eere/femp/laws-and-requirements-0 (describing the Federal Energy Management Program which "analyzes energy management legal authorities, develops guidance documents, and publishes notices and rules" necessary to support agency compliance with numerous federal energy laws and requirements) (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT); *see generally* Congressional Research Service, *supra* note 46 (cataloging numerous federal goals and citing underlying legislative authorities).

52. 42 U.S.C. §§ 15801–16524 (2012) [hereinafter EPACT05].

53. *See id.* § 15852 (establishing a number of renewable energy priorities for the entire federal government).

54. *Id.*

2007 ("EISA07")[55] introduced a required reduction in fossil fuel use in new and renovated buildings by fifty-five percent in 2010, increasing to one hundred percent in 2030.[56] An important qualifier for this requirement carried over from Executive Order 13423, which stated that at least half of the renewable energy contributing towards EISA07 goals must come from "new" sources.[57] Both of these legislative sources of renewable energy goals emphasize a preference for on-site generation facilities, which can contribute both to production efficiency and supply security.[58]

From 2009 through 2013, the Department of Defense fell short of its EISA07 mandated energy intensity goals.[59] Also, the Department of Defense failed to attain its 2013 EPACT05 goal for renewable electricity consumption: the DOD consumed 5.0% of its electricity from renewable sources, short of its 7.5% target.[60] In pursuing EISA07 targets, the DOD approached the annual goal—a 24% reduction in facility energy intensity—with a 17.2% reduction in energy consumer per gross square foot of facility space.[61] One area of promising development—the production of electric energy from renewable sources—revealed that 11.8% of the total facilities electricity consumption in 2013 came from

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55. Pub. L. No. 110-140, 121 Stat. 1492 (codified at 42 U.S.C. §§ 17001–17386 (2012)) [hereinafter EISA07].

56. *See* 42 U.S.C. § 6834(a)(3)(D)(i)(I) (2012) (displaying a timetable for reduction in federal fossil fuel consumption); *see also* 42 U.S.C. § 17131 (2012) (permanently authorizing a financing vehicle called Energy Savings Performance Contracts (ESPCs) which allow for a combination of appropriated funds and private funds).

57. *See* Exec. Order No. 13,423, 77 Fed. Reg. 17 (Jan. 25, 2007) (defining a "new" source as coming from a renewable energy generator coming into service after January 1, 1999).

58. *See* 42 U.S.C. § 15852 (offering double renewable energy credits for on-site generation); *see also* 42 U.S.C. § 6834 (requiring solar hot water technology to provide "not less than 30 percent of the hot water demand for each new Federal building or Federal building undergoing a major renovation" if "lifecycle cost-effective").

59. *See* OFFICE OF THE DEPUTY UNDER SEC'Y OF DEF., DEP'T OF DEF., 0-3C82BA1, ANNUAL ENERGY MANAGEMENT REPORT, FISCAL YEAR 2013, 19 (2014) (showing graphically in figure 3-4 Department of Defense performance relative to EISA07 goals).

60. *See id.* at 7 (charting "FY 2013 DoD Progress Toward Facility Energy and Water Goals" in table 1-1).

61. *See id.* (marking DOD progress in reduction of energy consumption).

renewable energy.[62] This shows progress towards the goal of 25% in 2025.[63]

B. Executive Action

In a broad inclusion of all federal agencies, Executive Order 13423—Strengthening Federal Environmental, Energy, and Transportation Management—called for improvements in energy efficiency and set long terms goals with annual benchmarks.[64] In part, the Executive Order called for agencies to:

> (a) improve energy efficiency and reduce greenhouse gas emissions of the agency, through reduction of energy intensity by (i) 3 percent annually through the end of fiscal year 2015, or (ii) 30 percent by the end of fiscal year 2015, relative to the baseline of the agency's energy use in fiscal year 2003;
> (b) ensure that (i) at least half of the statutorily required renewable energy consumed by the agency in a fiscal year comes from new renewable sources, and (ii) *to the extent feasible, the agency implements renewable energy generation projects on agency property for agency use.*[65]

In the summer of 2013, President Obama released a comprehensive Climate Action Plan, outlining the

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62. *See id.* at 33 (noting that the "EPAct 2005 goal measures total renewable electricity consumption as a percentage of total facility electricity consumption.").

63. *See id.* at 7 (reflecting DOD 2013 performance against 2025 goals).

64. *See* Exec. Order No. 13,423, 77 Fed. Reg. 17 (Jan. 25, 2007) (asserting goals after declaring general policy for federal conduct to occur in "an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner").

65. *See id.* (defining "new renewable sources" as only those "placed into service after January 1, 1999" and "renewable energy" as "produced by solar, wind, biomass, landfill gas, ocean[,] . . . geothermal, municipal solid waste, or new hydroelectric generation capacity . . . .") (emphasis added); *see also* Executive Order No. 13,514 (Oct. 5, 2009) (regarding federal agency greenhouse gas emissions).

Administration's vision for addressing climate change via the actions of the government and, in particular, federal agencies.[66] While the overall goals of the Climate Action Plan focused on combatting climate change across sectors and markets, some of the most tangible goals set forth by the Administration came in the form of promoting American leadership in renewable energy development.[67] In order to meet a goal of doubling renewable energy production by 2020, the Climate Action Plan proposed to issue permits for ten Gigawatts of renewable energy on public lands by 2020.[68] This includes a commitment by the Department of Defense to deploy three Gigawatts of renewables on military installations by 2025.[69] These goals will be analyzed more thoroughly below.[70]

III. Benefits of Renewable Energy to the Department of Defense

The transition from traditional, fossil fuel sources of electricity generation carries numerous advantages, both in the civilian world and in the military.[71] The recognition of these benefits has spread from a small section of the environmental

66. *See* CLIMATE ACTION PLAN, *supra* note 40, at 5 (describing a "broad-based plan to cut the carbon pollution that causes climate change and affects public health").

67. *See id.* at 4–6 ("Climate change represents one of our greatest challenges of our time, but it is a challenge uniquely suited to America's strengths. . . To ensure America's continued leadership position in clean energy, President Obama has set a goal to double renewable electricity generation once again by 2020.").

68. *See id*. at 7 (summarizing the progress towards previous presidential goals of renewable energy goals on public lands); *see also infra* Part VI and accompanying text (discussing emerging issues of public land management among federal agencies).

69. *See id*. (classifying the Department of Defense as the "single largest consumer of energy in the United States").

70. *See infra* Part VI and accompanying text (discussing hurdles to federal renewable energy goal accomplishment).

71. *See* CLIMATE ACTION PLAN, *supra* note 40, at 5 (commenting on interests pertaining to the general public in climate change and health); *see also* DEPARTMENT OF DEFENSE, *supra* note 59, at 33 (noting the DOD's interest in cost-efficiency as well as energy security).

community to a much wider spectrum of the country.[72] And given the size and distribution of domestic military installations, such benefits are multiplied across the largest federal agency.[73] Furthermore, the technology transfer from the DOD to other civilian applications stands as an additional benefit of aggressive and rapid development of renewable energy technologies in military settings.[74]

A Memorandum of Understanding between the DOE and DOD placed strong focus on the potential benefits of a transition to renewable energy to the United States military.[75] In doing so, the DOD may "improve energy security and operational effectiveness, reduce greenhouse gas ("GHG") emissions in support of U.S. climate change initiatives, and protect the [DOD] from energy price fluctuations."[76] These three broad benefits—

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72. *See* Ned Resnikoff and Amanda Sakuma, *The Largest Climate March in History*, MSNBC (Sept. 21, 2014), http://www.msnbc.com/msnbc/largest-climate-march-history-kicks-new-york# (stating that "[m]ore and more people are seeing how climate change affects them" as stated by one interviewee); *see also* ENVTL. PROT. AGENCY, *Renewable Energy* (last updated Aug. 13, 2014), http://www.epa.gov/statelocalclimate/state/topics/renewable.html (counting the benefits of renewable energy to include "[g]enerating energy that produces no greenhouse gas emissions from fossil fuels and reduces some types of air pollution[,] [d]iversifying energy supply and reducing dependence on imported fuels[,] [and] [c]reating economic development and jobs").

73. *See* NAT'L RENEWABLE ENERGY LAB., DEP'T OF ENERGY, *Department of Defense Energy Programs* (last updated Jan. 20, 2015), http://www.nrel.gov/defense/projects.html (asserting that "energy efficiency and renewable energy strategies can be replicated across the DOD") (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

74. *See id.* (suggesting that DOD renewable energy advances shift to "other federal agencies, setting the stage for broad market adoption").

75. *See* Memorandum of Understanding between The U.S. Department of the Energy and The U.S. Department of Defense 1–2 (July 22, 2010), *available at* http://www.energy.gov/sites/prod/files/edg/media/Enhance-Energy-Security-MOU.pdf [hereinafter DOE Memorandum of Understanding] (including in its purpose "to strengthen coordination of efforts to enhance national energy security, and demonstrate Federal Government leadership in transitioning America to a low carbon economy.").

76. *Id.*; *see also* ENVTL. AND ENERGY STUDY INST., *Fact Sheet*: *DoD's Energy Efficiency and Renewable Energy Initiatives* 1 (July 2011), *available at* http://files.eesi.org/dod_eere_factsheet_072711.pdf (outlining major energy efficiency and renewable energy initiatives underway by the Department of Defense, Army, Navy, Marine Corps, and Air Force) (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

security, environmental, and economic—are analyzed individually below.

A. Security

A domestic transition to renewable energy sources will contribute to long-term security of U.S. military interests.[77] Working towards shifting base and installation electricity generation to renewable sources and away from fossil fuel sources will lessen the dependence on foreign supplies of these resource extractive fuels.[78] One report calling for a more comprehensive military energy plan points out, "[m]oving the [Department of Defense] away from reliance on petroleum will also ultimately address the long-standing irony" of sourcing our military energy needs from conflict regions.[79]

Aside from reducing the need for conflict intervention to preserve fossil fuel sources, focusing energy acquisition on local sources of fuels reduces the risk of terroristic disruptions of energy to domestic military installations.[80] The DOD acts in accordance with specific legislative requirements to reach what it calls "energy security."[81] Essentially, the military must work towards "having assured access to reliable supplies of energy and

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77. *See* DOE Memorandum of Understanding, *supra* note 75, at 2 (defining energy security as "having assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet operational and Installation energy needs" and considering energy efficiency "as a force multiplier, increasing the range and endurance of forces").

78. *See* Renewable Energy, *supra* note 73 ("[R]educing energy costs, decreasing reliance on foreign oil and increasing energy security is part of the DOD mission.").

79. *See* WARNER, *supra* note 1, at 1 (adding that a shift away from foreign oil will "give our military forces greater freedom of maneuver and reduced lines of communication across the entire spectrum of warfare from Expeditionary Operations to Disaster Relief and Humanitarian Operations.").

80. *See id.* at 6 (suggesting a commission should be tasked with looking at each step in the process of energy development, acquisition, and generation "to determine energy security implications of issues such as import dependency, rare metals mining, and bio-based materials").

81. *See* 10 U.S.C. § 2924 ("In selecting facility energy projects that will use renewable energy sources, pursuit of energy security means the installation will give favorable consideration to projects that provide power directly to a military facility or into the installation electrical distribution network.").

the ability to protect and deliver sufficient energy to meet mission essential requirements."[82] As the department mandate states, the driving force behind energy security is found in "mission essential" considerations.[83] As described by the Office of the Deputy Under Secretary of Defense for Installations and Environment, this goal of energy security manifests as three key objectives.[84]

First, the development of more energy-efficient facilities, investment in economical energy sources—including alternative energy—and considerations across the DOD of energy use and conservation support the energy security of the Department of Defense's mission and assets.[85] Second, the Department recognizes that this mandate requires promotion of energy security of non-military infrastructure, "to monitor energy-related dependencies and promote the restoration and resilience" of other public and private sector equities.[86] Finally, technological innovation must drive the Department to achieve the security of future defense forces and missions.[87]

B. Environmental

Some critics may conclude that a transition to renewable energy represents the narrow goals of environmental groups. But the looming potential realities of climate change and finite resources have caught the attention of organizations and agencies seemingly removed from the environmental dialogue. The military itself has acknowledged climate change as a real and

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82. *See id.* (stating that "facility energy projects . . . should be prioritized to provide power for assets critical to mission essential requirements on the installation in the event of a disruption in the commercial grid").

83. *See id.* (defining energy security relative success in mission essential requirements).

84. *See* 2012 ANNUAL ENERGY REPORT, *supra* note 24 (emphasizing that these key objectives span "across the Department").

85. *See id.* (adding a recommendation that energy-informed analyses become integrated into all levels of decision making and business processes within the Department).

86. *See id.* (listing such entities as other federal departments and agencies, state and local governments, and private sector partners).

87. *See id.* at 5–6 (noting the need for support from both various Department subdivisions—Science, Technology, Engineering, and Environmental—as well as resources and expertise across the Government and the private sector).

pressing threat both to our society as a whole and to the ongoing operations of the military specifically.[88] A military advisory board recently stated that the "nature and pace of climate change being observed today and the consequences projected by the consensus scientific opinion are grave and pose equally grave implications for our national security."[89] The Department of Defense's own Quadrennial Defense Review noted:

> Assessments conducted by the intelligence community indicate that climate *change could have significant geopolitical impacts around the world*, contributing to poverty, environmental degradation, and the further weakening of fragile governments . . . . While climate change alone does not cause conflict, it may act as an accelerant of instability or conflict, placing a burden to respond on civilian institutions and militaries around the world.[90]

Therefore, any effort by the DOD and its component branches will "help to reduce greenhouse gas emissions and protect our natural resources in order to slow, stabilize, or reverse climate change."[91]

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88. *See On Point for the Nation*, *supra* note 31, at 58–59 (2013) (noting the national security implications of climate change).

89. *See* MILITARY ADVISORY BD., THE CNA CORP., NATIONAL SECURITY AND THE THREAT OF CLIMATE CHANGE 1 (2007), *available at* http://www.cna.org/sites/default/files/National%20Security%C20and%C20the%C20Threat%C20of%C20Climate%C20Change%-%20Print.pdf (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

90. Department of Defense, Quadrennial Defense Review Report 85 (Feb. 2010) [hereinafter QDR 2010], *available at* www.defense.gov/qdr/images/QDR_as_of_ 12Feb10_1000.pdf (emphasis added) (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

91. *See On Point for the Nation*, *supra* note 31, at 59 (positing that the breadth and depth of the military's national presence can begin to effect change across industries, leading to more investment in renewable technologies); *see also* Stan Alcorn, *Why The Military Is Pushing to Green the Government*, FAST COMPANY (Oct. 10, 2013, 11:26 AM), *available at* http://www.fastcoexist.com/3019332/heres-an-idea/why-the-military-is-pushing-to-green-the-government (explaining how the Department of Defense must "be onboard" in order to meet the President's goal of having 20% of the Federal

As the Climate Action plan pointed out, the military has an important role to play in our nation's progress in reducing greenhouse gas emissions association with traditional fossil fuel use.[92] However, given the varied and broad benefits which renewables can offer the DOD, a comprehensive and strategic plan must guide agency-wide actions and efforts.

C. Economic

Across the board, federal agency budgets have steadily declined while energy costs of all forms continue to fluctuate. At the same time, the costs associated with various renewable energy technologies decrease as innovation and development drive market competition.[93]

For example, "the average price of a completed [solar photovoltaic] system has declined by more than 40%" in the last three years.[94] Similar trends have occurred in other renewable energy generation fields.[95] The ability of the DOD to sign long-term contracts for these developing technologies allows it to hedge against volatile energy costs.[96] The economic

Government's energy come from renewable sources by 2020) (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

92. *See* CLIMATE ACTION PLAN, *supra* note 40 and accompanying text.

93. *See* RENEWABLE ENERGY BOOK*, supra* note 29, at 4 (noting that "in the United States, renewable electricity has been capturing a growing percentage of new capacity additions during the past few years"). In 2012, renewable electricity accounted for more than 56% of all new electrical capacity installations in the United States—a large change from 2004 when all renewable electricity captured only 2% of new capacity additions. *Id.*

94. SOLAR ENERGY INDUS. ASS'N, ENLISTING THE SUN: POWERING THE U.S. MILITARY WITH SOLAR ENERGY 7 (2013) [hereinafter ENLISTING THE SUN].

95. *See* Silvio Marcacci, *Analysis: 50% Reduction in Cost of Renewable Energy Since 2008*, CLEANTECHNICA (Sept. 11, 2013), *available at* http://cleantechnica.com/2013/09/11/analysis-50-reduction-in-cost-of-renewable-energy-since-2008/ (reviewing reports of lower capital costs for renewable energy technologies across all types between 2008 and 2012). The report found that some sources, such as wind and solar, are "now cost-competitive with many fossil fuel generation sources at an unsubsidized [levelized cost of energy], even before factoring in externalities like pollution or transmission costs." *Id.*

96. *See* ENLISTING THE SUN, *supra* note 94, at 9 ("the military signs a contract to purchase the energy produced by the solar installation at a price that is below local utility rates, which can save the DOD and taxpayers millions of dollars over the life of the system").

considerations will be analyzed more fully in Part VI which considers some challenges of a transition away from traditional energy suppliers in an effort to boost renewable energy consumption.

IV. Department Integration of Renewable to Date

> The military services have demonstrated a willingness to be early adopters of new technologies and enablers of renewable and alternative energy projects. [T]hey work towards net zero installations, adopt advanced metering technologies, investigate microgrid technologies, and partner with the private sector to develop wind, solar, geothermal and waste-to-energy systems, just to name a few.[97]

Despite this clear Congressional statement of confidence in the DOD's ability to achieve rapid integration of renewable energy technologies, the on-the-ground reality reveal this process easier said than done. A patchwork of legislative mandates, executive orders, and internal agency initiatives has created a somewhat opaque goal for the Department of Defense.[98] The legislative sources described above, in fact, create conflicting long-term goals in terms of the adoption of renewable energy sources, including different definitions of qualifying electricity sources.[99]

While EPACT05 and EISA07 apply broadly across the federal government, specific language in Title 10 of the U.S. Code

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97. *Energy Management and Initiatives on Military Installations*: *Hearing Before the H. Readiness Subcomm. Of the H. Comm. On Armed Services*, 111th Cong. 1 (2010) (opening statement of Hon. Solomon P. Ortiz, A Representative from Texas, Chairman, Readiness Subcommittee).

98. *See* Part II*, infra* and accompanying text.

99. *Compare* EPACT05, *supra* note 52, at § 203 (defining qualifying sources as "electric energy generated from solar, wind, biomass, landfill gas, ocean (including tidal, wave, current, and thermal), geothermal, municipal solid waste, or new hydroelectric generation capacity achieved from increased efficiency or additions of new capacity at an existing hydroelectric project"), *with* EISA07, *supra* note 55, at § 803(a)(4) (defining the term "renewable energy project" as one generation commercial electricity from: solar, wind, geothermal, ocean, biomass (as defined by EPACT05), landfill gas, or Alaska small hydroelectric power").

requires further specific actions by the Department of Defense.[100] The renewable energy goal found there measures the total renewable energy (electric and non-electric) production and procurement as a percentage of the total facility electricity consumption.[101] From this, the Code sets a goal of fifteen percent renewables by 2018, increasing to twenty-five percent by 2025.[102] Additionally, selected service branches have established independent goals of installing one gigawatt of renewable energy on or near their installations.[103]

The DOD's most recent Annual Report on energy management outlines the progress made towards these goals.[104] Looking broadly, in fiscal year 2013 the DOD failed to meet both its target for reducing facility energy use and its target for renewable energy consumption.[105] Additionally, in its goal of attaining twenty-five percent renewable source generation by 2025, the DOD reached 11.8% in 2013.[106] This data can be somewhat misleading, however, because of large variances between individual DOD branches. For example, the Marine Corps and Air Force have exceeded the EPACT05 goals of renewable energy consumption (11.7% and 8% respectively) while the Army and Navy have fallen short (1.1% and 1.7% respectively).[107] Conversely, the Navy has led the field in

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100. *See* 10 U.S.C. § 2911(e) (mentioning specific energy production targets and establishing interim goals for FY 2018).

101. *See* 10 U.S.C. § 2911(e)(2) (describing interim goals to be established for FY 2018).

102. *See* 10 U.S.C. § 2911(e) (noting production requirements for FY 2025).

103. *See* 2012 ANNUAL ENERGY REPORT, *supra* note 24, at 31 (including various target years for branch-specific attainment).

104. *See* DEP'T OF DEF., OFFICE OF THE DEPUTY UNDER SEC'Y OF DEF., INSTALLATIONS AND ENVIRONMENT, 0-3C82BA1, ANNUAL ENERGY MANAGEMENT REPORT, FISCAL YEAR 2013 (June 2014) (containing a detailed analysis of energy use by the Department of Defense in 2013 as well as a comprehensive assessment of energy initiatives across the Department).

105. *See id.* at 7, D-1 (noting a 17.2% reduction in facility energy use towards a goal of 24%, and total renewable consumption of 5% out of the goal of 7.5%).

106. *See id.* (reporting Department of Defense energy produced from renewable sources in fiscal year 2013).

107. *See id.* (showing the performance gap between branches).

renewable energy production, producing a total of 26.6% of total facility electricity consumed from renewable sources.[108]

As later sections of this Note will look at the specific fuels used in various renewable energy applications, it is worth noting the dominant fuel types used to date by the DOD.[109] Although solar (photovoltaic and thermal) comprise the largest portion of installation renewable energy projects by number of projects, the largest contributor to overall energy generation comes from geothermal projects.[110] One project—the Navy's China Lake geothermal power plant in California—supplies nearly half of all of the DOD's renewable energy production.[111] Large generation sites such as this may skew the overall spread of renewable energy generation within the DOD. But these projects also make the most significant advances to reaching statutory and agency benchmarks.[112]

V. Fixing Technology to Place

As noted above, both legislative mandates and agency policies favor on-site generation versus mere acquisition from outside renewable generators.[113] This method encourages both the utilization of local resources and the technologies that have

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108. *See id.* (listing the total renewable energy produced or procured as a percentage of total facility energy for the Department of Defense). It is important to note that almost all of the Navy's qualifying renewable electricity comes from the large China Lake geothermal project, discussed below. *Id*. at 37.

109. *See infra* Part V and accompanying text.

110. *See* 2012 ANNUAL ENERGY REPORT, *supra* note 24, at 35 (providing, in Figure 4-3, a graphical breakdown of renewable energy supply mix by technology type).

111. *See id.* (listing the top eleven sources of renewable energy generation, totaling nine major projects generating greater than 100 BBtu and approximately four-hundred and fifty smaller projects generating less than 100 BBtu electricity).

112. *See id.* at 37 (highlighting a 6.2% decrease in electricity generation capacity in FY2012). "Although there have been numerous improvements resulting in more efficient use of the geothermal resource at China Lake over the past 25 years, a decline in power production is typical for a liquid-dominated geothermal resource with long- term continuous liquid production." *Id*.

113. *See supra* Part IV and accompanying text.

been developed to capture those resources.[114] With each year, the spectrum of renewable energy technologies broadens; new and more efficient technologies continue to come into the market, allowing for some form renewable energy to be best suited to any particular geographic area. Given the near-ubiquitous presence of U.S. military bases and installations across the country, the Department of Defense is positioned to take advantage of regionally suited renewable energy technologies to meet its electricity generation needs.[115]

For example, a biomass energy facility located in a region dominated by forested lands already produces the secondary wood wastes necessary for biomass generation—the tree tops and bark from harvesting and mill waste from milling.[116] Woody biomass energy production uses these products to generate electricity.[117] Therefore, an existing market can be sustained or grown while closing the loop on one of the waste products of timber processing. Similarly, a region rich with geothermal resources[118] will create what amounts to neutral supply chains, taking advantage of the resource in-situ.[119]

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114. U.S. DEP'T OF ENERGY, THE POTENTIAL BENEFITS OF DISTRIBUTED GENERATION AND RATE-RELATED ISSUES THAT MAY IMPEDE THEIR EXPANSION: A STUDY PURSUANT TO SECTION 1817 OF THE ENERGY POLICY ACT OF 2005 ii (2007) [hereinafter DOE DISTRIBUTED GENERATION STUDY] (noting that the implementation of Section 210 of the Public Utilities Regulatory Policy Act of 1978 "sparked a new era of highly energy efficient and renewable [distributed generation] for electric utility system applications").

115. *See* DOD'S REAL PROPERTY INVENTORY, *supra* note 38, at 36–78 (providing a detailed list of the nearly 20 million acres of DOD's owned or managed lands in the United States).

116. *See NREL Biomass Maps*, NATIONAL RENEWABLE ENERGY LABORATORY [hereinafter *NREL Biomass Maps*], http://www.nrel.gov/gis/biomass.html (providing county-level maps of the availability of primary and secondary mill wastes to be used in biomass electricity production) (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

117. *See Biomass Energy Basics,* NATIONAL RENEWABLE ENERGY LABORATORY, http://www.nrel.gov/learning/re_biomass.html (outlining the technical basics of biomass electricity generation) (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

118. *See* RENEWABLE ENERGY BOOK, *supra* note 29, at 4 (including a map of geothermal resources in the United States).

119. *Geothermal Technologies*, NATIONAL RENEWABLE ENERGY LABORATORY (last updated Aug. 28, 2014), http://www.nrel.gov/geothermal/ (summarizing the mechanics of geothermal energy) (on file with the

Fixing renewable technologies to a geographic place has produced some of the most successful projects to date.[120] In addition to the large China Lake geothermal power plant in California, numerous other geothermal projects have tapped rich geothermal resources with the help of analyses by other federal agencies.[121] Similarly, branch projects in the Southeast and Northeast—historically timber rich regions—make biomass one of the most viable forms of renewable energy production.[122] By using local resources, the DOD can both ensure the security of its energy supply chains as well as approaching the goals of producing all energy "behind the fence."

A. Case Study I: Biomass in the U.S. Northeast

Numerous federal agencies are working on increasing the foundational knowledge of renewable energy resources and potential in the United States.[123] The DOE's National Renewable Energy Laboratory ("NREL") has completed extensive mapping projects to identify regions where certain renewable energy technologies would be best suited.[124] To ground-truth these

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WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT); *see also* Leslie Blodgett, *Geothermal Visual: Power Capacity and Potential at California Geothermal Fields*, RENEWABLE ENERGY WORLD (Feb. 7, 2014) http://www.renewableenergyworld.com/rea/blog/post/2014/02/geothermal-visual-power-capacity-and-potential-at-california-geothermal-fields?cmpid=WNL-Wednesday-February12-2014 (providing data of geothermal "resource rich" regions) (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

120. *See supra* Part IV and accompanying text.

121. *See* RENEWABLE ENERGY BOOK, *supra* note 29, at 4 (including a map of geothermal resources in the United States).

122. *See* 2012 ANNUAL ENERGY REPORT, *supra* note 24, at 35 (highlighting biomass projects in Georgia and Kentucky as two of the top ten renewable energy-producing sites nationally).

123. *See* Energy Research Knowledge Center, *United States*, STRATEGIC ENERGY TECHNOLOGIES INFORMATION SYSTEM (last visited Feb. 15, 2015), http://setis.ec.europa.eu/energy-research/country/united-states (describing the various agencies involved in energy resource in the United States) (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

124. *See generally* United States Department of Energy, *Research*, NATIONAL RENEWABLE ENERGY LABORATORY (last visited Apr. 12, 2015), http://www.nrel.gov/research/ (providing detailed information about a variety of

surveys to determine viability, the NREL completed a set of case studies to analyze the potential of various technologies at specific sites.[125]

One such study involved the EPA's RE-Powering America's Land initiative—a program to use contaminated sites for renewable energy generation.[126] The study focused on a timber rich region of Vermont where timber markets used to drive the local industry.[127] The closure of local mills and other manufacturing facilities left the area with an abundance of wood biomass resources.[128] Similar wood-based energy generation—both for electricity and for combined heat and electricity—would utilize local resources in heavily forested areas of the Eastern United States, ranging from Florida to Maine.[129]

The NREL study highlighted the potential of biomass technologies, particularly biomass-fired combined heating and electricity generation, as a viable and promising option for the former timber mill community.[130] Issues highlighted included "biomass availability and cost, equipment sizing and cost, and operation and maintenance costs."[131] Similar site-specific studies would need to be completed at any potential installation where biomass presented a viable option for renewable transition. In addition, in moving "behind the fence," these and other sourcing

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energy technologies, including mapping and research studies, which focuses on clean energy).

125. *See id.* (describing in detail each individual project under consideration).

126. *See RE-Powering America's Land*, U.S. ENVIRONMENTAL PROTECTION AGENCY (last visited Feb. 15, 2015), http://www.epa.gov/oswercpa/ (describing a process by which the EPA "identifies the renewable energy potential of . . . sites and provides other useful resources for communities, developers, industry, state and local governments or anyone interested in reusing these sites for renewable energy development.").

127. *See* NATIONAL RENEWABLE ENERGY LABORATORY, PUTNEY BASKETVILLE SITE BIOMASS CHP ANALYSIS, iv (Oct. 2013) [hereinafter NREL BIOMASS STUDY] (explaining the characteristics of the Putney site for biomass projects).

128. *See id.* at 4 (detailing the history and ownership of the Basketville site).

129. *See NREL Biomass Maps*, *supra* note 120 (providing GIS data for county-level biomass resource capabilities).

130. *See* NREL BIOMASS STUDY, *supra* note 132, at iv (summarizing the recommendations for the Basketville project).

131. *Id.* at v.

and cost challenges would likely become more complex, threatening the sustained viability of small-scale electricity generation projects.[132]

B. Case Study II: Solar in the U.S. Southwest

Another NREL study looked at the feasibility of solar photovoltaic cells at the Ft. Hood Military Base in Texas.[133] The purpose of the study was to "assess the site for possible [solar energy] installations and estimate the cost, performance, and site impacts" of different solar options.[134] In doing so, Ft. Hood sought to increase "behind the fence" generation using a locally available resource—ample land to introduce solar arrays.[135]

Factors for determining an appropriate site for a solar project on the base included: available area for the solar array, solar resource analysis, distance to transmission lines, and distance to major roads.[136] Aside from these technical requirements, any renewable energy project generating on an active military installation requires consideration of the base's operating status, ground conditions, and restrictions associated with future development of the base.[137]

The study noted that Ft. Hood is slated for future expansion.[138] Therefore, the feasibility study accounted for "construction projects on and around the base as buildings are

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132. *See infra* Part VI and accompanying text (reviewing a number of technical, legal, and practical challenges to similar "behind the fence" electricity production).

133. *See* NATIONAL RENEWABLE ENERGY LABORATORY, FEASIBILITY STUDY OF ECONOMICS AND PERFORMANCE OF SOLAR PHOTOVOLTAICS AT THE FT. HOOD MILITARY BASE OUTSIDE KILLEEN, TEXAS (Oct. 2013) [hereinafter NREL SOLAR STUDY] ("A Study prepared in partnership with the Environmental Protection Agency for the re-powering America's land Initiative . . . .").

134. *Id.* at iv.

135. *See id.* at iv (describing Foot Hood as the largest active-duty armored post in the United States at 159,000 acres).

136. *See id.* at 9 (pointing out that these and other factors are similar for rooftop mounted solar systems as well as those freestanding on the ground).

137. *See id.* at iv (adding further to the need to consider applicable local building code requirements with respect to snow, wind, and seismic zones).

138. *See id.* at 20 (estimating future energy cost and the amount of energy available to be used on site or sold to local companies).

upgraded regularly"[139] and "existing build-out plans"[140] to expand operations. Even taking these future variables into consideration, the nature of military strategy and planning—potentially expanding or reducing operations over the course of short time periods—rapid integration of "behind the fence" electricity generation will be further challenged by the rapid change inherent in military operations.[141]

The study identified approximately fifty acres on the Ft. Hood base for carport roof-mounted solar systems, a method of applying the solar technology to best fit with the operations and restrictions of the military installation.[142] Even considering the economic incentives available at the time of the study,[143] however, the low retail rate of electricity in the region led NREL to conclude that solar renewable energy projects "would not be recommended for the site at the current utility price."[144] Looking beyond pure economics, the base would need to consider other factors such as grid independence and supply guarantees, potentially making a solar project more beneficial in the long term.[145] Beyond solar, the Ft. Hood site has potential renewable energy prospects in the form of biomass power and biomass-based fuels and on- or off-site wind turbines.[146]

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139. See NREL SOLAR STUDY, *supra* note 133, at iv.

140. *Id.*

141. *See* U.S Army War College*, Energy Security in the 2010s and Implications for the U.S. Military*, STRATEGIC STUDIES INSTITUTE, 27 (2014) (analyzing the steps involved in satisfying the U.S. Military's energy needs in the 2010s).

142. *See* NREL SOLAR STUDY, *supra* note 133, at iv (noting that much of the installation's acreage was excluded from the study due to the need for open space for field operations).

143. *See id.* at v (including the Solar and Wind Energy Business Franchise Tax Exemption; the Renewable Energy Property Tax Exemption; an incentive program through the local energy company; and the Federal Investment Tax Credit).

144. *See id.* at v (showing a table that diagrams the various incentives evaluated when making this determination).

145. *See id.* at iv (analyzing the number of average American households that could be powered off such a system and corresponding estimated job creation).

146. *See id.* at 2 (summarizing the compelling reasons for a diverse energy plan to reduce dependence on outside fuel sources and to increase supply security).

C. Microgrids and Smart Grids

The increasing use of smart grid and microgrid technologies, combined with a shift from centralized energy generation to decentralized, small scale facilities better fits the structure and geographic distribution of Department of Defense installations.[147] A smart grid involves "an automated electric power system that monitors and controls grid activities, ensuring two-way flow of electricity and information between private power plants and consumers—and all points in between."[148] Proponents of smart grid technology note that it represents a technical improvement over traditional grid systems by using information technology to improve the movement of electricity from producers to consumers, allowing consumers to interact with the grid, and integrating new and improved technologies into the operation of the grid.[149]

Ultimately, smart grid technology can increase the efficient distribution of electricity based on real-time demand and react to power outages and other energy disturbances.[150] In the renewable energy context, the benefits are equally large: "[a] smart grid will allow for better integration of renewable energy

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147. *See* Jeff St. John, *The Military Microgrid as Smart Grid Asset*, GREEN TECH GRID (May 17, 2013), http://www.greentechmedia.com/articles/read/the-military-microgrid-as-smart-grid-asset (assessing the benefits of microgrid technologies as applied to the Department of Defense); *see also* Jeff St. John, *The Military Connects Microgrids for a 'Secure Cluster' of Power Network,* GREEN TECH GRID (August 26, 2013), http://www.greentechmedia.com/articles/read/connecting-the-military-microgrid-dots (showing a map of U.S. Department of Defense work on microgrids).

148. *See* FADRS, *What is Smart Grid*?, FADRS CORP. (last visited Apr. 12, 2015), http://fadrs.com/what-is-smart-grid.html (explaining how a smart grid works and the benefits these grids provide in our evolving energy sector) (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY CLIMATE AND THE ENVIRONMENT).

149. *See* RED MOUNTAIN INSIGHTS, MILITARY MICROGRIDS: MARKET POTENTIAL, CASE STUDIES, PROVIDER PROFILES 7 (2013) [hereinafter MILITARY MICROGRIDS] (outlining the various technical requirements to fit the smart grid nomenclature, including ability to self-heal from power disturbance events, active customer feedback in demand response, and resiliency against physical and cyber-attacks).

150. *See id.* (suggesting that a smart grid increases the efficiency of intermittent renewable technologies by controlling demand of traditional power sources during periods of high winds or strong solar activity).

sources" because of "smarter control over these intermittent power sources," leading to economic and environmental benefits.[151]

Microgrids operate much the same as smart grids on a smaller scale.[152] Like the smart grids described above, microgrids improve energy efficiency and accelerate the integration of renewable energy through the following mechanisms: facilitating demand management during normal operating hours; "islanding" the microgrid from the main grid if and when an upstream fault is detected; allowing for priority of loads during emergencies; and coordinating energy distribution to optimize the various energy streams.[153] During normal operations, a microgrid "increases energy efficiency by relying more heavily on non-continuous sources of power when they are available, such as wind and solar, and decreasing the use of generator or power from the civilian grid."[154]

For the Department of Defense, these characteristics of microgrid technology all contribute to the long term renewable energy goals in a number of ways. First, the demand management and feedback will help the DOD increase its overall energy efficiency, addressing the goals of reducing overall electricity use.[155] Second, use of microgrids will work towards a more independent and secure energy supply, contributing to the security and defense goals of the military's energy plans.[156] Finally, because of a microgrids ability to integrate renewable energy sources by handling non-continuous sources of power when they are available, such as wind and solar, a microgrid will

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151. *See id.* (adding that smart grid technology can contribute to energy storage capacities, important for new electric and hybrid vehicles).

152. *See* Toby Considine, William Cox, & Edward G. Cazlet, *Understanding Microgrids as the Essential Architecture of Smart Energ, Grid* Interop Forum 1 (2012) (describing how microgrids and smart grids operate and the current landscape for the smart energy industry).

153. *See* MILITARY MICROGRIDS, *supra* note 149, at 7 (describing the process by which microgrids adapt and respond to energy disturbances).

154. *Id.* at 8.

155. *See* 2012 ANNUAL ENERGY REPORT, *supra* note 24, at B-1–B-5 (listing the statutory and agency defined goals of energy reductions).

156. *See id.* at 57 (noting that smart grid technology offers "a more robust and cost effective approach to ensuring installation energy security than the traditional approach of backup generators tied to single critical loads.").

facilitate the DOD's renewable energy goals into the future.[157] This last benefit may stand as the key factor in the transition to renewable energy, allowing for transient electricity supplies to become more normalized and reliable for operational needs.

D. Microgrids in the Military

Recognition of the benefits of microgrids and other means of decentralizing energy generation goes beyond federal entities focused on renewable energy. The Federal Energy Regulatory Commission ("FERC") acknowledges the myriad benefits of distributed generation.[158] Similarly, a DOE study conducted pursuant to EPACT05 highlighted the benefits of distributed energy, which included: increased electric system reliability, reduction of peak power requirements, provision of ancillary services such as reactive power, improvements in power quality, reductions in land use effects and rights-of-way acquisition costs associated with centralized power, and a reduction in vulnerability to terrorism and improvements in infrastructure resilience.[159]

The DOE report concluded that distributed generation "will continue to be an effective energy solution *under certain conditions* and for *certain types of customers*, particularly those with needs for emergency power, uninterruptible power, and combined heat and power."[160] In particular, the study highlighted the potential for distributed power systems to reap the benefits of localized renewable energy generation, such as biomass, because of their ability to maintain an energy supply to local consumers

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157. *See* MILITARY MICROGRIDS, *supra* note 149, at 7 (pointing out that more efficient integration of intermittent renewable power sources through smart grid technology will reduce the use of traditional sources, therefore cutting greenhouse gas emission and lowering costs).

158. *See FERC Regulatory Change Could Boost Distributed Solar in the U.S.,* CLEAN TECHNICA (Jan. 18, 2013), http://cleantechnica.com/2013/01/18/ferc-regulatory-change-could-boost-distributed-solar-in-the-us/ (highlighting aspects of the FERC guidelines intended to "streamline the grid interconnection process for mid-sized solar projects that meet certain technical standards . . . [with the potential to] double the amount of solar qualifying for "fast track" interconnection in the US.").

159. *See* DOE DISTRIBUTED GENERATION STUDY, *supra* note 114, at i (summarizing the focus areas of the study).

160. *Id.* at iv.

even in the face of a regional blackout.[161] An ability to operate despite regional disturbances or other large-scale issues with a centralized grid represents a huge advantage to military installations because of the benefits of autonomy and security.[162]

Showing the impact of this study, recent regulatory reforms by FERC, the federal agency responsible for regulating the interstate commerce of electricity and other fuels, show further support for distributed forms of renewable energy.[163] These reforms were intended to streamline the grid interconnection process for mid-size solar projects that meet certain technical standards.[164] These and other reforms could double the amount of solar qualifying for "fast track" interconnection, allowing for expedited projects favoring renewable energy.[165]

A combination of on-site, "behind the fence" electricity generation and new and evolving microgrid technologies to facilitate distributed energy make strides towards weaning the DOD off of traditional fossil fuels while also bolstering the three broad benefits highlighted above. This transition, however, will not come without challenges and legal, logistical, and practical hurdles. The diversity of installation characteristics and grand size of the DOD itself combine to challenge the realities of potential transition programs. Recognizing these challenges, the last Part of this paper breaks down some of the major hurdles to rapid integration of renewable energy in the form of "behind the fence" electricity generation.

VI. Challenges and Recommendations

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161. *See id.* at iii (adding that this increased reliability in the face of interruption will affect many sectors of the federal government, including telecommunications, chemicals management, agriculture and food, and government other facilities).

162. *See id.* (noting a cadre of benefits addressing the National Infrastructure Protection Plan (NIPP) issued by the Department of Homeland Security).

163. *See* CLEAN TECHNICA, *supra* note 158 and accompanying text.

164. *See id.* (stating that reforms would update orders from 2005, which first established procedures for interconnectivity).

165. *See id.* (indicating the importance of issuing new orders by explaining that the earlier FERC orders created barriers to bringing new projects online).

While renewable energy may present numerous benefits the Department of Defense—strategic, environmental, and economic—and facilitate successful fulfillment of statutory mandates across federal agencies, various hurdles remain in the way of immediate change. These challenges—including a cumbersome process of federal contracting and securing financing for large projects, a lack of incentive to address long term goals on an annual basis, the necessity to maintain back-up electricity supplies (either behind the fence or localized), and the barrier to new renewable acquisition given existing electricity contracts—detracts from the viability of integrating renewable energy into the greater DOD energy portfolio. While variable other challenges remain outstanding, the following sections represents a non-exhaustive analysis of some of the major legal hurdles to rapid and fluid renewable energy integration.

A. Federal Permitting Restrictions

Despite the announcement in the Climate Action Plan of an expedited permitting process for new renewable energy project on federal lands, a lingering reality of any large-scale federal project is the cumbersome process of contracting with private parties. [166] Guidelines known as the Federal Acquisition Regulation ("FAR") "makes the process lengthy and limits industry's ability to research and lean forward on project development."[167] Therefore, issues of timing and considerations of viability are necessarily affected by the ability of any individual military installation to study a site, develop a plan, secure financing, and commence construction.[168] New Executive action addresses this problem, but the environment for public-private

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166. *See On Point for the Nation*, *supra* note 31, at 101 (describing the "rule-laden government contracting process that starts upon the submission of the application"). The Federal Acquisition Regulation ("FAR") standards are demanding and leave very little maneuver room for the federal agency to deviate from the pattern contracting process. *Id.* The selection process takes months to complete and the applying company has absolutely no indication of what the project may be or whether it will be profitable. *Id.* at 102.

167. *Id.* at 102.

168. *See id.* at 101 (listing the requirements companies proposing to address solar, wind, biomass or geothermal needs must demonstrate).

partnerships still demands a great deal of time.[169] Once again, these factors make on-site development of renewable energy generation more favorable to off-site projects or leasing installation lands to private developers.

B. Lack of Short Term Incentives

The current goals—and the lack of incentives to meet them on an annual basis—hold back rapid development in the renewables field for the Department of Defense. As seen in the 2013 Annual Report, the DOD as a whole fell short of its annual goals for both energy efficiency and renewable electricity consumption.[170] With the exception of the Air Force, every branch individually fell short of the performance standards set forth for the year.[171] Without any incentive to meet these annual standards, individual branches may fall behind on the long-term goals and fail to pursue active integration of renewable energy into their overall energy portfolios.

These shortsighted decisions will often be made on the basis of economics. A cadre of observers has made it clear, however, that a successful move towards more renewable energy in the military must focus on the diverse advantages.[172] Mission security, supply reliability, and environmental considerations all contribute to the long-term advantages of a transition to renewables.[173]

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169. *See* Christopher J. Aluotto, *Privatizing and Combining Electricity and Energy Conservation Requirements on Military Installations*, 30 PUB. CONT. L.J. 723, 725 (2001) (examining the privatization of military electric utility systems in response to "the deteriorating condition of military systems" and to streamline the timeline of development).

170. *See* 2012 ANNUAL ENERGY REPORT, *supra* note 24, at D-1 (identifying the percent decrease in energy intensity as 17.7%, falling short of the goal of 21% for 2012, and a Department-wide introduction of 3.96% total renewable energy use, falling short of the annual goal of 5%).

171. *See id.* at 7 (highlighting the Air Force's energy intensity reduction of 22.3% and increase of renewable consumption as 8% of total energy consumption, both exceeding the respective 24% and 7.5% goals for the year).

172. *See* WARNER, *supra* note 1, at 1–2 (describing the two complementary objectives of renewable energy integration).

173. *See id.* at 7 (observing that, by setting clear and defined goals, the Department "will be signaling to industry that it is serious, allowing them to make the needed changes in their structures and research").

C. Generation vs. Acquisition

As Department of Defense reports show, one of the largest sources of renewable energy currently used to reach agency goals has been through the purchase of renewable energy from outside producers and through obtaining renewable energy certificates from other generators.[174] While this short-term approach may help achieve the interim benchmarks set forth in the EPACT05 and EISA07, acquisition of renewable energy from outside generators simply represents a shift in electricity sourcing rather than adoption of renewable energy practices.[175] In fact, both legislative mandates encourage and favor on-site generation in place of such external acquisition.[176] A number of existing funding mechanisms facilitate the construction and operation of on-site energy generation facilities.[177] By using these funding mechanisms now, the DOD will work towards building its total on-site generation capacity and focus on site-specific renewable projects.[178]

In 2013, the Department of Defense had nearly seven hundred renewable energy projects that represented seventy-five percent of the total amount of renewable electricity used.[179] For many of these projects, three main funding mechanisms were used: Energy Production Facility Agreements ("EPFA"), Energy

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174. *See* 2012 ANNUAL ENERGY REPORT, *supra* note 24, at 35 (highlighting that the second and fourth largest "sources" of renewable energy in 2012 were through these methods of acquisition rather than through on-site generation).

175. *See id.* at 31 (listing goals for EPACT05 and EISA07).

176. *See id.* (demonstrating the increase in renewable and other forms of distributed, on-site electricity generation for cost-effective solutions).

177. *See id.* at 71–78 (enumerating and describing the various sources of energy funding).

178. *See id.* at 6 (stating fixed installations are a vital component of the military's ability to win wars and the importance of reducing energy costs by using renewable energy sources).

179. *See id.* at 34 (describing the remaining 25% of renewable energy procurement as purchases of renewable energy from third parties or through renewable energy certificates (REC)); *see also* Loni Silva, Note, *The Problems with Using Renewable Energy Certificates to Meet Federal Renewable Energy Requirements*, 41 PUB. CONT. L.J. 985, 988 (2012) (suggesting RECs should only be "a short-term, stop-gap way to meet the [EPACT05] requirements while agencies build the facilities needed to actually consumer renewable energy").

Enhanced Use Leases ("EULs"), and Power Purchase Agreements ("PPA").[180] The first two of these mechanisms, EPFAs and EULs, heavily favor on-site construction of energy generation facilities.[181]

Power Purchase Agreements ("PPAs") function essentially as a traditional agreement to purchase energy, only in this context from a renewable source.[182] PPAs allow "a developer to build, own, operate, and maintain a renewable generation systems on, or near, a customer's property" and then sell the power to that customer.[183] This approach to electricity generation would allow the DOD to rapidly reach its goals of renewable energy integration without having to bear the financial and technological burdens that comes with bringing energy generation facilities on line.[184]

PPAs also ensure these investments in generation facilities and distribution by private parties will "create jobs, foster a marketplace which allows for innovative technologies to

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180. *See* 2012 ANNUAL ENERGY REPORT, *supra* note 24, at 34 (defining and elaborating on these three funding mechanisms, including defining the source of statutory authority); *see also* Kevin McAllister, BARRIER TO MILITARY INSTALLATIONS UTILIZING DISTRIBUTED GENERATION FROM RENEWABLE ENERGY RESOURCES: THIRD PARTY POWER PURCHASE AGREEMENTS (2011) [hereinafter BARRIER TO MILITARY DISTRIBUTED GENERATION] (describing Power Purchase Agreements and their role in military energy acquisition).

> A third party Power Purchase Agreement (PPA) allows a developer to build, own, operate and maintain a renewable energy (RE) generation system on, or near, a customer's property; and sell power, and possibly renewable energy credits (REC) to that customer. The developer provides a majority of the initial capital, and operation and maintenance expenses. The customer receives the benefits of local generation and possibly, depending on the contract language, the RECs associated with the renewable energy generated. *Id.* at 2.

181. *See* 2012 ANNUAL ENERGY REPORT, *supra* note 24, at 34 (defining the functions of EPFAs and EULs and indicating their location in the US Code).

182. *See* BARRIER TO MILITARY DISTRIBUTED GENERATION, *supra* note 180, at 2 (describing the relationship between the energy source developer and potential customers, including the benefits to each party).

183. *Id.* at 2.

184. *See* ENLISTING THE SUN, *supra* note 94, at 9 (explaining a PPA is an attractive financing option because of the Federal Investment Tax Credit and the ability to use on-site renewable energy generation, avoiding up-front costs).

be developed, maximize the benefit to taxpayers . . . and allow the [DOD] to maintain a mission critical focus while meeting its requirements for renewable energy sources, energy efficiency, and energy security."[185] The disadvantages of PPAs, however, lie in the reliance on external sources of electricity, exacerbating the challenges of security and reliability highlighted above.[186]

Significantly, although many states have legislative barriers to the use of PPAs, "effectively eliminating the ability of rate payer in the state to enter into power purchase agreements with third party developers/operations of distributed generation," the DOD appears to have a way around these state laws through statutory mechanisms.[187] Section 591 of Title 40 and Section 2922(a) of Title 10 "seem to resolve this issue by granting the Department of Defense . . . the ability to enter into contracts with energy providers regardless of state law."[188]

D. Shifting Land Management

Another emerging issue challenging a transition to on-site, "behind the fence" electricity generation results from a subtle trend to withdraw Department of Defense lands to management by the Department of the Interior ("DOI").[189] This results in a net decrease in land area managed by the military and its branches.[190] Various factors have contributed to the more frequent practice of transferring management of some Department of Defense land to the Department of Interior.[191]

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185. *Id.* at 1.

186. *See supra* Part III and accompanying text (describing the benefits of renewable energy to the DOD).

187. *See* BARRIER TO MILITARY DISTRIBUTED GENERATION, *supra* note 180, at 1 (suggesting the DOD's office of General Counsel needs to clarify certain statutory provisions that could potentially resolve the issue).

188. *Id.*

189 *See* Memorandum of Understanding between The Department of Defense and The Department of the Interior 1 (July 20, 2012) [hereinafter DOD/DOI MOU] (proposing a partnership between the Department of the Interior and the DOD to create renewable energy sources on withdrawn lands).

190 *See* Ross W. Gorte et al., FEDERAL LAND OWNERSHIP: OVERVIEW AND DATA 15 (2012) (reporting a 1 million acre decrease in land area for the DOD between 2010 and 2012, while acreage of land controlled by departments of the DOI has increased).

191. *See id.* (stating the DOD may dispose of unwanted lands that it deems surplus to its purposes).

To address this issue, the DOI partnered with the DOD to meet the dual goals of helping "the [DOD] develop renewable energy in the interest of greater installation energy security and reduced installation energy costs and to help meet [DOI] goals of increasing renewable energy production from public lands."[192] This partnership seeks not only to "encourage a dialogue" with energy developers and the agencies, but it also attempts to "investigate existing contract and management authorities to achieve mutual renewable energy goals and identify required changes in existing authorities" to facilitate a more streamlined permitting process.[193] In essence, the partnership will allow for increased interagency coordination to address the complex siting and permitting issued discussed in earlier sections.[194]

The Department of Defense is concurrently developing programs to increase land under its management to combat urban encroachment and to meet conservation goals.[195] The overall trend, however, is less land for potential energy projects—particularly those requiring large land areas such as solar and wind—and more complex inter-agency processes for permitting and development of renewable energy projects on land held by non-defense agencies.[196]

E. Technological Challenges

Another clear challenge of "behind the fence" generation arises when military installations attempt to incorporate new or

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192. DOD/DOI MOU *supra* note 189, at 2.

193. *See id.* at 2 (outlining a plan for the partnership between the DOD and the DOI).

194. *See id.* at 1 (showing the DOD and DOI's commitment to partnership to work together to create safer, cleaner, and more secure energy supplies).

195. *See Readiness and Environmental Protection Integration (REPI) Program*, U.S. DEPARTMENT OF DEFENSE, SUSTAINABLE RANGES INITIATIVE, http://www.denix.osd.mil/sri/repi/ (describing the land acquisition program as a partnership to "acquire easements or other interests in land from willing sellers to preserve compatible land uses and sustain wildlife habitat near installations and ranges where the military operates, tests, and trains") (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

196. *See id.* (stating that the REPI program is part of a larger initiative not only to promote military readiness but also preserve the habitat through various means).

under-tested technologies to reach renewable goals. Additional resource challenges will arise, such as the external requirements of any form of energy production. For example, "biomass programs, geothermal projects, and to a more limited extent the solar programs . . . must have sufficient supplies of water. Additionally, in order to transport and manage water, the energy-dependent water utilities infrastructure must also have sufficiently reliable electricity."[197] While these resource barriers would be present with any form of energy generation and transport, the renewables context may present additional technological hurdles for military integration of renewables versus well-known traditional forms.[198] As highlighted above, this aspect of facility-specific generation may make offsite "neighbor" generation facilities a more practical manifestation to achieve renewables integration.[199] Power Purchase Agreements "allow federal agencies to implement on-site renewable energy projects with no upfront capital costs."[200] This, in turn, provides a secure source of renewable electricity for a known period of time while leaving lifetime ownership, operation, and maintenance of the system to the developer.[201]

F. Existing Contracts

The Power Purchase Agreements ("PPA") mentioned earlier in this Part stand as one of the largest roadblocks to the introduction of new renewable energy projects on military installations.[202] The traditional energy market relies on long-term purchase agreements to meet the up-front capital investment to

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197. *On Point for the Nation*, *supra* note 31, at 75–76.

198. *See Project Financing Analysis*, NATIONAL RENEWABLE ENERGY LABORATORY (last visited Apr. 12, 2015), http://www.nrel.gov/analysis/key_activities_finance.html?print ("Development of projects relying on newer or innovative technologies that lack extensive operational track records may be slowed because many tax equity investors are seen as highly averse to technology risk.") (on file with the WASHINGTON AND LEE JOURNAL OF ENERGY, CLIMATE, AND THE ENVIRONMENT).

199. *See id.* (summarizing aspects of renewable resource project finance that may be problematic for potential investments).

200. *On Point for the Nation*, *supra* note 31, at 78.

201. *See id.* at 78–79 (stating the costs and benefits for agencies and developers in the contractual relationship).

202. *See supra* Part VI(C) and accompanying text.

bring new energy generation on-line.[203] Without such agreements, it would be very difficult for new energy projects to ever obtain the capital to build a new facility—investors are weary to provide start-up capital without some promise of long-term profits.[204] This is just as true for renewable energy projects as it has been for traditional energy projects.[205]

As a result of these existing variables, even if the capacity for renewables were established on all military installations in the near future, the transition to all renewable electricity or even net-zero installations would depend heavily on the lifespan of existing contracts and the potential ability of the DOD to opt out of existing contracts.[206] This may involve negotiations with current generators and producers. The trickle-down effect of these negotiations could been seen in the willingness of states or regions to allow increased renewable production; if large military installations cease to purchase large quantities of electricity from their local traditional energy producer, other users may realize significant rate increases.

While the opportunity for rapid renewable energy through "behind the fence" electricity generation stands large for the Department of Defense, a number of hurdles remain, including federal permitting challenges, lack of short term incentives, myriad challenges of transitioning to on-site generation from traditional acquisition agreements, and potential challenges by local providers and state governments.[207] It will be through partnerships such as the DOD/DOI Renewable Energy Partnership Plan, however, that interagency action will both

203. *See* BARRIER TO MILITARY DISTRIBUTED GENERATION, *supra* note 180, at 2 (describing the traditional financing relationship in a PPA).

204. *See id.* at 1 (emphasizing the importance of leveraging third party investors and building on previous contracting schemes).

205. *See id.* at 2 (describing the Army's desire to use renewable technologies yet recognizing the high costs to implement it and increased private capital required to pay for the new systems).

206. *See id.* at 8 (giving the example of North Carolina, where customers of existing electric utility monopoly must get permission from those suppliers to enter into PPAs with third parties).

207. *See supra* Part VI and accompanying text (detailing the challenges presented to the DOD in implementing new policies).

facilitate rapid integration and alleviate the issues raised above.[208]

VII. Conclusion

As the largest single global consumer of energy and electricity, the U.S. Department of Defense stands to contribute a great amount in the shift towards renewable energy.[209] The past decade has included a wealth of action from the executive and legislative branches, as well as activity within the agency itself, to create aspirational benchmarks of renewable energy production and use.[210] The realities of the challenges of financing, siting, and procuring the technologies necessary to get these projects online caused the Department of Defense to fall short of its goals in the 2012. However, progress has been made—increasing total use of renewable electricity use by the DOD to 4% and an increase in energy efficiency, decreasing use across the board by 17%.

To quicken integration of renewable sources into the DOD's overall energy portfolio, two mechanisms should be adopted. First, energy production for use on military installations should be distributed and decentralized, increasing efficiency and gaining the benefits of energy security and reliability.[211] Related to this, the DOD should also quickly assess the availability and efficiency of place-specific renewable fuel sources such a geothermal and biomass.[212] Together, these two mechanisms will expedite getting new energy generation on-line and will remove the complicated issues of transmission and scale.

One of the largest challenges that stands in the way of progress is long term procurement and generation contracts already in place on many military installations.[213] With the DOD

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208. *See* DOD/DOI MOU, *supra* note 189 (documenting a partnership between the DOD and DOI to commit to renewable energy projects).

209. *See supra* Part I and accompanying text.

210. *See supra* Part II and accompanying text.

211. *See supra* Part V(C) (describing the benefits of microgrids and smartgrids and their fit into the DOD systems).

212. *See supra* Part V (outlining potential technologies that could promote local energy generation).

213. *See supra* Part VI(F) (explaining why existing contracts can delay or increase costs of renewable energy projects).

trying to reduce its use across the agency and to replace existing sources with renewable sources, many of these existing contracts will have to either be renegotiated or not renewed.[214] Additionally, the high costs of instituting new energy generation projects—even on a small scale—make adoption across the entire Department of Defense huge challenge.[215]

Ultimately, the benefits of transitioning to renewable energy sources are great for the Department of Defense. A comprehensive and expansive initiative that couples site-specific technologies with agency-wide coordination will help the DOD both meet its statutorily mandated targets for energy efficiency and production and also effect positive change in the environmental impact of our nation's single largest energy consumer.

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214. *See id.* (describing challenges existing contracts pose for changing technology).

215. *See id.* (explaining the investment trends in energy projects and why renewable energy projects have unique problems).