Department of Defense Installation Energy

Energy Resilience Review

OSD & MIT-LL Study

WEEC

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OASD (Energy, Installations & Environment)

September 22, 2016

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DoD Energy Resilience

Acquisition, Technology and Logistics

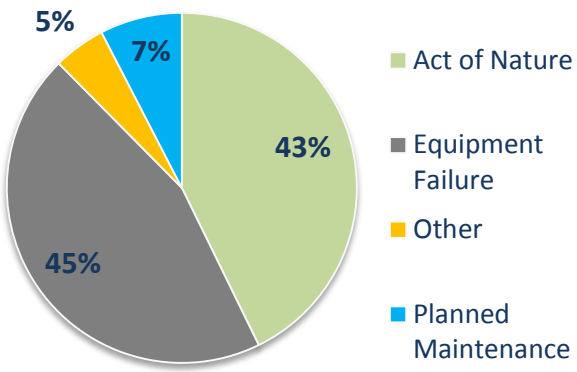
❑ Policy Drivers

- Multiple requirements through FY2017 NDAA;
- Title 10, Section 2925(a) (modified thru FY2016 NDAA);
- ASD(EI&E) Memorandum on Power Resilience;
- Department of Defense Instruction 4170.11, Installation Energy Management; and,
- Unified Facilities Criteria (such as Electrical Series).

❑ What are we doing now?

- DoDI 4170.11 change focused on energy resilience complete
  - Ensures performance against existing requirements
  - Encourages cost-effective solutions improving mission assurance
- Developing business case analyses (BCA) approaches to support/prioritize budgetary resources or alternative financing projects for energy resilience
  - MIT-LL study informs energy resilience BCA framework
  - Facilitates framework to quantify costs and availability/reliability

FY 2015 Utility Outages



Details on OASD(EI&E) Energy Resilience Initiatives:
http://www.acq.osd.mil/eie/IE/FEP_Energy_Resilience.html

DoD energy resilience is the ability to prepare for and recover from energy disruptions that impact mission assurance on military installations.

Energy Resilience Policy Overview

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- DoDI 4170.11 policy includes the following energy resilience requirements:
  - Better define and describe 'critical' energy requirements for installations (coordinate collaboratively with tenants, missions owners and operators of critical facilities)
  - Continue to perform against already existing requirements: sizing of energy loads, maintenance, fuel, plans, and testing/exercising (principally generators)
  - Encourage the most cost-effective solutions that improve mission readiness (allows for solutions beyond generators)

Our Priorities: (1) Make sure the stuff you got will work (generators); and (2) think about smarter ways to support the mission (more resilient and will save money).

Application of DoDI 4170.11 Policy
MIT-LL Study Example

Study Problem Statement: How does DoD meet current requirements for cost-effective and reliable energy resilience solutions for critical mission operations?

- To implement energy resilience solutions, DoD requirements include:
  - Prioritization of energy requirements to critical mission operations (in partnership with DoD mission assurance communities)
  - Pursuit of life-cycle cost-effective energy resilience solutions that provide the most reliable energy to critical mission operations
  - Reviewing energy solutions beyond typical backup or standby generators
- How does MIT-LL study help DoD address this problem?
  - Primary focus is to review cost-effective and reliable energy resilience solutions
    - Technology agnostic – focus on quantifying and optimizing cost and availability/reliability to critical mission operations
    - Aligned energy resilience solutions to prioritized critical energy loads for the military installations
    - Analysis of alternatives comparing current baseline (generators) vs. over 40 potential energy resilience options

DoD Energy Resilience
Base-Level Critical Loads Example

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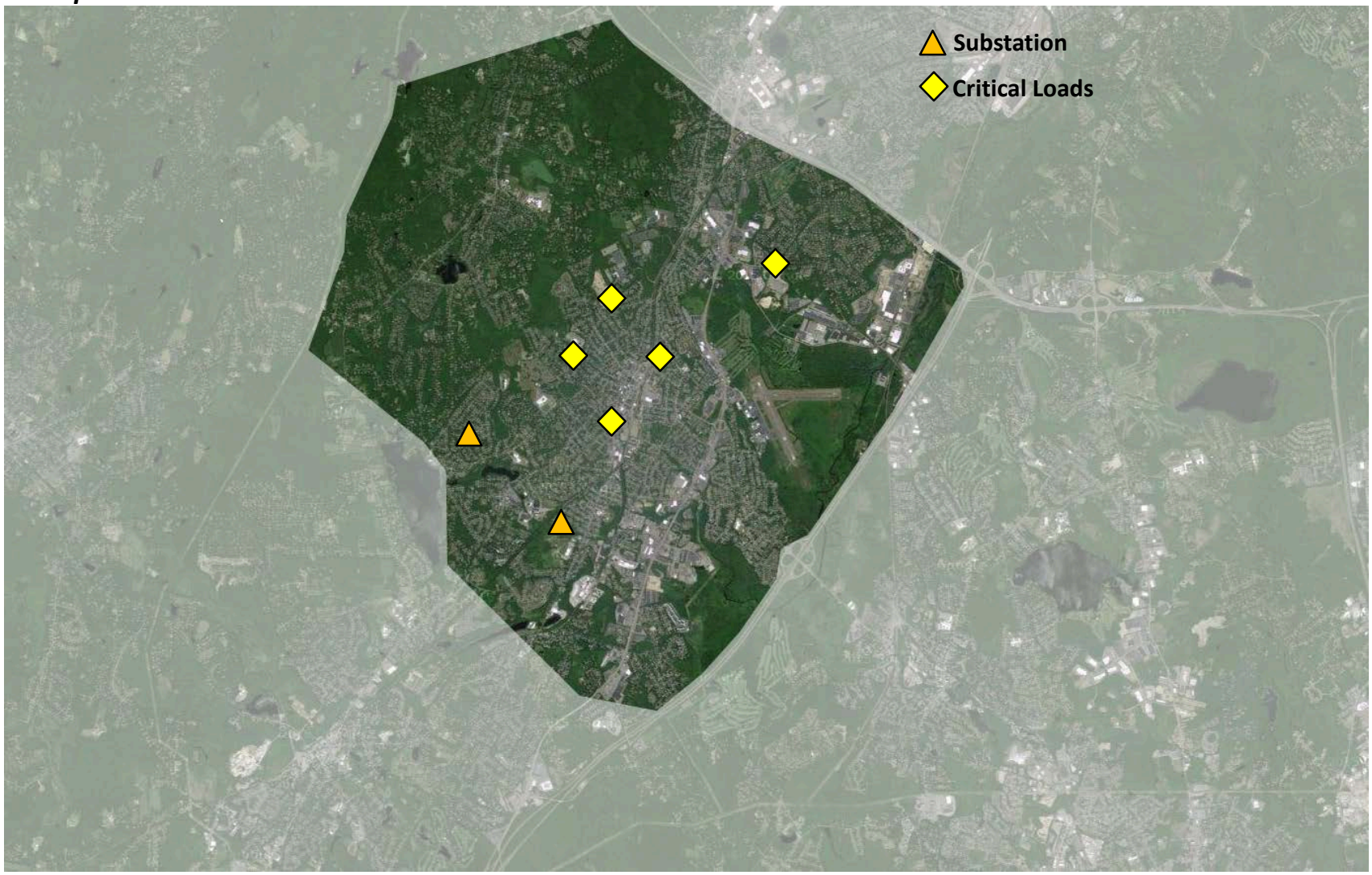
Example Case – Not an actual installation



Bottom-Line Up Front (BLUF) Study Results Overview

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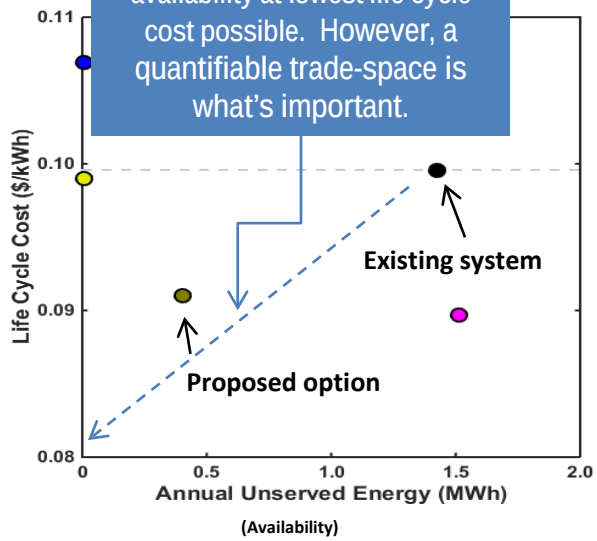
Cost attribute: life-cycle costs ($/kwh)
Mission attribute (availability): annual unserved energy (MWh)

Ideally, you want to maximize availability at lowest life cycle cost possible. However, a quantifiable trade-space is what's important.



Findings/Results

(generalized/approximated)

- Critical Energy Loads: 5 MW to 20 MW
- Generators: 50 to 350 generators
- Reductions in costs: 0.2¢/kWh to 2.5¢/kWh,
- Availability improvements: 0.3 MWh to 1.3 MWh
- Base characteristics: Isolated location with frequent outages, integrated/urban base with reliable power, etc.

	Generator	Microgrid	UPS	PV	CHP	FC
●	x					
●	x	x	x			
●	x	x	x	x		
●	x		x	x		
●	x			x		
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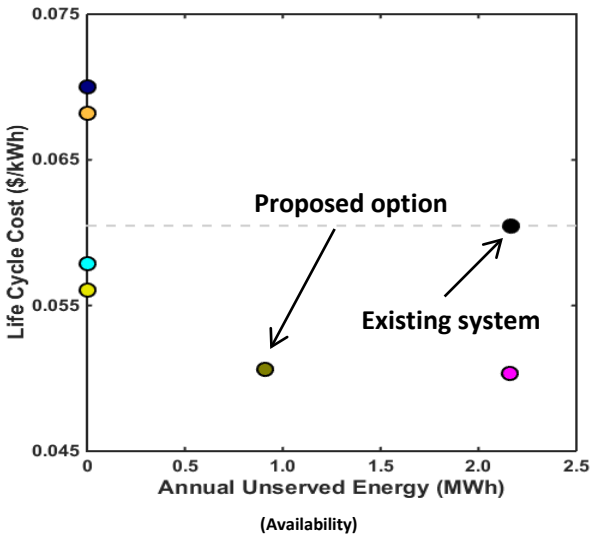
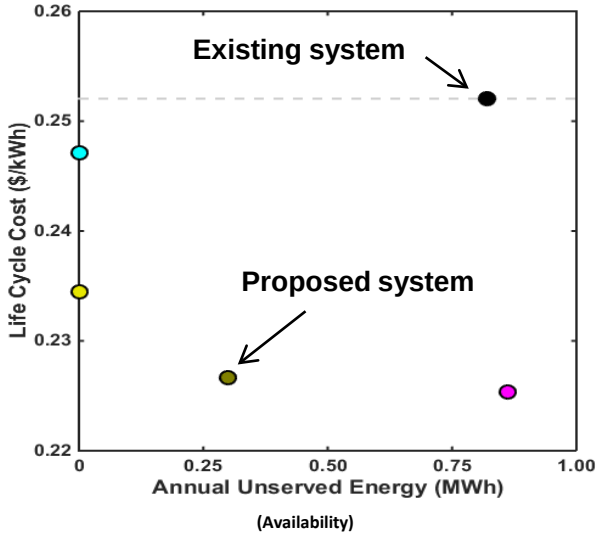
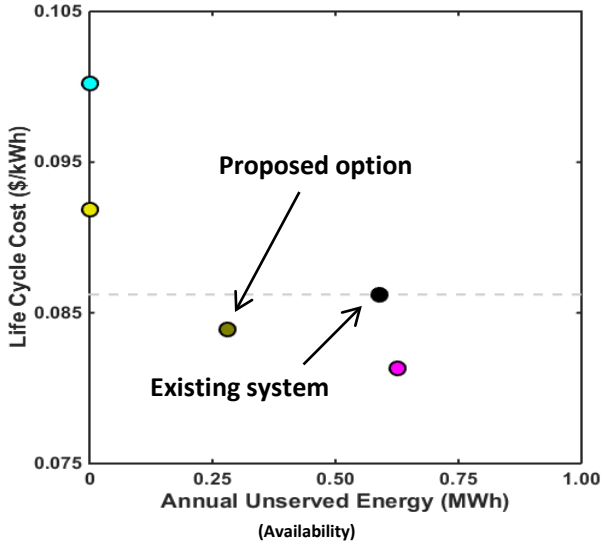


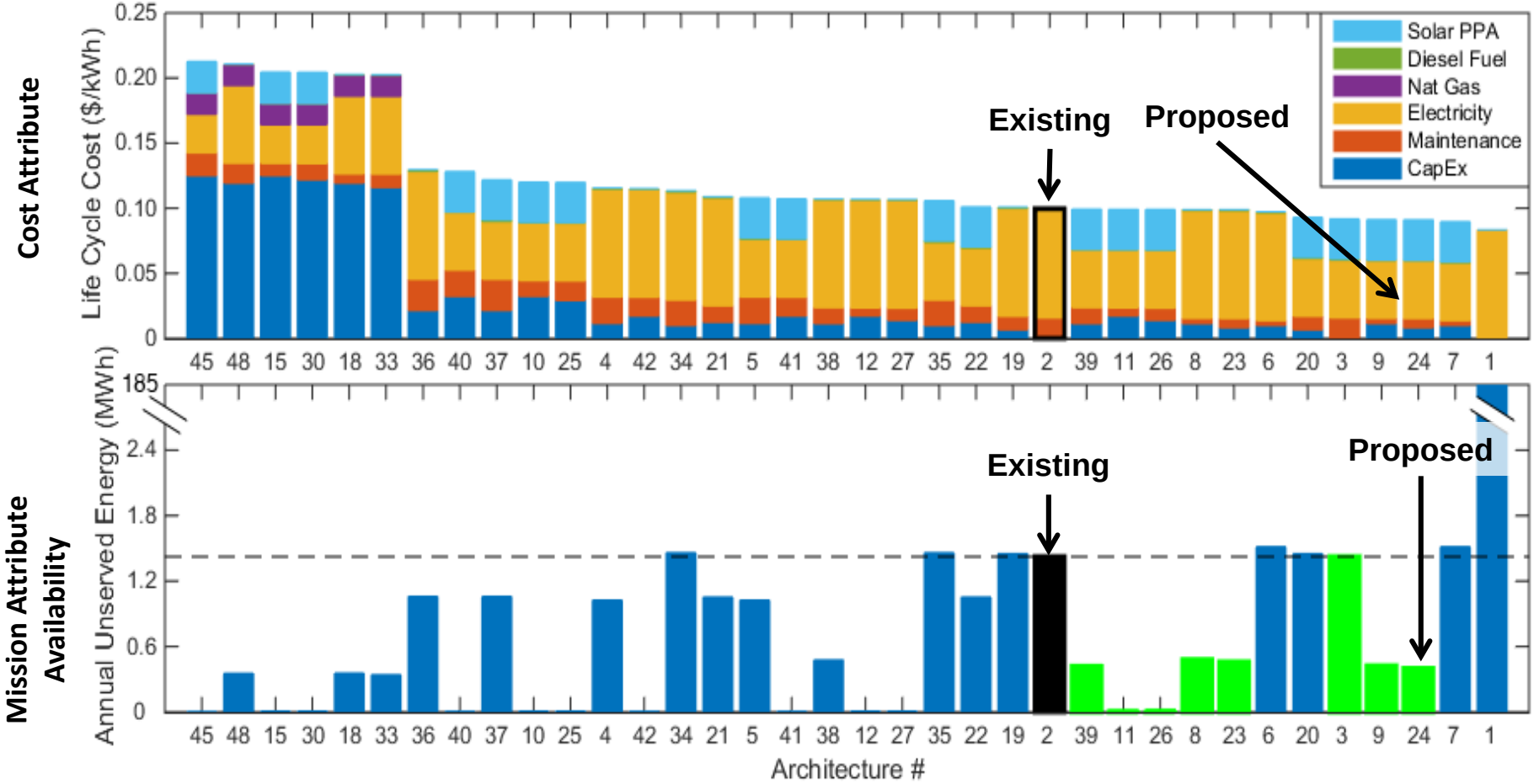




Framework allows for quantifiable tradeoffs between cost and mission assurance attributes.

Results across diverse bases indicate that more cost-effective and reliable energy resilience solutions exist to support critical mission operations on our military installations.

Energy Resilience Solutions Analysis of Alternatives
Tradeoffs Between Cost and Mission



DoD-Wide Recommendations

Sampling of Findings

These are not necessarily new requirements – further prioritization and awareness is required in the installation energy portfolio.

- Communication
  - Encourage routine meetings between installation energy leads and mission operators to determine and prioritize 'critical' mission operations and energy requirements across the entire base
    - Improve guidance to determine prioritized energy load calculation for critical mission operations
  - Coordinate with the community (inside and outside of the base) to ensure critical interdependent mission requirements are met during energy outages
- Technical
  - Understand current energy systems/infrastructure – improve distribution reliability to accept energy resilient systems
  - Prioritize/ensure energy resilience systems are only placed and appropriately sized to service critical energy loads
  - Standardize a process to ensure OM&T of energy systems (e.g., generators, UPS, etc.) for full reliability picture
- Cost and Performance Data
  - Encourage tracking of the appropriate cost data (capital, operation, maintenance, and testing) of energy generation and infrastructure to replicate and justify the business case for future energy resilience solutions
  - Encourage tracking of performance data that aligns to mission and availability/reliability of energy systems and infrastructure (outage data, failure rates, etc.) to assist in tradeoff decisions between cost/mission
    - Helps to identify cost-effective and prioritized remediation for reliability risks on the base's electrical distribution system

Collaborating with Services and Defense Agencies to raise awareness through future guidance across the DoD.

Questions