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Installation Energy--The Future Challenge

by

Lieutenant Colonel Andrew Liffring
United States Army

Under the Direction of:
Professor Thomas Galvin

United States Army War College
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14. ABSTRACT
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Abstract

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Installation Energy--The Future Challenge

Energy security, defined as "having assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet mission essential requirements," is a strategic issue for the United States.[1] The Department of Defense (DOD) is the nation's single largest energy user, consuming slightly more energy than the entire State of Rhode Island.[2] Therefore, the DoD is dependent on unimpeded access to energy, a resource that will see a 37 percent increase in global demand over the next 30 years and therefore increased competition. Recognizing this, the *2010 Quadrennial Defense Review* recognized the importance of energy security, and called for increasing the energy supplied by renewable sources and reducing demand.[3]

The U.S. Army is the DoD's greatest energy user, consuming 36 percent of the DoD's total in 2014, and therefore has a vested interest in increasing its energy security posture.[4] However, the Army faces a critical energy security threat in the form of domestic utility disruptions due mainly to the service's dependence on commercial power grids, especially due to enemy action such as cyber-attack. Despite legislation and policies that provide a roadmap for improving the energy security posture, (e.g., the *National Energy Policy Act of 2005*, the *National Defense Authorization Act of 2007*, *The 2010 Quadrennial Defense Review*, and *Executive Order 13693*) the Army has only been able to reduce its vulnerability to domestic utility disruptions in recent years, not eliminate it. This is insufficient and presents unacceptable risk to future operations.

Recognizing this, the *Army Energy Security and Sustainability Strategy*, published in 2015, describes the Army in 2020 as a strong and flexible force that is housed, trained, and maintained on sustainable installations that are able to project power unimpeded by the disruptions to domestic utilities or local constraints.[5] The Army

Assistant Chief of Staff for Installation Management (ACSIM) presented a solution calling for installations to “island” themselves.[6] This technique allows installations to remove themselves from the national electrical grid in the event of a natural disaster or cyber-attack and power themselves from internally produced energy to sustain the installations’ critical activities. However, achieving this goal requires investment in renewable energy projects that provide uninterrupted energy sources when combined with a micro-grid and an energy storage infrastructure. This adds to the resiliency of Army installations and makes them more self-reliant and flexible to respond to unforeseen disruptions.

The greatest challenges are funding and time. This paper will show that the Army must increase its investment in energy security to ensure it can deploy units immediately without disruptions from domestic utilities or other local constraints.[7] By analyzing current Army and private investment models used to fund renewable energy projects and comparing them to the current global security environment, I will show why it is critical for the Army to increase funding towards its energy security program.

Vulnerabilities with Current Energy Posture

As a former Secretary of Defense said, “We have to look at cyberattacks being able to shut down our power grid, which you have to remember is in the private sector's hands, not the government’s. And we're vulnerable.”[8] To demonstrate the urgency of the threat that domestic utility disruptions pose, I will use a five-ring model that Colonel John Warden developed in the 1990s to allow planners to attack an enemy center of gravity systematically. As shown in Figure 1, the five rings from outer to inner are (1) fielded military, (2) population, (3) infrastructure, (4) system essentials, and (5) national leadership. The optimal way to defeat an enemy is to engage as many rings as possible bringing the enemy to physical paralysis.

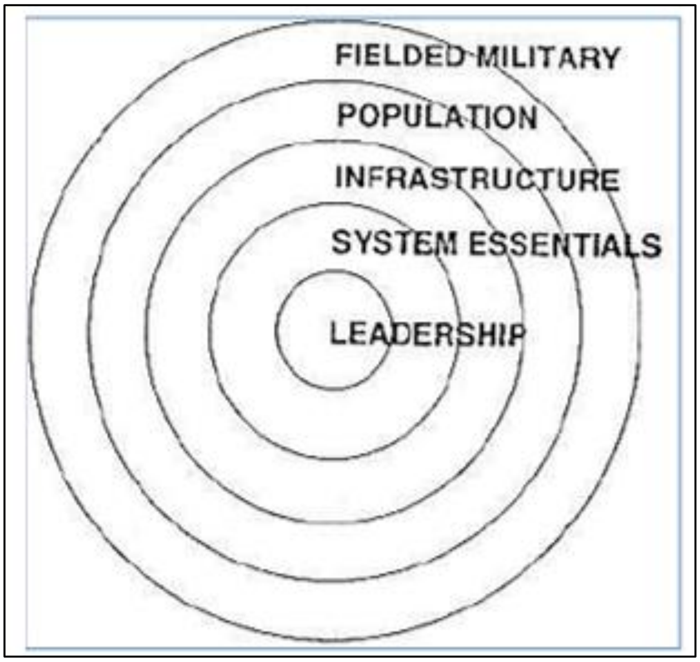

Figure 1. Col. Warden's Five-Ring System Theory Diagram[9]

Applying Colonel Warden's theory from an enemy's perspective shows the importance of securing the nation's infrastructure and system essentials from attack. Cyber-attacks have targeted personally identifiable information, infrastructure, and domestic utilities during the past five years, influencing national decision-making and disrupting the well-being of the people. Adversaries are increasingly their activities. The Department of Homeland Security's Industrial Control Systems Cyber Emergency Response Team responded to 295 reported incidents in 2015 compared to 39 in 2010.[10] Primary targets of cyber-attacks include the Nation's Supervisory Control and Data Acquisition and Digital Control System networks that control the nation's electrical grids, natural gas pipelines, water, and water treatment facilities. An example of a recent attack on the nation's infrastructure was in 2003 when hackers attacked the Davis-

Besse Nuclear plant in Oak Harbor, Ohio, preventing the plant's access to the Safety Parameter Display System and the process computer for 6 hours.

Cyber-attacks on national power infrastructures have moved from random malicious acts without a central purpose to state and non-state actors targeting critical infrastructure to achieve their foreign policy goals. The Stuxnet attacks against Iranian nuclear facilities in 2010 delayed the capability of Iran to produce a nuclear weapon for years, and the December 2015 cyber-attacks against the Prykarpattyaoblenergo power plant in Ukraine cut power to more than 80,000 customers.[11] Senator Susan Collins, Republican (Maine), stated, when interviewed by *60 Minutes* about the cyber threat to national power grid, "I can't think of another area in Homeland Security where the threat is greater and we've done less."[12]

Army installations are also vulnerable to ordinary disruptions such as blackouts. In 2009, the Defense Science Board warned that the Army's "almost complete dependence of military installations on a fragile and vulnerable commercial power grid and other critical national infrastructure places critical military and Homeland defense missions at an unacceptably high risk of extended disruption."[13] For example, in 2011, the United States power grid experienced 191 blackouts from January through June affecting a number of military installations. Even with these interruptions, the nation has yet to update its fragile commercial power grid, which the American Society of Civil Engineers' rated as a D+ in 2013.[14]

Consequently, outages to DOD installations are increasing. Those lasting more than 8 hours increased 31 percent, from 87 outages in FY2012 to 114 in FY2014.[15] On average this costs DOD more than $246,000 per day, and the outages lasted an average of 7.4 days.[16]

The potential impact of such lengthy and costly outages could be severe. An installation could lose its ability to communicate, control aircraft, cook food, secure sensitive sites, or even issue or receive supplies. An outage of electrical service would essentially shut down an installation, negatively affecting the Army's ability to deploy equipment, train Soldiers, or sustain troop readiness. Such was the case on Fort Bragg after a tornado destroyed the powerlines supplying electricity to the installation on April 16, 2011. The loss of power closed Fort Bragg except for key and essential personnel for 24 hours and affected Simmons Army Airfield, the commissaries, post exchanges, and the access points that allowed traffic onto Fort Bragg.[17]

Regulatory Response

Congress passed the *Energy Policy Act of 2005* (hereafter "EPAct") to ensure the DOD and other federal agencies were unimpeded by disruptions to domestic utilities. It defined renewable energy as "electric energy generated from solar, wind, biomass, landfill gas, ocean, geothermal, municipal solid waste, or new hydroelectric generator capacity" and required federal agencies, including the Army, to consume not less than 7.5 percent of their electric energy from renewable sources by 2014.[18] Two years later, Congress refined the federal energy guidelines with the passage of the *National Defense Authorization Act of 2007*, which established a goal for DOD to produce or procure at least 25 percent of the total quantity of facility energy consumed by 2025.[19] In 2012, the Army increased these standards under an initiative to produce more than 1 gigawatt of renewable energy by 2025.[20] President Obama further expanded these goals in March 2015 when he signed Executive Order 13693, titled *Planning for Federal*

Sustainability in the next Decade, which mandated all federal agencies to produce or procure 30 percent of their total quantity of facility energy by 2025.[21]

The Army is struggling with the limited means allocated by Congress to meet the energy goals outlined in the EPAct, the *National Defense Authorization Act of 2007*, and *Executive Order 13693*. For example, in 2014 the Department of Defense spent $4.2 billion to provide energy to more than 500 installations worldwide.[22] These funds covered the Army's existing energy demands for daily operations but provided insufficient funding for increasing installation energy security. The annual cost to provide energy to installations competes with other investments forcing the Army to focus on less expensive energy conservation measures and not increasing the installation's energy security. As a result, the Army has fallen far short of the benchmarks established by law or DOD policy. According to the DOD's Annual Energy Management Report released in May 2015, only 2 percent of the Army's total electrical energy came from renewable energy sources, well short of the 7.5 percent required by the EPAct. Additionally, the report also noted the Army did not meet the required renewable energy standards required by *Executive Order 13693*, resourcing only 11.3 percent of the 68.3 billion British thermal units (BTUs) used for facility energy from renewable energy sources.[23]

Congressional appropriations have been insufficient for the Army to meet federal requirements. In 2014, the Army spent $333 million in appropriated funds towards 746 energy projects.[24] Of that, the Army spent $253 million on 599 energy conservation projects and distributed $53 million among 117 other projects in an effort increase the amount of renewable energy produced.[25] These projects, although important, did little to increase capacity and meet federally-mandated goals because of the small amount of renewable energy these projects produced.

Due to the limited means provided by Congress, the Army exercised third party agreements to finance renewable energy projects on installations. The Congressional Research Service report on the *Federal Agencies Authorities to Contract for Electrical Power and Renewable Energy Supply*[26] details these authorities, the most frequently being power purchase agreements (PPAs), utility energy service contracts (UESC), and out grants. These tools promote renewable energy projects by allowing the Army to purchase electricity directly from renewable energy sources, fund energy conservation projects, or allow the Army to lease land in exchange for in kind contributions. This guarantees a market for renewable energy and provides an incentive for local utility companies to invest in the production of renewable energy.

These tools can help but are normally not effective in the southern and northwestern portions of the United States where electricity is regulated or inexpensive. In these areas, the price of electricity is too low to make renewable energy projects economically viable, which limits the ability of the Army from using private capital to develop them.[27] The best available option is pursuing funding through the Army's military construction (MILCON) program for these projects.

However, MILCON is not a straightforward option. Building the MILCON program involves several reviews by the Office of the Secretary of the Army, the Office of the Secretary of Defense, Office of Management and Budget (OMB), and Congress. The program continuously changes until it becomes law. Central to the process at the Department of the Army level is the program review board (PRB).[28] The PRB analyzes the construction needs of the Army, and determines whether requests meet the current program guidance and provides recommendations on appropriate funding levels incorporated in the program objective memorandum (POM) and the Future Years Defense Program (FYDP). Even if funded, MILCON projects may take considerable time before actual construction begins.

Models Associated with Prioritizing Capital Infrastructure Investments

The Army must prioritize its investments in installation energy security because of the limited means available and need to take advantage of private investment. There are several different strategies within the Army and in the private sector available to assist the Army in this endeavor, but comparison is difficult because they exercise different assumptions regarding acceptability of risk. Some strategies define risk in financial terms and use a project's internal rate of return to measure that risk, while others define risk in terms of readiness and relate risk to an installation's ability to conduct its assigned missions.

Figure 2 shows the Energy Security Framework to illustrate tradeoffs between readiness and the rate of return. The energy security framework graphically depicts risk as defined by readiness as the Installation Status Report rating for energy security on the "X" Axis where C1 represents a state of high readiness while C4 is low. The financial risk on the "Y" Axis measures the Internal Rate of Return for individual projects, where "+ value" represents are more likely to be profitable to private investors whereas "- value" are less likely. These divide the framework into four quadrants.

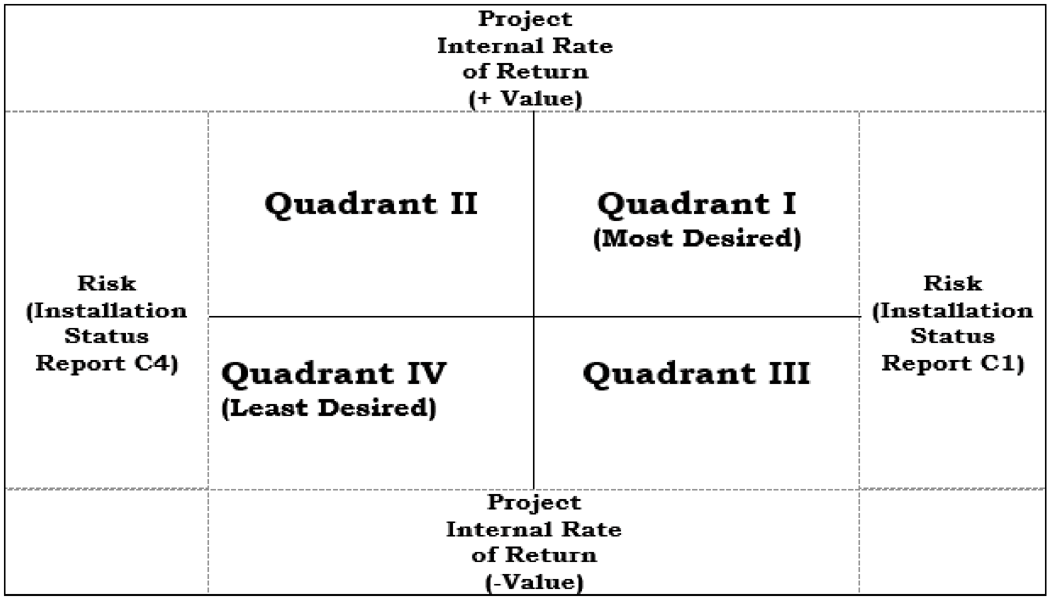

Figure 2. Energy Security Framework[29]

Quadrant I located in the upper right portion of the graphic is the most desirable quadrant. This is ideally, where the Army wants all future projects to plot. It represents the situation where access to energy signifies an acceptable risk to an installation's mission and the proposed projects are economically feasible for private investors to develop. This situation allows the Army time to negotiate the best possible deal with private industry while accepting minimal risk to the mission.

Quadrant II, located in the upper left portion of the graphic represents a favorable, but not ideal, scenario for the Army and private developers. Projects in this quadrant increase installation readiness with little to no investment by the Army because these projects buy down risk and are profitable for private investment. However, achievement of energy security outcomes will take longer than Quadrant I.

Conversely, Quadrant III, in the lower right portion of the figure, represents a scenario where projects are not economically viable, but the risks to the installation's mission are acceptable. The Army should develop projects in this quadrant internally when funds are available.

Finally, Quadrant IV, in the lower left portion of the figure, is the least desired state because these projects are not economically viable for private investment and require the Army to fund them to increase the energy security of an installation.

I will now apply the above framework to four known strategies, called *models*, which the Army and the public sector use to prioritize energy security investments. These four are (1) The Army Master Planning Model, (2) The Installation Readiness Model, (3) The Capital Investment Model, and (4) The Office of Energy Initiatives Model. All of these models align the ends, ways, and means; however, they operate under different assumptions and may be incompatible with each other.

The Army Master Planning Model

The Army Master Planning Model is the primary method used by Army installations to prioritize infrastructure investments. It prioritizes projects based on an individual installation's requirements and assigned missions and results in a recommended list of projects forwarded to the PRB for approval and incorporation into POM and the FYDP.

The model helps installation commanders prioritize projects by synthesizing requirements and responsibilities with available real property and planned investments. Commanders convert requirements into an Installation Development Program detailing utilization of the installation's real property and recommending investments as needed to support future needs. Installation Management Command integrates all the Installation Development Plans into their budget to propose infrastructure investments into the POM.

Installations incorporate energy projects into their Master Plans at the beginning of the process by talking about sustainability or energy security in their vision statements. Installation commanders then provide direction and influence to their staffs to meet these requirements as they create the Installation Development Program. Fort Detrick used the Army Master Planning Model to develop a 15-megawatt solar array, pursuing the goal to "create as much energy on post as it consumes," which the Army brands as a *NET-Zero Energy Installation*.[30] The project broke ground in April 2015.

Installation Readiness Model

Another method used to prioritize projects is the Installation Readiness Model, also known as the Installation Status Report Program. It assesses the infrastructure (e.g., facilities and real property), natural infrastructure (e.g., land, air space, and water), and services on each installation. The Assistant Chief of Staff for Installation Management uses this data to determine Army-wide base conditions, identify concerns that degrade readiness, and identify future requirements. This allows ACSIM and Army leaders to make strategic decisions that sustain or improve facilities on installations. The Installation Readiness Model defines risk in terms of mission readiness and uses the data collected from Army installations through the Defense Readiness Reporting System-Army. They assess each installation's readiness based on whether it can mobilize enough capable units when needed to support the *National Military Strategy*. For each facility type, inspectors assign a score for the quality of the infrastructure, denoted as the "Q" score, and for the overall readiness, denoted as the "C" score with 1 being the highest 4 being the lowest.[31] The consolidated data determines the level of risk based on the quality and readiness in an installation's infrastructure. The Installation Readiness Model is useful in relating energy security to other issues affecting installation readiness. It allows ACSIM to see the cost and benefits associated with investments in energy security and prioritize them against other installation requirements in pursuit of sustaining a high overall readiness level.

The Capital Budgeting Model

Private industry takes a different approach and uses the Capital Budgeting to "plan for a firm's capital investments such as major expenditures in buildings or equipment."[32] This model is ideal when equating projects with disparities in size, time, or unequal lives.[33] It uses mathematical formulas to calculate competing projects' payback period, net present value, internal rate of return, and the profitability index to decide whether to delay, extend or abandoned projects all together.[34]

The Assistant Chief of Staff for Installation Management uses Capital budgeting to compare the cost of potential projects, calculate savings, and determine payback periods when negotiating UESCs, or PPAs. It helps the Army select projects with the best value by showing which projects have the largest net present value, shortest payback period, and the highest internal rate of return.[35] These values are especially useful in prioritizing projects that reduce the cost of electrical service or other utilities by upgrading, building, or installing new equipment and facilities.

Office of Energy Initiatives Model ("OEI Model")

Due to the complex nature of this procuring energy for installations, and the different authorities involved, the Army's Energy Initiatives Task Force developed the Office Energy Initiatives Model (OEI) to help implement renewable energy projects and improve energy security on installations.[36] The Army's Office of Energy Initiatives directly manages this model and solicits private investors to create a pipeline of economically feasible projects over 10 megawatts. This allows the Army to take advantage of the economies of scale and the expertise in the Office of Energy Initiatives in negotiating complicated UESC, PPAs, and United States Code contracts.

The primary goal of this model is to secure reliable energy supplies that support the Army's mission at a predictable cost over the long term. It balances the economic viability of a project from the installation or Army-wide perspective with the need for competitive returns for developers and investors.[37]

In this model, the Army Office of Energy Initiatives negotiates to reduce the aggregated annual energy cost for an installation below existing levels or at least remains at the current level. This lowers the Army's annual energy expenditures while guarantying private investors a market for their energy for the length of the contract, which can be 20-30 years.

Analysis

Each of these models present different ways to prioritize energy projects because they operate under different assumptions and define risk differently. The Capital Investment Model and the OEI Model prioritize projects with respect to financial terms while the Army Master Planning Model and the Installation Readiness Model prioritize projects based on the installation's mission. The difference in the prioritization raises questions about whether the Army is using the right model and when should it switch to a different one.

Comparing Models Using the Framework

As each model emphasizes risk differently, the Energy Security Framework provides a means of comparison, as Figure 3 shows. The OEI model works the best in developing projects located in Quadrant I because the dominant risk is the financial risk accepted by private investors in the development of the project. These projects give the

Army advantage in negotiating out grants, PPAs, or UESCs because they expose the Army to limited risk and provide sustainable investment in the long term for the Army after the projects are developed.

In Quadrant II, a combination of the Capital Investment Model and the OEI Model is the best model to use because the Army and private investors share the risk in the development of these projects. The Army assumes the energy security risk while the private investors assume the financial risk of the project. The combined input from the Capital Investment Model and OEI Model allows the Army to see which projects produce the most profit and reduce the energy security risk the most. The projects with the highest priority have the highest internal rate of return and are on the installations with the greatest energy security risk.

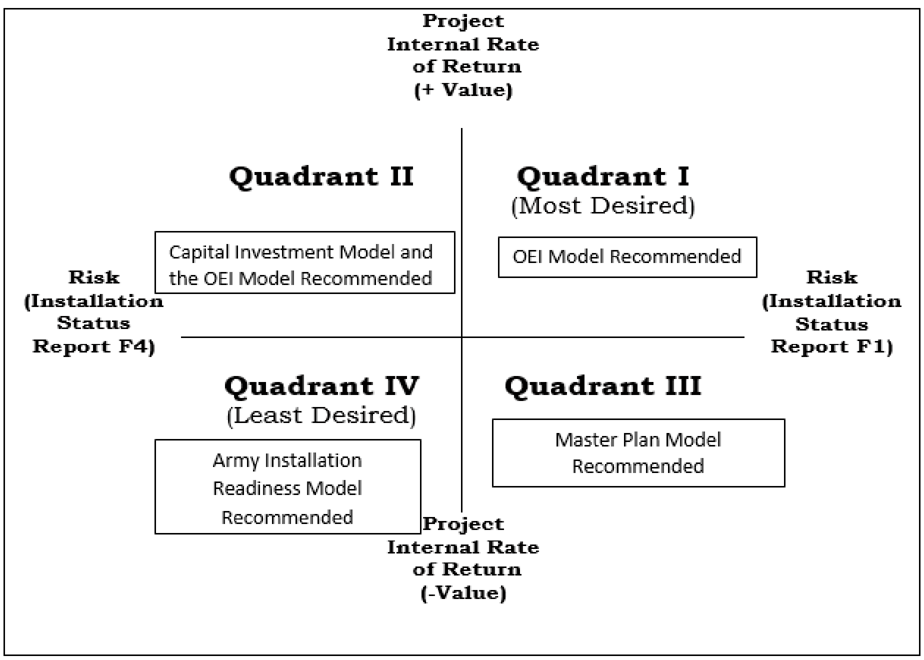

Figure 3. Models Applied to the Energy Security Framework[38]

In Quadrant III, the Army must assume both the financial risk of the project and the installation's energy security risk although the energy security risk is limited due to the high state of readiness already in place. The Master Plan Model is ideal for prioritizing projects in this quadrant because it balances the risk to installation readiness with the means appropriated and meets the individual requirements of each installation.

Quadrant IV is similar to Quadrant III in that the Army assumes both the financial risk of the project and the installation's energy security risk, but in Quadrant IV the risk affects the readiness of the installation. Projects in this quadrant are not currently economically viable making the Army Installation Readiness Model the best choice to prioritize projects based on need. The Army Installation Readiness Model focuses on immediately increasing the capability of the Army while balancing the adverse effects to an installation's natural infrastructure. Although, this model does not use economic data, the use of that data would be useful to minimize the cost to the Army at the same time improving energy security.

Implications

Selecting the right model to use in the prioritization of projects requires determining a projects internal rate of return and comparing it to the Installations' Status Report (ISR) rating then plotting the resulting data on the energy security framework in Figure 3. The resulting location of the project determines the best method to use and shows the amount and type of risk related to the project.

This framework helps the Army align the ways to prioritize projects with the estimated $814 million needed to meet federal energy standards by 2025.[39] Ideally, the majority of the projects would be in Quadrant I, and the $814 million would come from private investment in renewable energy projects, but this is unrealistic. Those projects not economically viable need funding and prioritization within the Army budget based on readiness requirements or made economically viable by extending the length of the contract. Either way, it is important that the Army take action to move projects out of Quadrant IV before addressing those in Quadrant III.

For example, consider the existing postures of Installation “F” and Installation “C”. Based on installation readiness data available at the time of this report (see Figure 4), Installation “F” had a low overall readiness rating in electric and gas utilities, both on the U.S. Army Garrison (USAG) side and in support of tenant units. Installation “C” is at higher readiness already but still requires investment to achieve energy security goals. Projects at Installation “F” (Quadrant IV) would provide a better value to the Army versus projects at Installation “C” (Quadrant III). An investment by private industry or by the Army at Installation “F” increases the readiness and helps the Army meet its energy goals. Whereas an investment made at Installation “C” or Installation “A” would help the Army meet its regulatory goals, but does little to increase readiness at the installation level. The risk to readiness decreases as quadrant IV transitions into quadrant III to the point investing in energy projects does not add to improving energy security. At this point the Army needs to move from using the Installation Readiness Model to using the Master Planning Model and tying future energy projects to installations modernization plans.

Organization	Avg. Industry Electrical Rate (cents/kWh)	Mission Rating			
		FY12	FY13	FY14	FY15
Installation “A”	**6.64**	**C1**	**C1**	**C1**	**C1**
Installation “B”	**5.73**	**C1**	**C1**	**C1**	**C1**
Installation “C”	**6.40**	**C1**	**C1**	**C2**	**C2**
Installation “D”	**7.08**	**C1**	**C1**	**C1**	**C1**
Installation “E”	**8.64**	**C1**	**C1**	**C1**	**C2**
Installation “F”	**5.58**	**C2**	**C2**	**C2**	**C3**
Installation “G”	**6.26**	**C1**	**C1**	**C1**	**C1**
Installation “H”	**7.77**	**C1**	**C1**	**C1**	**C1**
Installation “F” (USAG)	**5.58**	**C2**	**C2**	**C2**	**C3**

Figure 4. Installation Readiness Levels for Select Installations FY12-15[40]

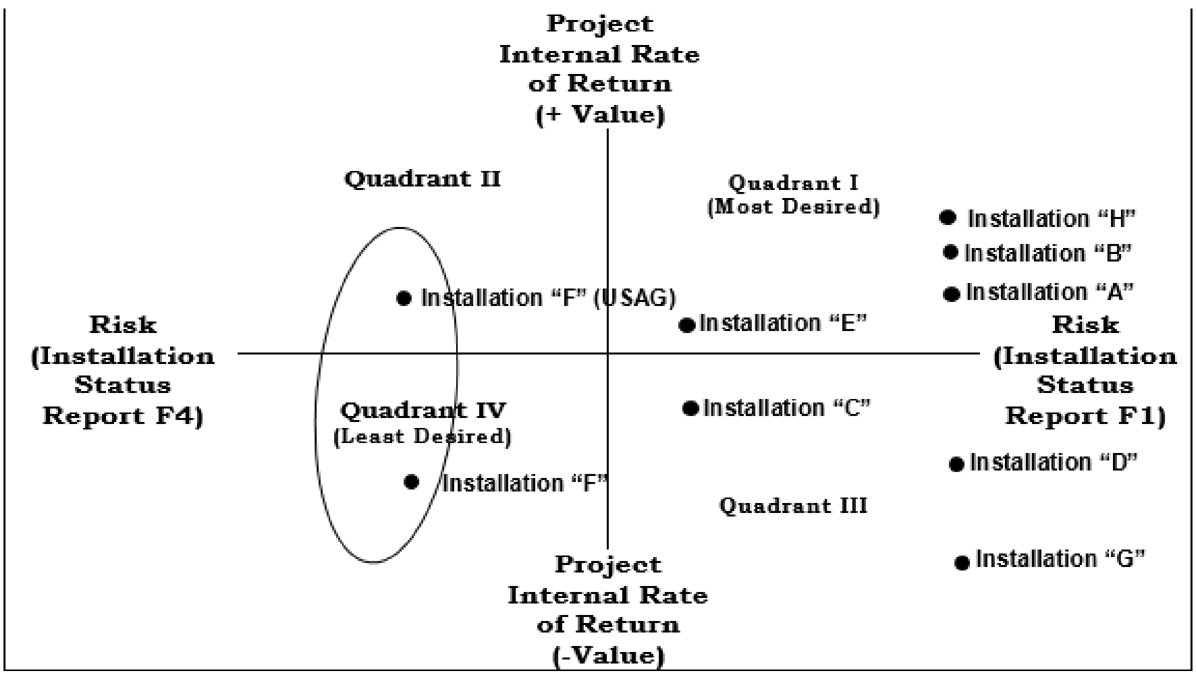

Figure 5. Energy Security Framework with ISR Data[41]

The Energy Security Framework also assists in prioritizing projects in more complex situations such as prioritizing projects in quadrant III and quadrant II. Like the previous example where moving horizontally in the Energy Security Framework allows risks to be compared based on readiness, when moving vertical in the Energy Security

Framework risk can be compared based on financial risk. Projects with a high financial risk also have a low or negative internal Rate of Return compared to projects with low financial risk which have high Internal Rates of Return. Private investors will develop projects that offer low financial risks (high Internal Rates of Return) leaving the Army to develop projects with high financial risk.

For example, consider a project at Installation “C” in quadrant III and a project at Installation “F” in quadrant II. In this case, the Army should prioritize the Installation “C” project over the Installation “F” project because the Installation “F”’s project allows developers to profit from it saving the Army’s investment funds for those projects that are not profitable, like Installation “C’s” Project. The same logic can be applied when comparing projects in Quadrant III to Quadrant I and Quadrant IV to Quadrant II.

Recommendations

Going forward, the United States Army needs to move away from a single model for prioritizing energy projects and adapt a holistic model that incorporates risk and economic variables. Adapting a model that incorporates the Installation Status Report Model, the OEI Model and the Master Planning Model, allows the Army to better integrate readiness risk and anticipated returns on investment. It also allows the Army to balance the risk associated with securing access to energy with the means available. Moreover, it places the overarching strategic goal--that of energy independence--as the driver for decisions rather than risks and returns separately.

Figure 5 also shows how far the Army must go to achieve the 2025 mandates, to be a net contributor, a net receiver, or be isolated from the civilian power grid, thereby attaining the higher levels of energy security. Overall, the Army must increase funding for the construction of renewable energy projects, micro-grids, smart grids, and energy storage units in the short term to decrease the immediate impact of power outages as well as provide the infrastructure for future renewable energy projects. This will increase the economic viability of renewable energy projects, decrease annual energy costs, and prevent the undesired situation where the Army invests in a future project when private investment is available.

There is a current limitation to the use of the framework due to that fact that the OEI manages only large projects. The Army should lower the management standard to the 1-megawatt level, which increases the number of projects in the Army's portfolio and allows greater flexibility for incorporating readiness impacts. It also places the management of these projects at the enterprise level allowing for greater expertise in managing these projects and allows for better management of vulnerabilities across the Army. Although the OEI currently assists installations with projects at this lower scale, this is insufficient for helping make sound readiness-informed decisions across the Army.

Alternative Solutions

There is an element in the country that believes the Army does need to be investing in renewable energy to secure its access to energy. They believe access to reliable energy has become an issue due to the Environmental Protection Agencies' (EPA) aggressive regulation of Green House Gases is forcing power generating companies to close coal powered generation plants without a reliable replacement. A recent report by the Institute for Energy Research stated "the U.S. Environmental Protection Agency is promulgating regulations that will reduce the reliability of the power grid with little thought of the consequences."[42] The Institute for Energy Research advocates allowing coal generating plants to continue operating and not investing in unreliable sources to increase energy security. The Institute for Energy Research argues that renewable energy sources like wind and solar are unreliable due to their dependence on the wind and sun and believes stopping the closing coal plants that produce approximately 72 gigawatts of electricity annually better supports energy security goals.[43]

The Government Accountability Office also argues against increasing investment in renewable energy and prioritizing investments based on a readiness-oriented model. They say there is not enough information available to justify the increase in spending and the investment appears too risky without completed vulnerability studies, network inventories, and quality data. The Government Accountability Office stated in a 2015 report “without collecting and reporting complete and accurate data, decision makers in DOD may be hindered in their ability to plan effectively for mitigating against utility disruptions and enhance utility resilience and Congress may have limited oversight of the challenges these disruptions pose.”[44] Although the data published by the DOD in the *Department of Defense Annual Energy Management Report* is not 100 percent accurate, it does give Department of Defense and Congress a very conservative estimate of the problems associated with aging energy infrastructure.[45] Vulnerability assessments and network inventories are in the final phases of being completed. Instead of spending, more money to gain an extremely accurate estimate, those funds are better utilized in decreasing the vulnerability of our installations, which the proposed Energy Security Framework provides a way quantify the risk.

Future Considerations

The Energy Security Framework is valuable to use to measure the Army's progress towards meeting the ultimate end state-full energy independence. It measures progress in the amount of projects plotted on the graphic and not BTUs, percentages or Mega Watt-hours. This makes it easier to relate the recommended ways, with the means to the achieve the ends and shows the amount of risk the Army is either mitigating, accepting, shifting or reducing with each strategy. This methodology promotes the strategic goal of achieve energy security, rather than treating it as solely a budgetary question.

To make the Energy Security Framework more valuable, additional research should be devoted to correlating the OEI project portfolio with the Installation Status Reports. The enormous amount of data produced by ACSIM and OEI made it infeasible for this paper to develop an extensive model. The Army tracks over 145 installations and one installation can have over 700 energy projects resulting in over 100,000 projects that need to evaluated and plotted on the proposed Energy Security Framework. Developing better estimates requires correlating and plotting this data, which will allow for the enhanced prioritization of projects.

Conclusion

The growth of the global demand for energy over the next 30 years is making access to energy more competitive and limiting the ability of installations to train, sustain, and project military forces abroad. The 2010 Quadrennial Defense Review recognized the importance of installation energy to national security and called for investing in renewable energy to supply our military installations. The Army is struggling with the limited means available to meet energy goals outlined in The Energy Policy Act of 2005 and the National Defense Authorization Act of 2007. Producing or procuring 30 percent of facility energy from renewable sources and consuming at least 7.5 percent of the electric energy sounds good, but the Army is far from it. Meanwhile, adversaries are taking a keen interest in using energy disruptions as a way of negating the Army's superiority. This is not a problem to sweep under the rug until friendlier budgets come around.

The Army must effectively prioritize projects based on readiness to meet the energy challenges of the future. The Army needs to increase the funding for the construction of renewable energy projects, micro-grids, smart grids, and energy storage units to decrease the immediate impact of power outages and make available the infrastructure for future renewable energy projects. The Office of Energy Initiatives should also reduce its threshold of management to 1megawatt to leverage the expertise of the entire enterprise as well as provide increased situational awareness of the problem.

Ultimately, the Army will not meet the Federal requirements outlined in the EPact, the *National Defense Authorization Act of 2007*, and *Executive Order 13393* by 2025 if they continue to follow their current strategy. This paper presented the issue of energy security as more than a matter of compliance--it is a national security vulnerability. The Army cannot afford to allow adversaries an easy way to defeat the U.S. before it can project military power abroad. The Army must invest now in energy security.

Endnotes

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