

## A Model for Installation Energy Resilience Planning

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**Background/Objectives.** In March 2016, in response to the growing threat of climate change to installation infrastructure and mission, a memorandum from the Office of Assistant Secretary of Defense established a policy that requires all US DoD components to develop installation-level energy plans. These plans lay out the strategies to assist installations in achieving their energy goals and ensuring energy and water resilience to meet critical mission assurance requirements. Each service has taken a slightly differing approach to developing these installation energy plans (IEPs). The Air Force and Navy IEPs are supported by a quantitative method of defining energy needs and evaluating potential strategies. This abstract covers the pilot work for both the Air Force and Navy in developing and piloting this methodology at over 20 installations across the US. These installations differ widely in threats (from tornados and extreme heat in Oklahoma to sea level rise and typhoons in Hawaii), mission requirements, and existing infrastructure age/condition. As such, the methodology is required to be flexible and adaptable.

**Approach/Activities.** The IEPs are developed at an installation scale (typically between 10 and 500 buildings). The IEP incorporates input from mission owners, installation planners, engineers, and other key stakeholders; includes long-range plans for energy resilience capabilities; ensures available and reliable utilities for each of the installation's critical missions; and defines energy requirements to maintain the mission during power/water outage events. This methodology is innovative both in the application of modeling tools and the make-up of the multidisciplinary teams conducting the assessment, from energy engineers through to cyber-security specialists and military planners. The Resilient Energy Assessment Framework (REAF) Model was developed to integrate these inputs and to rapidly assess the energy resiliency posture of an installation and the missions therein against the applicable definition of resiliency (e.g. the Air Force's 5 R's). This tool also facilitates the development of strategic scenarios towards mitigating risks and improving the energy resiliency. It does this with a combination of a large strategy database (>150 unique variations) and an interactive set of gameboards through which to inform the mission-owners and capture input.

**Results/Lessons Learned.** The result of the IEP and REAF Model development process is a flexible and adaptable framework for the quantification of energy resilience needs and strategy assessment for campuses. Based on the success of this pilot project, the Air Force is deploying this framework across its portfolio. The Navy model was more in-depth (including the quantification of specific projects, such as building upgrades and renewable energy generation) and has been applied at multiple locations across the Pacific where in-depth assessment was desired.

The presentation will demonstrate the resilience assessment method and will walk the attendee through a threat assessment, defining mission requirements, and establishing a robust assessment of both existing and future resilience posture. Examples of strategy resilience attributes will provide greater context on assessment methodology, and examples for specific locations (redacted as needed) will be provided. The session will focus upon how this methodology can be applied in other campus environments to support the integration of resilience planning into campus master plans and capital plans to minimize the impact of climate change and related hazards on mission assurance.