


Department of Defense Installation Energy

Energy Resilience Review

OSD & MIT-LL Study

FUPWG

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OASD (Energy, Installations & Environment)

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DoD Energy Resilience

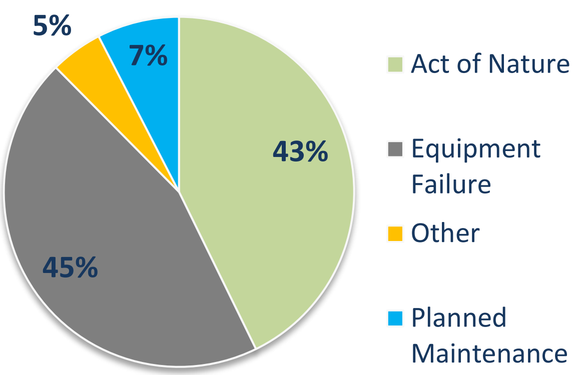
❑ Policy Drivers

- Title 10, Section 2925(a)(9) (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 reliability
- Partnering with OASD(R&E) to pursue energy resilience technologies
  - Broad Agency Announcement for Rapid Innovation Funds
  - Focus to advance commercialization of energy resilience technologies

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.

<u>Study Problem Statement:</u> How does DoD meet current requirements for cost-effective and reliable energy resilience solutions to 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 <u>cost</u> and <u>reliability</u> to critical mission operations
    - Aligned energy resilience solutions to <u>prioritized critical energy loads</u> of the installation
    - <u>Analysis of alternatives</u> comparing current baseline (generators) vs. 48 potential energy resilience options

Energy Resilience Approaches for DoD Installations

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May 18th, 2016

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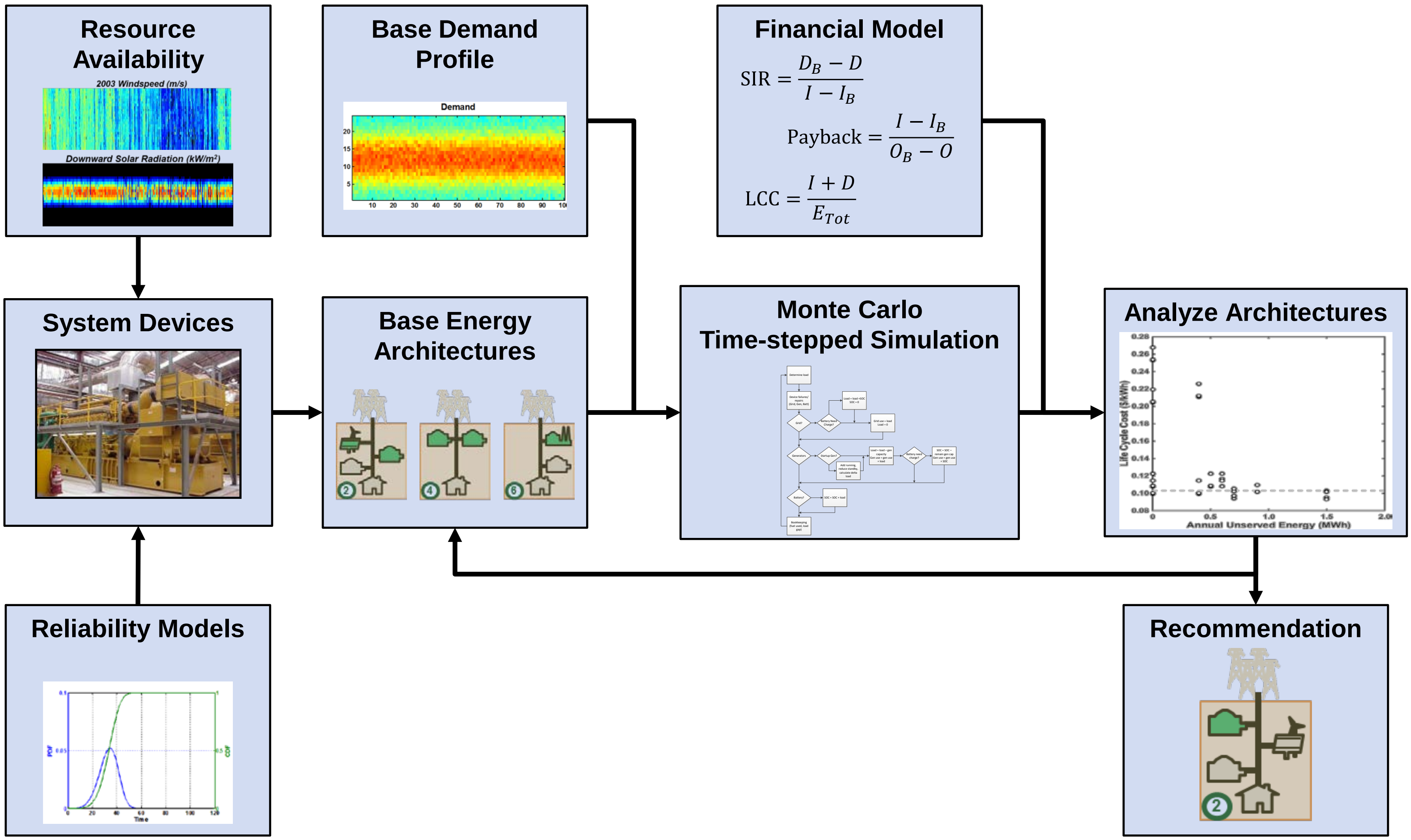
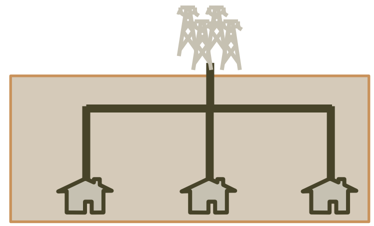
Analysis Methodology

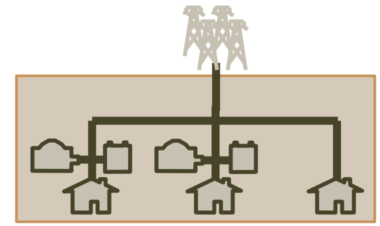


Architecture Options

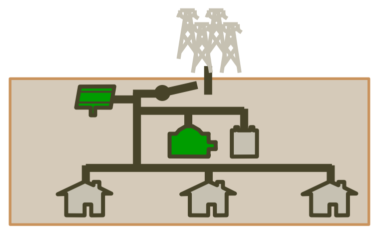
- Grid Tied Solar PV
- Islandable Solar PV
- Building Generator
- Central Generator
- UPS
- 1-Day Load Battery
- Microgrid
- Cogeneration
- Fuel Cell
- Grid Electricity
- Local Load



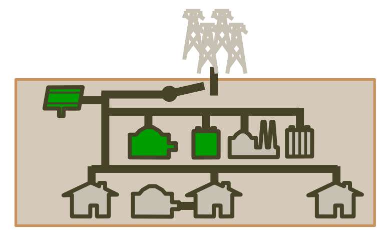
No Backup Systems



Building Generators & UPS



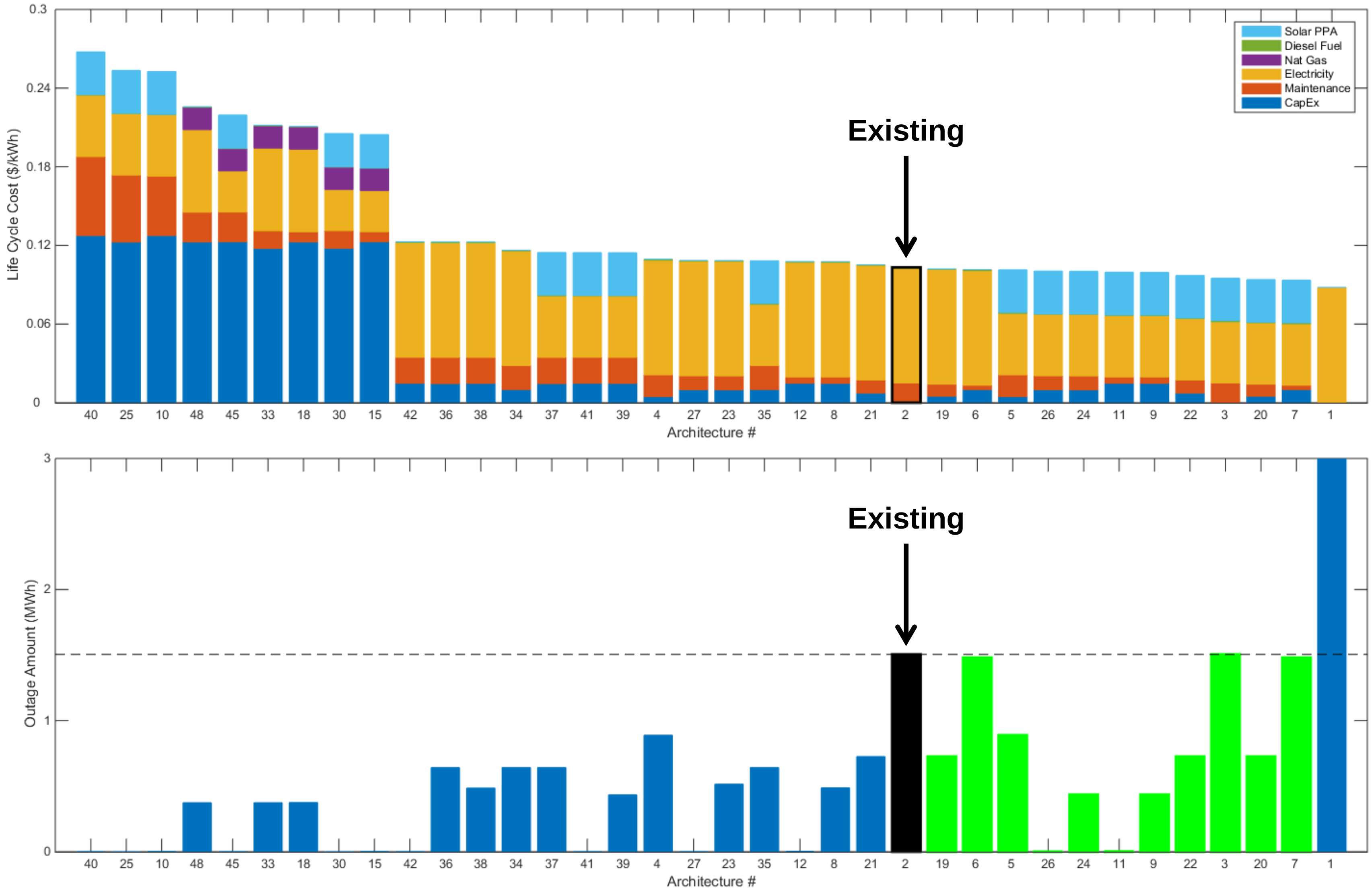
Islandable Solar PV, Microgrid, Central Generators, & UPS



Microgrid, Islandable Solar PV, Building Generators, Central Generators, 1-Day Battery, Fuel Cells, & Cogeneration

These examples explore the possible complexity of architectures available with the tool; a larger number of architecture options are possible.

Architecture Cost Breakdown



Recommendations

- **Consolidated generation at the substation / critical feeder level improves resiliency**
  - **Large emergency diesel generators or natural gas cogeneration with dual fuel capability**
  - **Requires a reliable distribution system on the installation**
  - **Reduces the maintenance burden on base personnel -> more likely to work during an outage**
- **Solar PV through 3rd party financed PPAs can often provide electricity to the installation at below market rates**
  - **For islanded operation the appropriate inverter functionality will need to be included in the PPA agreement**
  - **Potential to offset a modest amount of diesel needed during grid outages**
- **Microgrids that enable a more flexible allocation of power on the installation can also improve resiliency**
  - **Upgraded distribution system including additional switching capability**
  - **Installation wide communication and control of the energy system**