Defense Energy Resilience and the Role of State Public Utility Commissions

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Abstract

Physical hazards such as extreme weather, and increasingly, sophisticated cyber threats, jeopardize safe, reliable operation of the power grid in the United States. More than 98 percent of military installations in the nation depend on the civilian power grid to execute military and national security missions around the world. For these installations, power outages can have devastating consequences. Public Utility Commissions are in a unique position to help bring stakeholders together and work to enhance resiliency of this defense critical energy infrastructure.

This article examines issues related to defense energy resilience and explores opportunities for PUCs to develop relationships with the Department of Defense to encourage projects that will enhance national security and provide resilience benefits to communities outside the fence line. Effective state-specific examples are highlighted.

Keywords: defense energy resilience, public-private partnership, public utility commissions, regulation

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Introduction

The risks to critical energy infrastructure are rising. Extreme weather events such as fires, floods, and extended hot or cold snaps jeopardize reliable operations. Rapidly evolving cyber threats demand constant attention to avert. Consequently, the potential for destructive, long-duration power outages grows.

This threat environment has spurred the development of defense energy resilience policy and frames the current Department of Defense (DoD) approach to infrastructure investments. More than 98 percent of military installations depend on the civilian power grid and interdependent civilian utilities for communications, natural gas, and water (Narayanan et al., 2020). Power outages can affect DoD's ability to execute its military and national security missions in the U.S. and around the world. To minimize risk, energy resilience has become a central tenet of DoD's energy policy, focused on maximizing efficient energy use, expanding supply for mission assurance, and enhancing energy resilience (ASD(S), 2020a.)

In 2014, Department of Defense Directive (DoDD) 4180.01 established the need to improve energy security and "enhance the power of resiliency of installations" (DoD, 2014). In 2016, Department of Defense Instruction (DoDI) 4170.11 was updated and broadened to require that DoD "take necessary steps to ensure energy resilience on military installations ... and have the capability to ensure available, reliable, and quality power to continuously accomplish DoD missions from military installations and facilities" (DoD, 2016). The FY18 National Defense Authorization Act codified and defined energy resilience for the first time in law (H.R.2810, 2017). Today, each military branch has adopted requirements for domestic military installations to operate independently of the power grid from 7 days to 2 weeks, if necessary (ASD(S), 2020a, p. 13).

To achieve its ambitious energy resilience requirements, DoD is actively working with utilities to develop on-installation energy resilience projects and is exploring partnerships "outside the fence line," that is, outside the borders of its installations. Nonetheless, DoD must significantly accelerate the pace of investment both inside and outside the fence line to meet its energy resilience goals. DoD's success will depend, in part, on productive public-private collaboration, but few roadmaps exist. The U.S. Department of Energy (DOE) is examining opportunities to build stronger ties with DoD to advance mutually supportive energy resilience goals, as evidenced in the 2020 Memorandum of Understanding (MOU) between the DOE and DoD to address energy resilience needs of military installations and associated commercial electric grid (ASD(S)-DOE/OE, 2020) facilities. The Edison Electric Institute, an association that represents all investor-owned electric companies in the U.S., is working with the Army to pilot engagement strategies (EEI, 2019). Interestingly, state public utility commissions (PUC) are beginning to do the same.

Building Energy Resilience through Partnership

DoD is served by hundreds of different utilities, of all types, and across different electricity market structures. Investor-owned utilities (IOUs) serve over 300 major military and national security installations across the country. In most states, IOUs are regulated by the state PUCs. As such, PUCs play an implicit vital connective role between utilities they regulate and the defense communities those utilities serve.

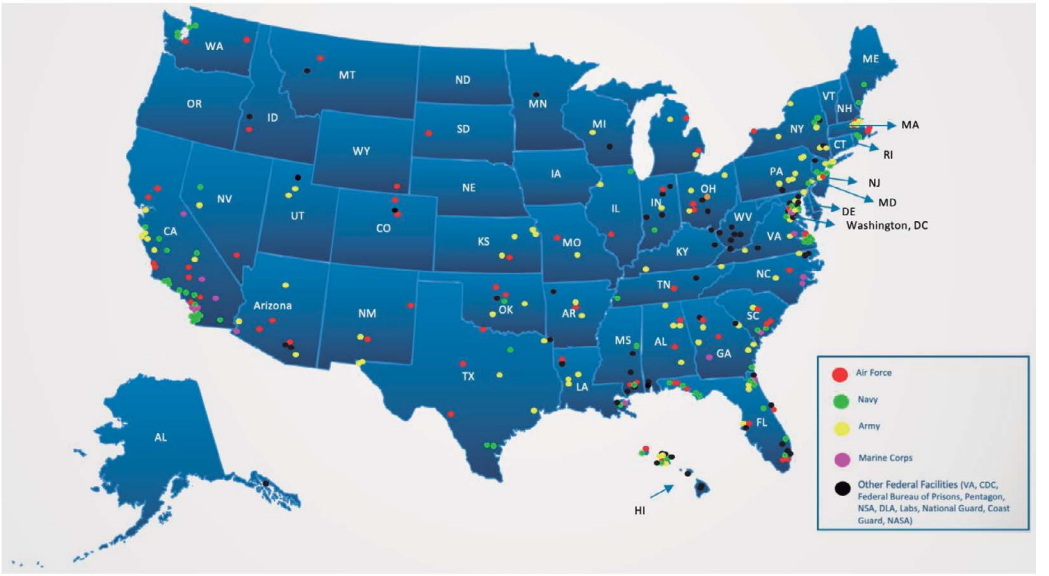

Figure 1. Department of Defense and Federal Installations Served by PUC-regulated Utilities. Source: Edison Electric Institute (2019)

PUCs are also the nexus of approval for regulated utility investments in defense energy resilience projects. Oftentimes, such projects are expected to provide resilience benefits to utility ratepayers as well. However, consideration of ratepayer investments in defense energy resilience improvements outside the fence line will require new modes of collaboration between PUCs and DoD and its federal installations that have yet to be established.

To date, most PUCs have had limited involvement with DoD related to energy resilience investments. Yet, opportunities exist for proactive outreach to discuss energy resilience priorities and the role state utility regulators might play in investment decisions around enhancing DoD energy resilience. The two notable examples that follow provide insights on the potential benefits of such collaborative engagement.

Pacific Missile Range Facility Barking Sands (Kaua'i, Hawaii)

The Hawaii Public Utilities Commission (HI PUC) approved a utility-scale solar

photovoltaic (PV) and battery project (Docket No. 2017-0443) sited on land leased by a cooperative utility from the DoD (see Figure 2). The project provides firm renewable electricity to the power grid during normal operations and will serve the installation as an islandable microgrid during power interruptions and during mission critical operations. Construction on the system was completed in December 2020, and a full islanding capability test is planned in 2022.

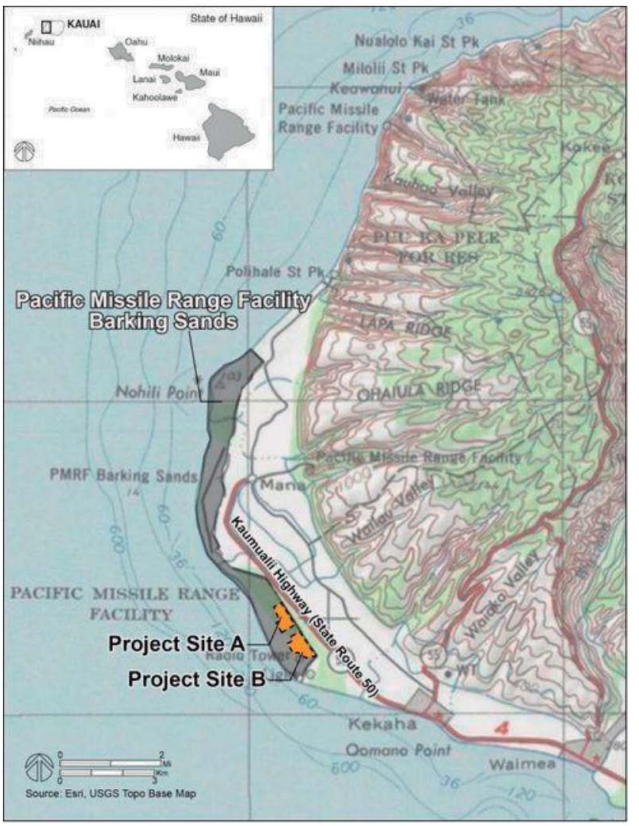

Figure 2. Sites for the KIUC Solar and Storage Facility at PMRF Barking Sands. Source: Else, 2017

In December of 2017, Kaua'I Island Utility Cooperative (KIUC) filed its initial application to HI PUC for their proposed power purchase agreement (PPA) with AES and the Pacific Missile Range Facility (PMRF) Barking Sands solar and storage project. On June 20, 2018, the HI PUC approved KIUC's application for the PPA. HI PUC concluded that the PPA was reasonable and in the best interest of the public to both add capacity and add new renewable energy generation. The price of $108.50 per MWh was found to be reasonable. HI PUC also approved KIUC's sublease to AES, KIUC's request to build an above-ground transmission line, as well as KIUC's request to spend approximately $8.87 million on the PMRF Barking Sands Substation.

Davis-Monthan Air Force Base (Tucson, Arizona)

The Arizona Corporation Commission (ACC) approved an environmental compatibility certificate for a planned project by Tucson Electric Power (TEP) to expand and upgrade the transmission system in the region surrounding Davis-Monthan Air Force Base (DMAFB) (Docket No. L-00000C-20-0007-00186). The project was undertaken to enhance service reliability for current and new customers, and in response to DoD energy resilience policies and requirements. The project will reduce the risk of transmission system overloading within the region and enhance service reliability for current and new customers. The upgrades will also accommodate the expansion of renewable energy resources in the future (TEP, 2020a). The new substation will be fed by two separate 138 kV transmission lines. The addition of a second point of entry for electrical power to DMAFB eliminates the risk to the base of a single point of failure.

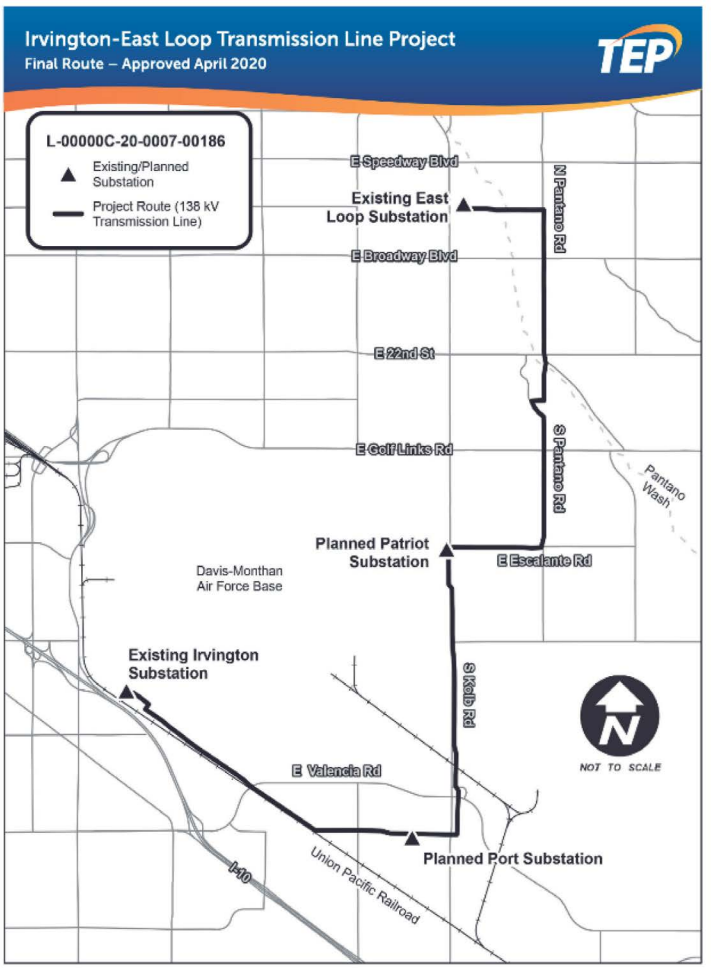

Figure 3. Irvington to East Loop 138 kV Transmission Project
Source: TEP, 2020b

On January 15, 2020, TEP applied for a Certificate of Environmental Compatibility with the Arizona Power Plant and Transmission Line Siting Committee. TEP provided testimony that "the decision to move forward with the project was driven by the needs of DMAFB to meet a new DOD mandate regarding energy resiliency" (ACC, 2020a, p. 13). In addition to emphasizing DoD energy policy, TEP also specifically cited the requirements of the Air Force Energy Flight Plan (U.S. Air Force, 2017) to increase the use of energy resiliency technologies and partnerships for critical infrastructure, eliminate single points of failure for facility energy, and eliminate energy shortfalls to improve contingency operations (ACC, 2020a, p. 83). In April 2020, the ACC issued an order approving the certificate, allowing the project to move forward. ACC found that the project was in the public interest because it would enhance the utility's ability to respond to future load growth, provide support to existing distribution substations, and "assist [DMAFB] in fulfilling the DoD … directive for enhancing energy resiliency" (ACC, 2020b).

As these examples suggest, PUCs across the U.S. may benefit from a greater understanding of the broader DoD energy resilience policy landscape as well as their specific role in fostering relationships that enhance the protection of critical infrastructure and enhanced national security. The National Association of Regulatory Utility Commissioners (NARUC) recently released a white paper describing the military's defense energy resilience policies and suggestions for opportunities for PUC engagement (Rickerson, et. al, 2021). The paper describes key steps and raises important considerations for PUCs as they begin to grapple with defense-related topics:

Assess in-state defense critical infrastructure (DCI)

Regulators can identify the military installations in their state and review the extent to which DoD bases are served by regulated utilities. This assessment could be limited to electricity infrastructure or could also include a review of how additional sectors that commissions regulate serve in-state defense facilities.

Engage with in-state DoD representatives and activity

Regulators can engage the staff of in-state military installations to identify planned or ongoing energy resilience projects that may rise to the level of commission consideration.

Initiate an investigative docket

Commissions in some states can initiate dockets that are informational in nature. Commissions could open proceedings to investigate, for example, the current status of utility and military partnership within the state, the nature and duration of outages experienced by military facilities, opportunities to include projects with military co-benefits in integrated resource planning, or options for low-cost or

no-cost resilience improvements. Adding DoD sites to black start crank paths or to the bottom of load shed lists, for example, represent lost-cost ways to improve the resilience of defense facilities.

Explore the development of joint energy resilience metrics

There are multiple ongoing efforts to identify metrics that can be used for resilience planning, and for utility energy resilience (Anderson et al., 2017; Kallay, Napoleon, Havumaki et al., 2021). Regulators can review and engage with these efforts as they develop.

Convene and/or participate in value of resilience investigations

There are multiple, ongoing efforts to explore the value of resilience that are being led by the national laboratories and by the utility industry. In the near-term, regulators can engage with these initiatives to assess emerging methodologies and provide feedback on potential use cases. Regulators can also commission their own studies of the value of resilience and work with utilities to integrate them in benefit-cost analyses.

Investigate defense energy-related cybersecurity investments

Given the ambiguities around the comparative benefits and costs of cybersecurity countermeasures, regulators could work with in-state military installations to anchor investigations into the effectiveness of cybersecurity strategies.

Engage in planned or ongoing defense-relevant collaborations and explore secure communications frameworks

Pilot projects represent opportunities for commissions to engage with and learn alongside the communities, utilities, state agencies, and defense agencies. State public utility commissions can work in close conjunction with their sister agencies – state energy offices – to coordinate funding for military energy resilience projects. The California Energy Commission, for example, signed an MOU with the Department of the Navy to support renewable energy development, energy security, and energy reliability (California Energy Commission, 2016), following recommendations from the California Governor's Military Council (2015). Commissions could also provide guidance or checklists to the proponents of ongoing efforts about how to best prepare to have productive regulatory engagement as their projects mature. Future work in the defense energy resilience space will need to include policy development on how regulators can best engage in secure communications and decision making as they address the issues outlined in this article.

Ultimately, a PUC may initiate proceedings to explore the current status of utility-military partnership within the state, the nature and duration of outages

experienced by military facilities, options for low-cost or no-cost resilience improvements, and opportunities to integrate projects with co-benefits between defense customers of utility services and the surrounding community into integrated system planning.

Emerging Issues for Regulators

The field and practice of defense energy resilience remains nascent as does the role of state utility commissions within it. Going forward, regulators may proactively engage with issues related to defense energy resilience, or they may increasingly see issues related to defense energy resilience integrated into their normal course of business. In either case, there are several uncertainties and unresolved issues that regulators will need to navigate when considering defense-related topics.

Rate Recovery—Who Pays?

Although many stakeholders are active in areas related to defense energy resilience, clear responsibilities for coordinating and resourcing investments have not been established. The rapidly evolving policy landscape at the federal and state levels has created different avenues to support defense energy resilience, but each has benefits and drawbacks.

DoD funding

DoD has a massive energy budget to acquire the fuel and systems it needs to sustain global operations. DoD's budget for domestic on-base energy improvements, however, is limited compared to the need (Niemeyer, 2018). DoD relies primarily on third-party financing to acquire energy efficiency, renewable energy, and energy resilience. DoD has also not historically had the funds or the authority to make "outside the fence line" investments in community and private sector energy infrastructure on which its installations depend.

Other federal funding.

There are a broad range of funding programs from federal agencies beyond DoD that could potentially be used to support energy infrastructure projects. Many of these are described in a NARUC publication titled "Federal Funding Opportunities for Pre- and Post-Disaster Resilience Guidebook" (Monken, 2021). Funding opportunities included in the Infrastructure Investment and Jobs Act (The White House EOP, 2022), and programs such as FEMA's Building Resilient Infrastructure and Communities have budgets that are an order of magnitude larger than DoD's community programs. Defense energy resilience-related investments could be possible, but the programs serve a broad range of competing uses beyond defense infrastructure and may be difficult to secure. The Defense Access Roads Program,

for example, is a joint program between DoD and the Federal Highway Administration for DoD to pay its share of the cost of public highway improvements required by defense activity (Federal Highway Administration, 2021). Similar programs for DoD to contribute to energy infrastructure do not yet exist.

Ratepayer funding

National security is a public good, and investments in electrical infrastructure to secure critical DoD bases is broadly in the public interest. Utilities are best positioned to make investments in their systems that serve DoD bases, but the extent to which in-state utility ratepayers should carry the cost of defense-relevant infrastructure is unclear. Commissions have rejected ratepayer recovery for some non-DoD energy resilience projects because they served too narrow a geographic area and did not create sufficiently widespread ratepayer benefits (Rickerson, Gillis, and Bulkeley, 2019). Similar arguments could be made to limit investments that benefit DoD installations alone.

On the other hand, DoD installations have successfully demonstrated that they are able to use on-base energy resilience systems to support grid operations during severe weather events to the benefit of regional ratepayers. Military-utility energy resilience cooperation can be a two-way street. Just as there have been examples of civilian support for military energy resilience projects, there have been multiple instances during the past several years during which military bases have used their on-base generating assets to support grid stability during severe climate events. Two recent examples involved heat waves in California in 2020 and the polar vortex of 2021:

Marine Corps Air Station (MCAS) Miramar

In August 2020, California ISO issued an alert to reduce energy demand statewide in response to a record-breaking heat wave (California ISO, 2020). MCAS Miramar in San Diego has an installation-wide microgrid that incorporates battery storage, and landfill gas, solar PV, natural gas, and diesel generation (Booth et al., 2020). During the event, MCAS Miramar activated the microgrid to reduce demand on the commercial grid. The base was able to remove 6 MW of its demand from the grid, which helped keep an estimated 3,000 homes online (Carlisle, 2020; Dockery, 2021).

Offutt Air Force Base

A polar vortex in February 2021 brought extreme cold temperatures across the southwestern and midwestern United States. The cold caused widespread power outages across the United States and Mexico and precipitated a power crisis in Texas. In Nebraska, parts of the state experienced temperatures nearing -20 degrees. In Omaha, NE, the Omaha Public Power District contacted Offutt Air Force

Base to help alleviate the strain on the grid (Starr and Kaufman, 2021). Offutt Air Force Base activated its on-base power plants and emergency back-up power systems and reduced their demand on the grid by 6 MW. The base utilized its on-site generation assets to support the grid for 75 hours (U.S. Air Force, Offutt Air Force Base, 2021).

How to Weigh Benefits: Quantifying the Value of Defense Energy Resilience

Utility investments in defense electric infrastructure can create a resilience value that accrues to a broad range of stakeholders above and beyond the economic development benefits discussed in the previous section. State commissions have emphasized the need for a quantitative resilience value to support rulemaking, rate making, and emergency planning (California PUC, 2020; MPSC, 2019). The value of resilience is typically acknowledged to be significant, but notoriously difficult to quantify. There have been many attempts to identify a resilience value that can be used to support energy decision making, but the energy industry has not adopted a standard approach (Electric Power Research Institute, 2021).

The practice of integrating energy resilience into regulatory benefit-cost analysis remains at an early stage (Kallay, Letendre et al., 2021), and NARUC research found that a quantified value of resilience has not been considered in commission energy resilience proceedings (Rickerson, Zitelman et al., 2022). Research into the value of resilience is ongoing, however, and both commissions and utility stakeholders will likely continue to attempt to integrate resilience into regulatory proceedings in the future.

Utility cost recovery may be most feasible when there are clear benefits for ratepayers above and beyond supporting national security. In the case of PMRF Barking Sands, the project will provide additional energy and capacity to the grid while helping the state cost-effectively achieve its renewable energy target. In reviewing TEP's proposal in the region around DMAFB, ACC recognized the project's broader benefits in its 2021 Order.

Cybersecurity may also have bearing on commissions' consideration of defense energy resilience. Most of the case studies and examples in this report focus on investments in physical electricity infrastructure (e.g., transmission, distribution, and generation). Commissions are increasingly being asked to consider whether the costs of utility investment in cybersecurity measures are just and reasonable, and there are many cases in which commissions have approved ratepayer investments in cybersecurity. Although asset-level investments at military installations may face scrutiny as to whether they benefit ratepayers broadly, cybersecurity investments in central automated systems that serve DoD installations would likely also create benefits for civilian customers across utility service territories.

Military Energy Resilience and Economic Development

The role of economic development within regulatory proceedings is mixed. Although regulators in many states are statutorily able to consider economic impacts as in rulemaking, some commissions are not and may invite litigation if they do so (Zitelman and McAdams 2021). Even if commissions are allowed to consider economic impacts, it does not mean that they will. Recent studies of regulatory decisions related to damage from extreme weather events, for example, found that commissions have not used regional economic impacts in their decision making (Sanstad et al., 2020).

There have not yet been cases in which regulators have specifically taken the economic impact of avoiding base closure into account when considering military energy resilience investments. However, there are some instances in which state regulators have considered base retention when evaluating military renewable energy investments. The Alabama Public Service Commission (Alabama PSC) approved a petition from Alabama Power to build and own a 10.6 MW_{AC} solar PV plant at both Fort Rucker and at Anniston Army Depot in Docket No. 32382 in 2015.

Alabama Power justified its request to partner with the Army in part by citing federal law requiring agencies to procure renewable energy and stating that the PV projects "should help [the installations] avoid unwarranted scrutiny by federal leaders (Alabama PSC, 2015a)." In its Order approving the two Army projects, Alabama PSC cited staff analysis that considered the "direct benefits associated with retaining the military bases load by supporting them in meeting federal mandates associated with renewable energy standards and the indirect benefits associated with retaining residential and commercial loads that are highly dependent on the economic impact of each military base" (Alabama PSC, 2015b). Given the energy resilience policies set by DoD within the last 5 years, there may be instances in the future in which commissions are asked to consider military energy resilience from an economic development perspective.

Next Steps

State public utility commissions play a critical role in approving a variety of utility investments for projects directly impacting defense community customers. PUCs can act as a convening entity to encourage collaborative engagement among utilities, defense customers, public agencies, and local communities. Ample opportunity exists for PUCs to develop relationships with DoD to encourage projects that will enhance national security and provide resilience benefits to communities outside the fence line.

PUCs are strongly encouraged to familiarize themselves with the strategic priorities around defense energy resilience and develop their own guidelines for

engagement on these issues, particularly as these types of investments become more common. NARUC is in the process of developing several key resources to help PUCs navigate the complexities of the DoD energy policy landscape and to provide some guidance on how a PUC might engage on defense energy resilience topics. Those resources will be forthcoming later in the year.

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