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Energy Exchange

Federal Sustainability for the Next Decade
U.S. Department of Energy

DoD Energy Resilience Initiatives

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Agenda

- ❑ Energy Resilience Overview
- ❑ DoD Power Resilience Review
 - ❑ Findings & framework review
 - ❑ Conclusions
- ❑ Business Case Analysis Study
 - ❑ Overview & concept review

Energy Resilience

Overview, Findings and Next Steps

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

□ What we found?

- Many energy resilience policies did already exist
- Disruptions primarily from natural and reliability issues
- ‘Critical’ energy requirements were identified by DoD Components that align to mission assurance
- Most solutions for critical energy requirements are fixed backup generators tied to a critical facility
 - Opportunities beyond generators could be more *cost-effective* while also improving *mission readiness*

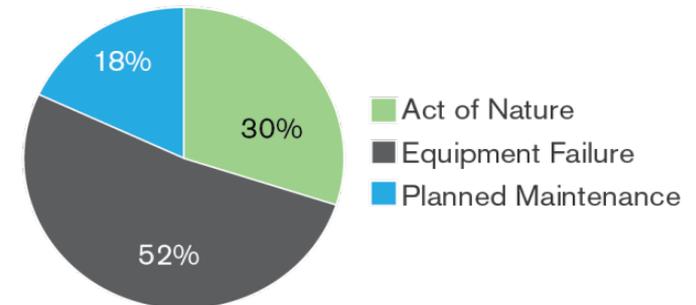
□ What are we doing now?

- Developing universal energy resilience guidance
 - Ensure performance against existing requirements
 - Encourage the most *cost-effective* solutions that improve *mission readiness*
- Developing business case analyses (BCA) approaches to support budgetary resources or alternative financing opportunities
 - Study to review BCA approaches (MIT-LL Study)

²Further details of utility outages are found in DoD’s Annual Energy Management Report, located at the following: http://www.acq.osd.mil/ie/energy/energymgmt_report/main.shtml.

FY 2014 Utility Outages²

Utility Outages by Cause



Results – Dec 2013 thru June 2014

Existing Requirements Reviewed	DoD % Compliant
Trained Operator	90%
Received Preventive Maintenance	94%
Fueling Contracts in Place w/ DLA*	74%
Fueling Plans in Place	84%
Testing/Exercising	60%

*Installations also have contracts in place with other providers.

Power Resilience Review

Overview

- ❑ OASD(EI&E) conducted a DoD Power Resilience Review from Dec 2013 – Jun 2014¹
- ❑ DoD-wide power resilience review helped understand vulnerabilities and risks that impact mission assurance
 - Results included 500+ CONUS/Hawaii/Alaska installations, sites and facilities
 - Examined adherence to key resilience policies and policy gaps
 - Identified more integrated/holistic critical energy requirements
- ❑ Focus was on remediating issues associated with existing critical energy requirements and policies

¹Further details on the power resilience review, along with resilience guidance are located at: <http://www.acq.osd.mil/ie/energy/power.shtml>.

Results

Establishing Critical Energy Requirements

Organization	Total Energy (MW)	Critical Energy (MW)	% Critical by Org
Total	10,000	2,500	-
Org 1	3,000	750	30%
Org 2	2,000	500	20%
Org 3	3,000	600	24%
Org 4	1,000	350	14%
Other	1,000	300	12%

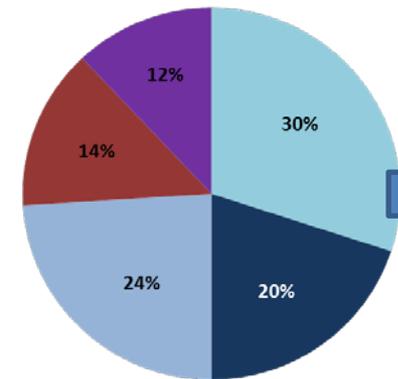
*Conceptual data for training purposes only.

- First time we had identified and specifically quantified critical energy requirements
 - Alignment to critical mission operations by-installation
 - Established prioritization for energy resilience requirements and policy/compliance
- Good first attempt to quantify critical energy requirements to support mission assurance
 - However, gap was identified for initial sizing and specifically continuous sizing as mission adapts

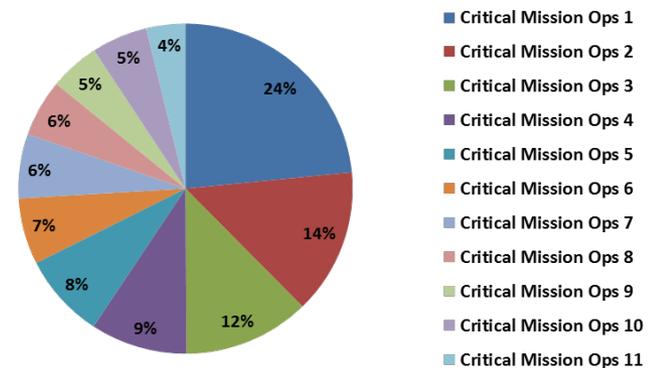
Improving guidance to quantify energy loads that align to critical mission operations – encouraging continuous process to ensure appropriate sizing of energy generation with evolving missions.

Critical Energy Requirements by Organization

Org 1 Org 2 Org 3 Org 4 Other



Org 1
Critical Energy Requirements by Mission



Results

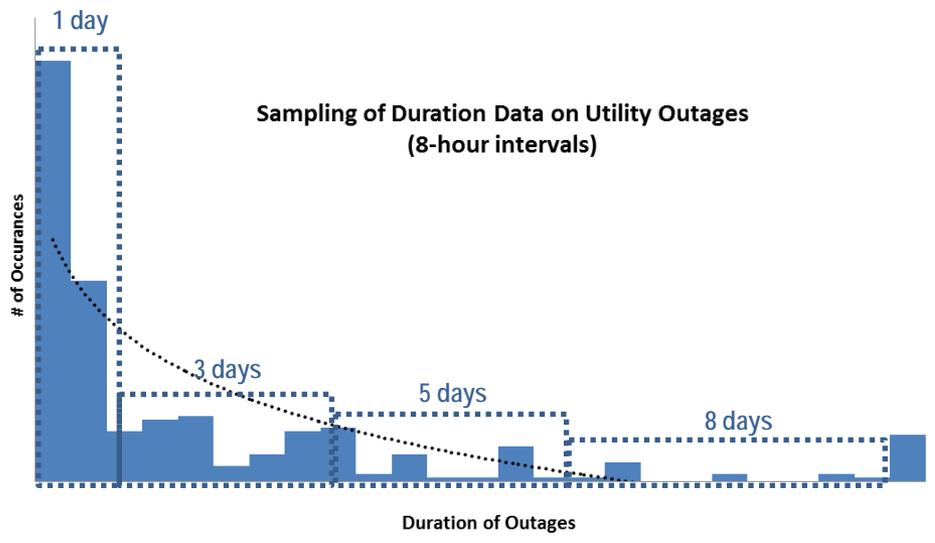
DoD Emergency Power, Fuel, and Testing

	Trained Operator	Preventive Maintenance	Fueling plans in place	Testing/Exercising	Fueling Contracts with DLA
Total DoD	90%	94%	84%	60%	74%

% of respondents in compliance with policy.

- Most solutions for critical energy requirements are backup generators tied to an individual 'critical' facility – there is a gap in policy for other solutions that could be more cost-effective and reliable
 - Initial and continuous sizing of energy generation was identified as an area for improvement in policy compliance
 - O&M in terms of trained operators, preventive maintenance, and fueling plans generally in good shape across installations, some issues identified by-installation
 - Most apparent opportunity was in testing/exercising backup and fueling plans

Establishing a Baseline and Thinking about Risk Trade-Offs



* For training purposes, analysis performed on sampling of outage, generator, and fuel data.

Analysis of Current State of Generators and On-site Fuel Supplies:

- On-site fuel supply fell between 1-2 day range at 100% load requirements
 - Current on-site fuel supply has potential to meet ~70% of historical outages
 - On-site fuel supply does not include additional fuel deliveries
 - If fuel deliveries extend to 1 week or greater, could potentially meet ~95% of historical outages
- However, we should still ask: Are generators the most resilient and cost-effective way to support mission assurance on military installations?

Ensure compliance with existing policies to remediate risks today, and think about more cost-effective and reliable solutions to improve our energy resilience.

- Outage Duration Data Results
 - > 50% only lasted 1 day
 - ~ 25% lasted 1 to 3 days
 - < 10% lasted beyond 5 days
 - ~5% lasted beyond 8 days

Most outages are of shorter duration and very few typically extend beyond 1 week.

Energy Resilience

Policy Conclusions & Recommendations

- Develop universal power resilience guidance, prioritizing important energy resilience requirements
 - Encourage the most cost-effective solutions that improve mission readiness (allow for solutions beyond generators)
 - 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

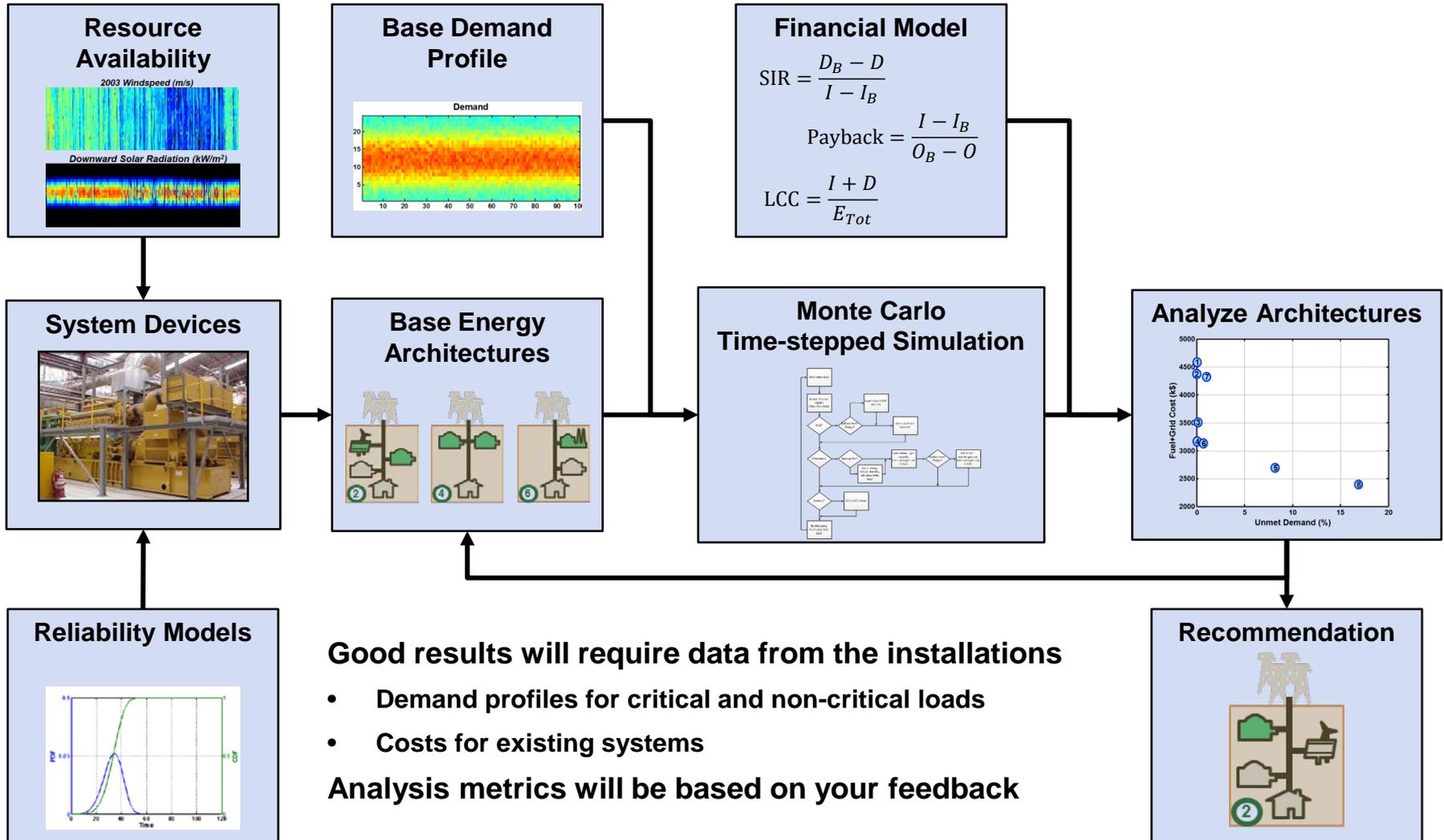
Our Priorities: (1) Make sure the stuff you got will work (generators); and (2) think about smarter ways to support the mission (more resilient and will save money).

Energy Resilience

BCA Study Overview

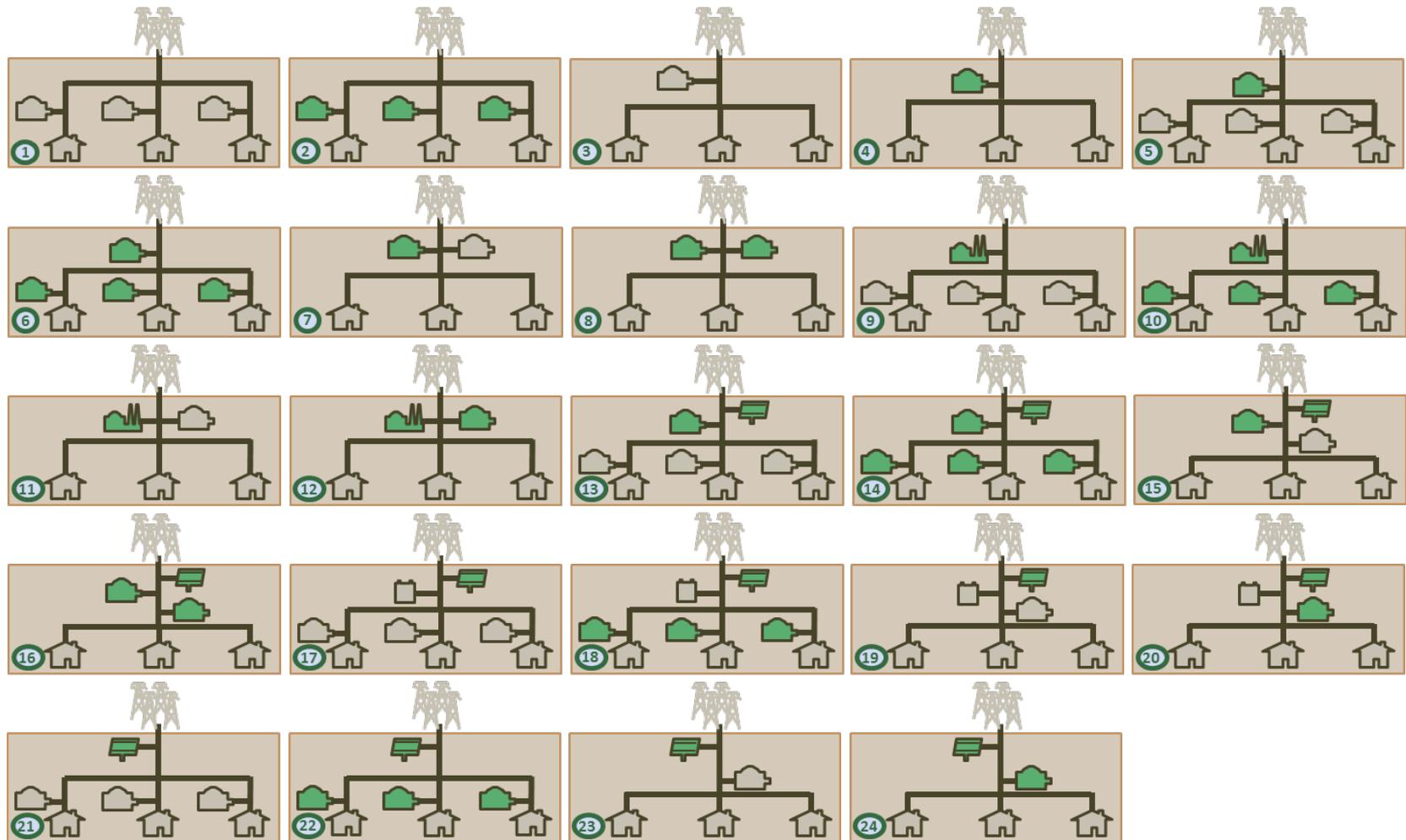
- ❑ **Developing business case analyses (BCA) approaches to support budgetary resources or alternative financing opportunities**
 - Evaluate current DoD life cycle cost analysis approaches and levelized cost of electricity practices and methodologies
 - Items of interest include:
 - ✓ *Operations, maintenance, and repair related costs*
 - ✓ *Disruption/outage costs*
 - ✓ *Financial incentives*
 - ✓ *Availability, reliability, and quality metrics*

Energy Resilience BCA Study Analysis Approach



Energy Resilience BCA Study

Energy Architecture Review Concept



Energy Resilience BCA Study

Energy Architecture Comparison Concept

Energy Architecture Comparison Concept – Solar PPA and Generator Battery and Building Backup Generators

