

Achieving Energy Security in Federal Facilities

FEMP FIRST THURSDAY
SEMIN@RS 

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Federal Energy Management Program



Agenda for Today

- Setting the Stage
- Introduction to Energy Security
- Developing a Site-Specific Energy Security Plan
- Conclusions



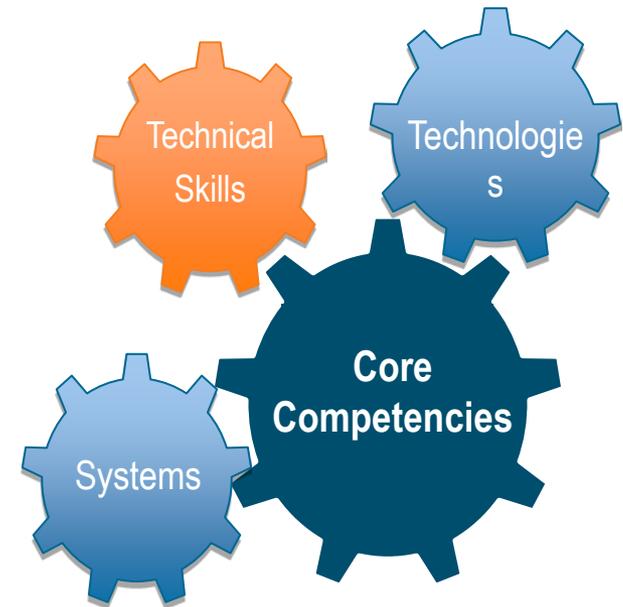
Core Competencies Addressed in this Seminar

Energy/Sustainability Managers, Facility Managers

- Building Systems
- Building Technologies
- Energy Analysis
- Industry Trends
- Energy Systems (DER, microgrid)

Operating Engineers/Building Technicians

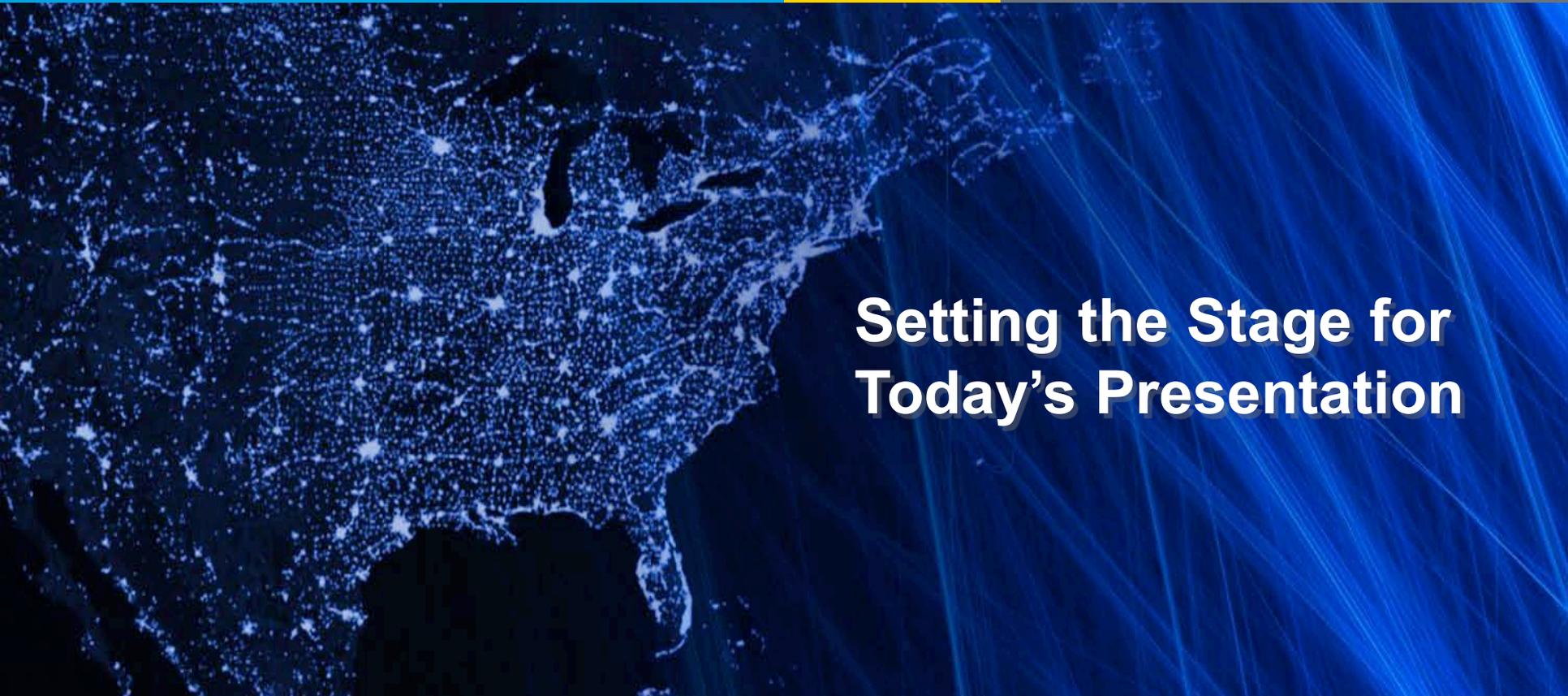
- Building Systems



Results Expectations

Develop plans to maintain mission-critical activities in the event of disruption in energy systems and/or infrastructure





Setting the Stage for Today's Presentation

Key Points

Purpose

- Educate federal employees about the basics and importance of energy security

What is the main issue to solve?

- Energy Security
- What is it?
- Why is it important?

- *Reducing demand*
- *Challenges in Energy Security*
- *Technologies for Energy Security*
- *Assessing and reducing risk*
- *Developing a site-specific energy security plan*
- *Next steps...*

Let's start with a little Quiz...

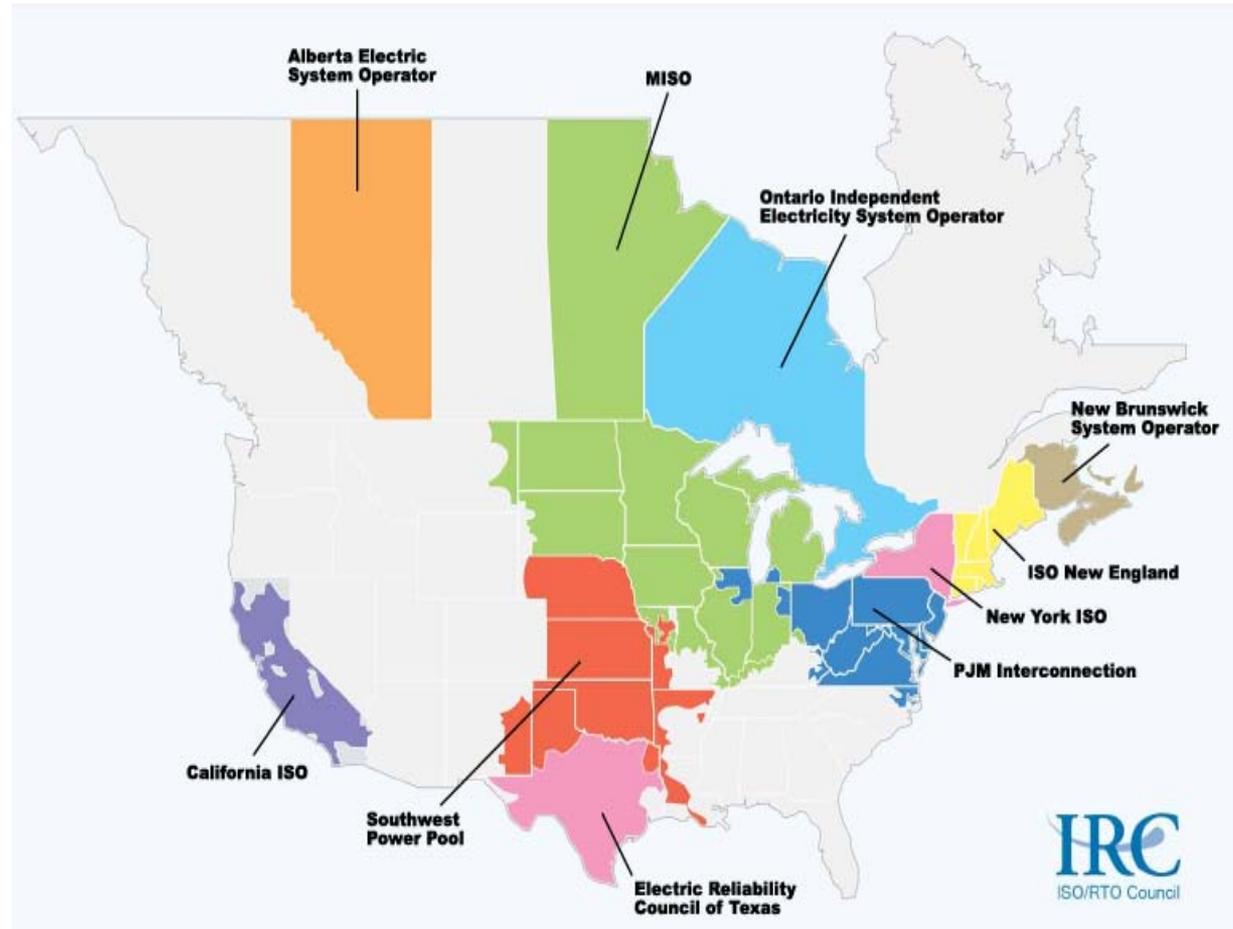
Ask yourself –

- If you lose power at your facility, how long can you run the operation?
- How many hours/days of backup operation can you handle?



North American Independent System Operators (ISOs)

There are
10
ISO/RTO's
operating in
North America

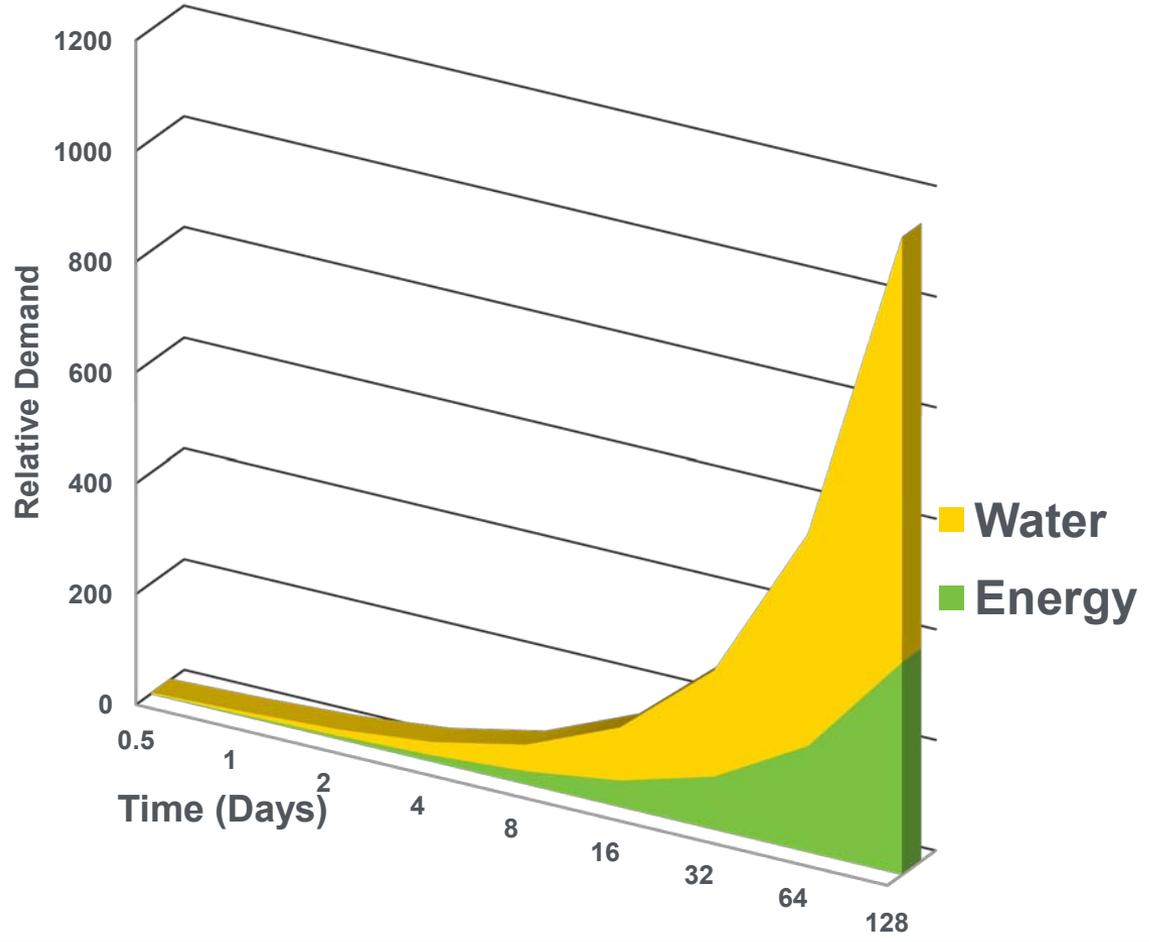


2 – 2 – 2 – 2 – 6

- 2 hours
- 2 days
- 2 weeks
- 2 months
- 6 months

Developed by Brian Lally

Relative Demand for Energy and Water Over Time

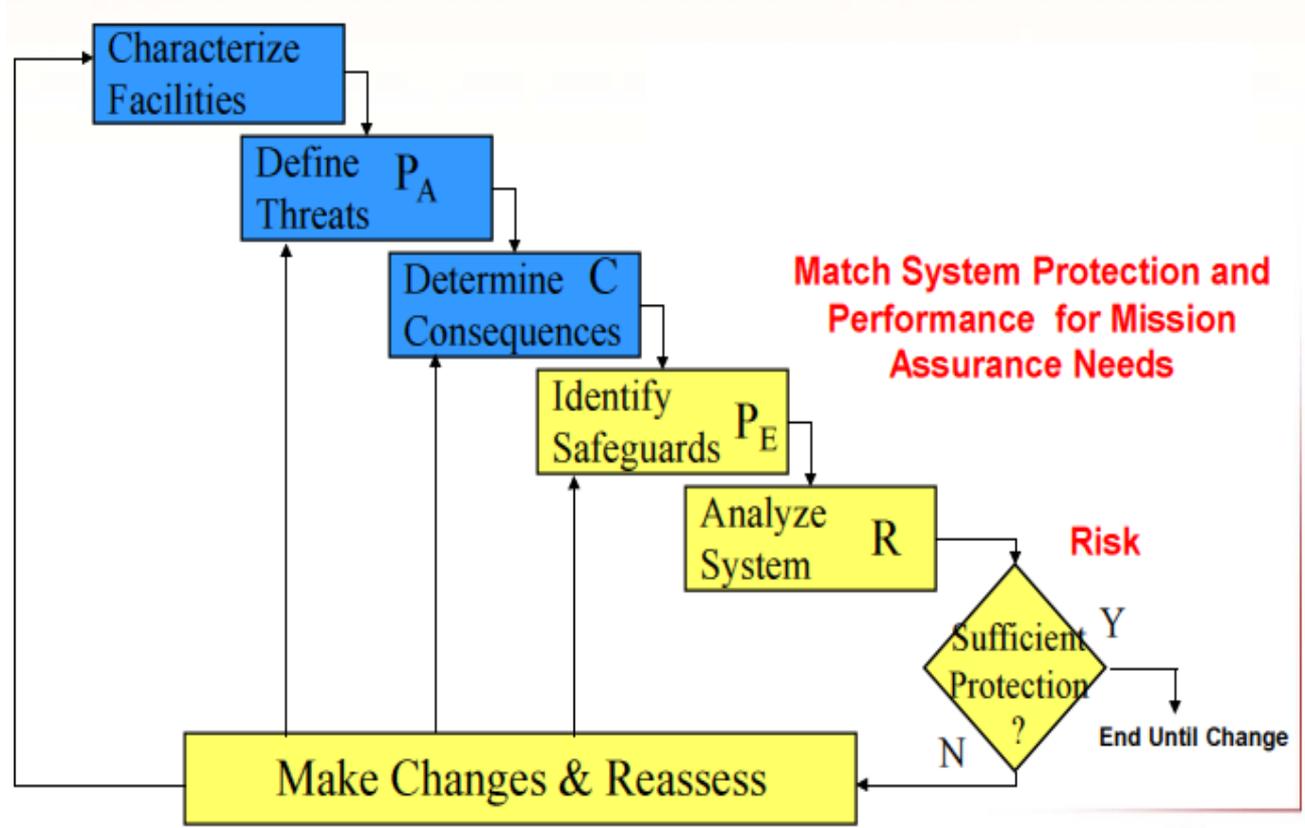






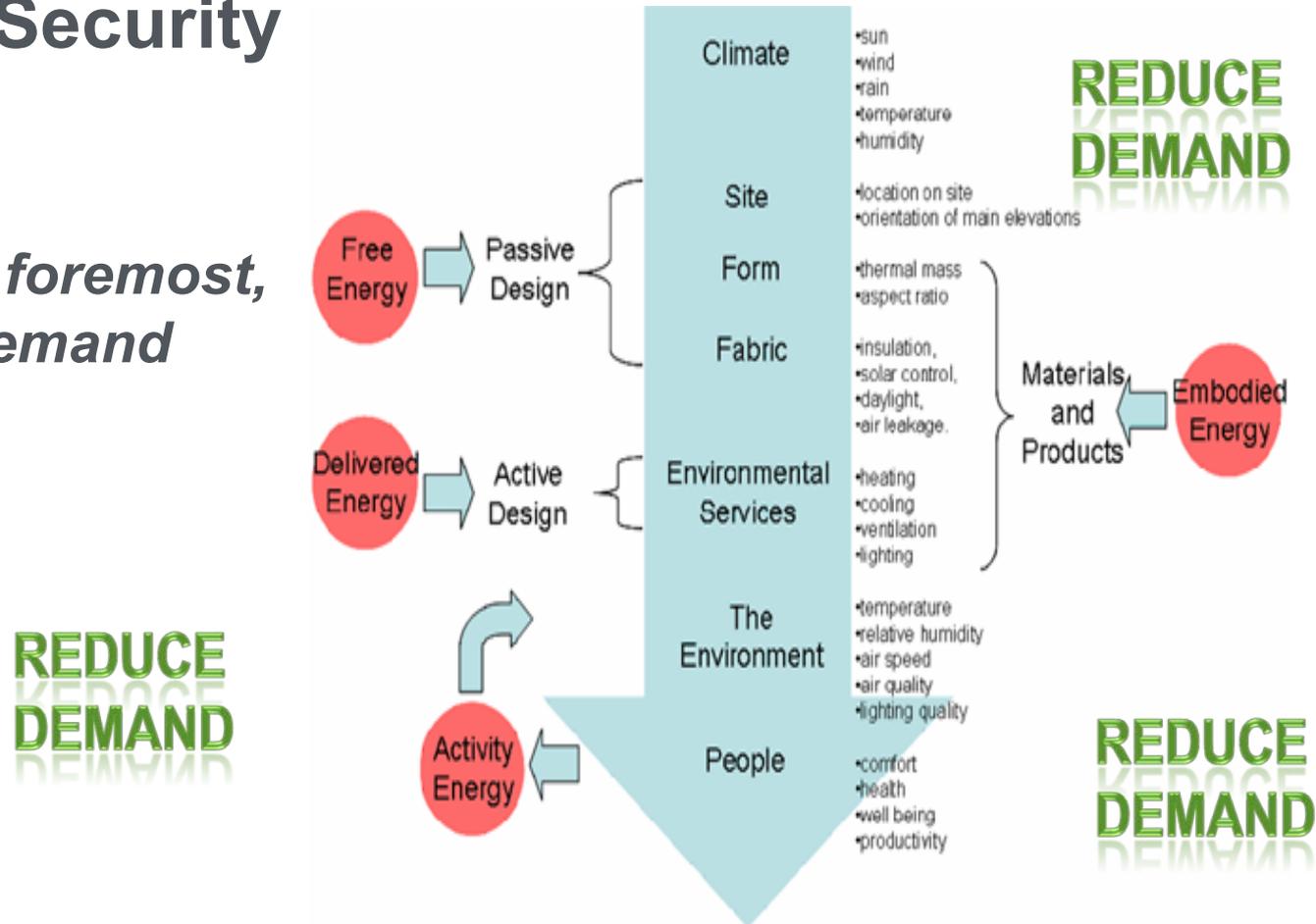
**After multiple
events:
2 hours
2 days
2 weeks
2 months
6 months**

Sandia National Lab Energy Surety Micro-grid uses risk-based assessment for Energy System Assurance



Energy Security

First and foremost, reduce demand



Energy Assurance Equals

- Energy Efficiency
(reducing energy consumption) +
- Load shedding of non-critical loads +
- Energy Reliability +
- Security +
- Sufficiency

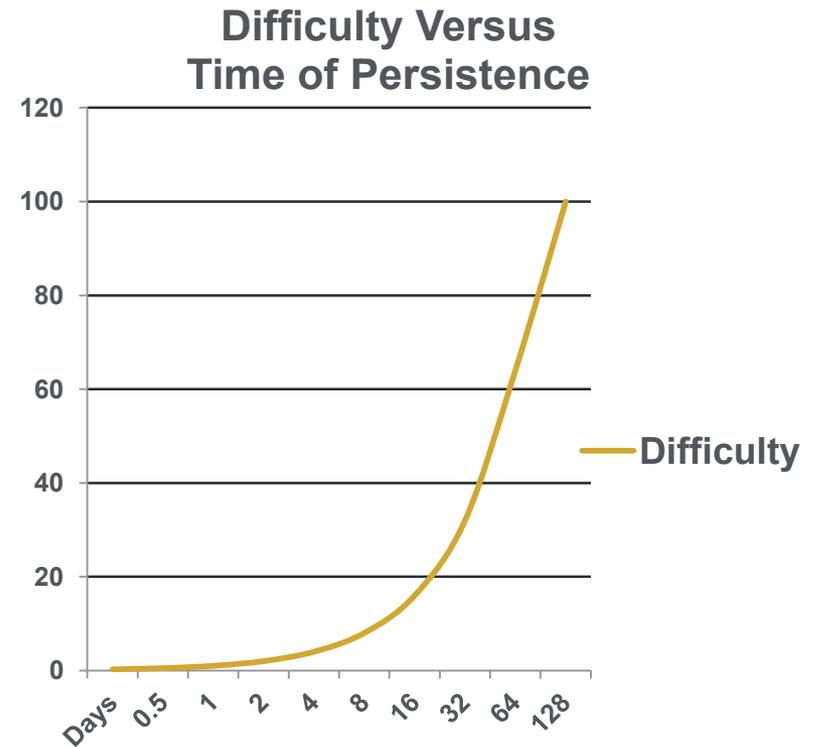


Energy Security and Persistence

Continuing critical operations and how long they need/plan to persist

The longer the persistence the more water becomes a serious issue

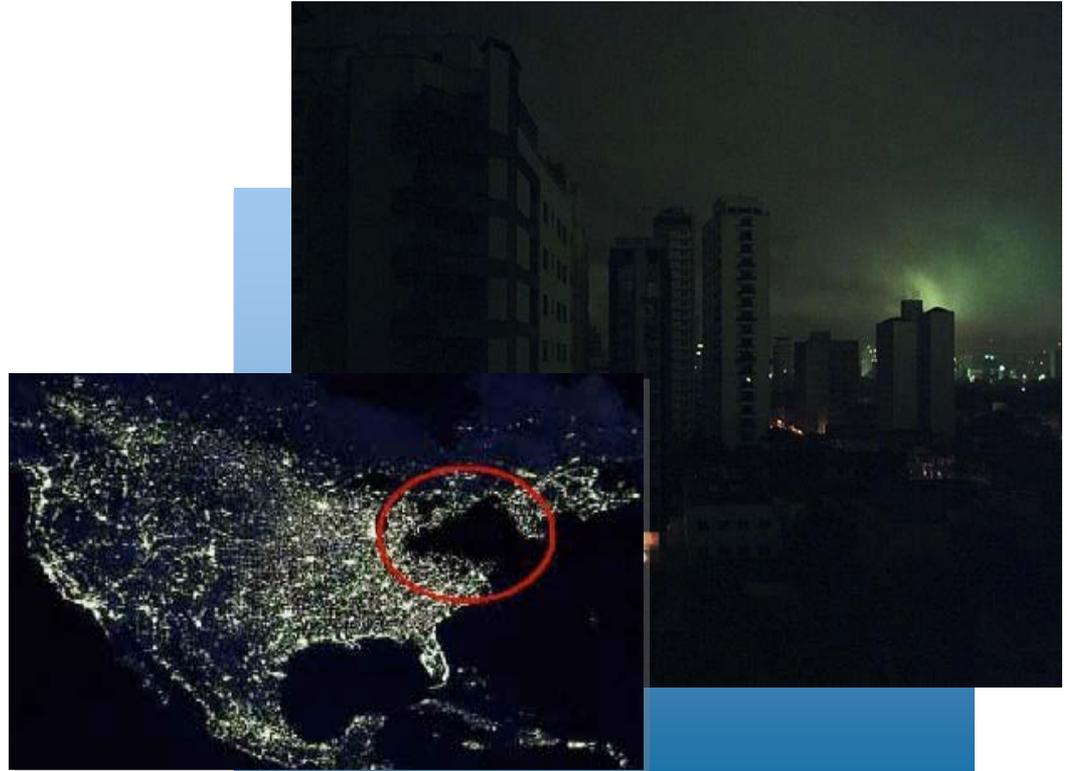
It takes power to move water!



Continuing with our Quiz...

Ask yourself –

If you lose power at your facility, how long is the *“blink”* before backup power begins?



Thinking Site-Specific

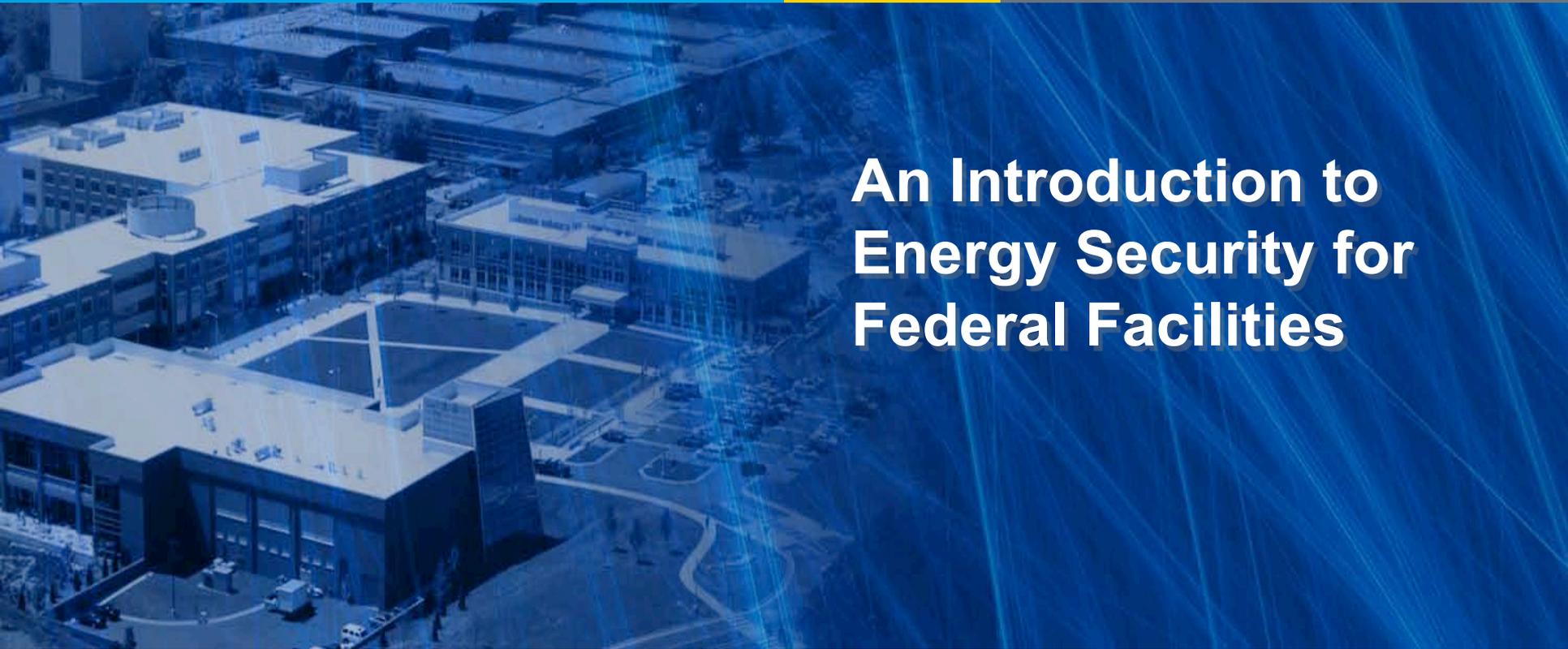
- Each location, facility, campus, installation has different inputs to key variables
- Rubrics
- Energy Surety = Critical Loads (Local source of generation) and the time variable



Issues with Many Federal Facilities

- Major energy assets outside agency control
- Significant energy feeds from municipalities
- Water and sewer services outside the installation/base
- Fire and police protection are shared with local municipality
- Proximity to general population

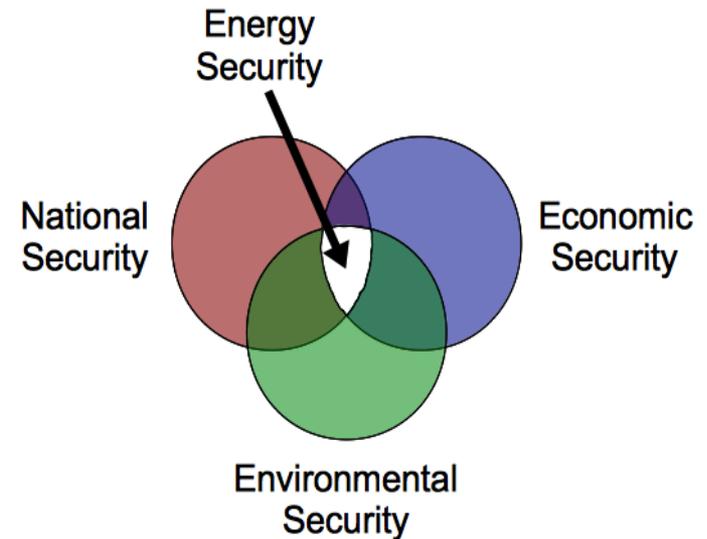




An Introduction to Energy Security for Federal Facilities

Definitions of Energy Security

- Standby measures that can be implemented in the event of a supply disruption
- The intersection between national security, economic security and environmental security along with the availability of energy resources and infrastructure to meet mission
- Resilient and redundant energy supplies that are accessible when needed

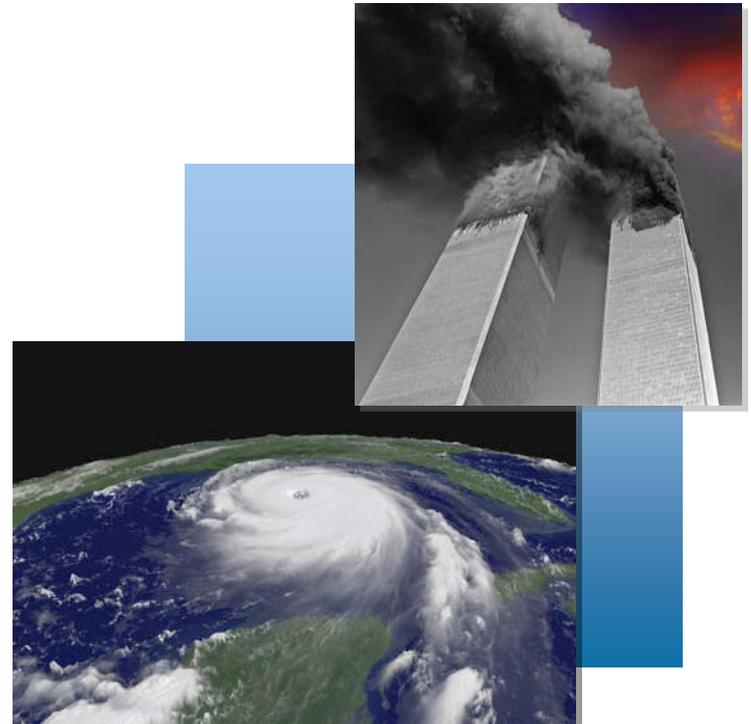


What Constitutes an Energy Security Related Event?



Potential Threats to Energy Infrastructure

- **Reliance on non-U.S. sources of oil**
 - Related political instability of several energy producing countries
- **Accidents and natural disasters**
- **Intentional Acts (cyber or physical)**
 - Attacks on supply infrastructure
 - Attacks on supply water supply
 - Internal attack by disgruntled employee



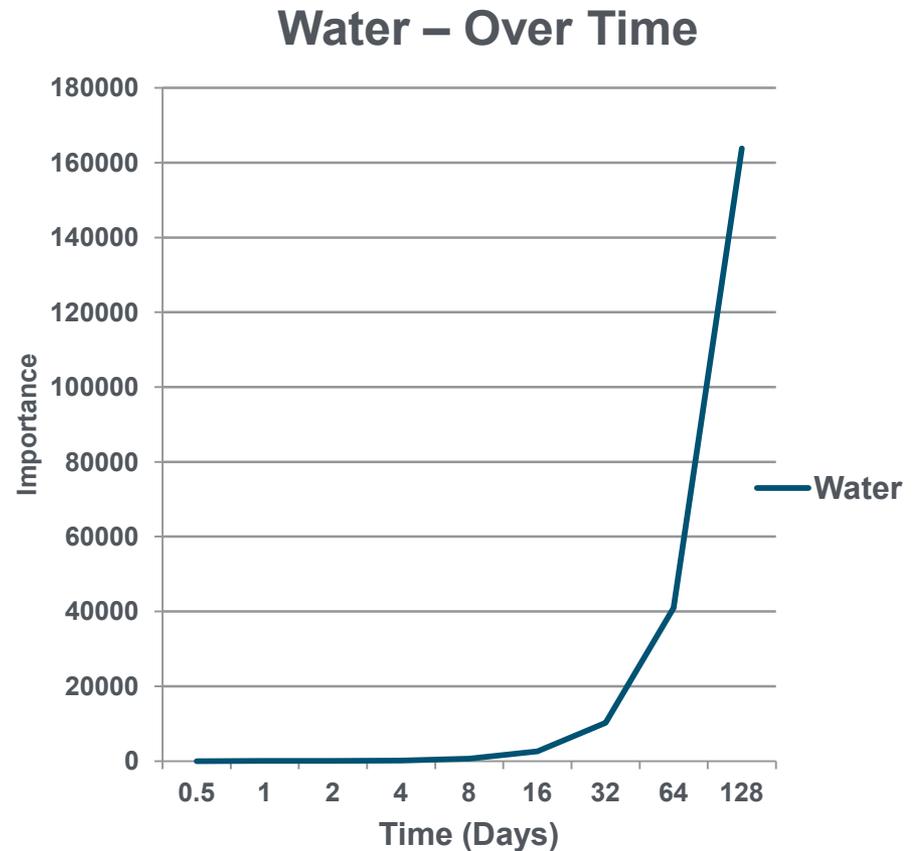
Critical Sources of Energy for Site

- Electricity
- Natural Gas
- Petroleum
- Renewables
- Nuclear
- Storage



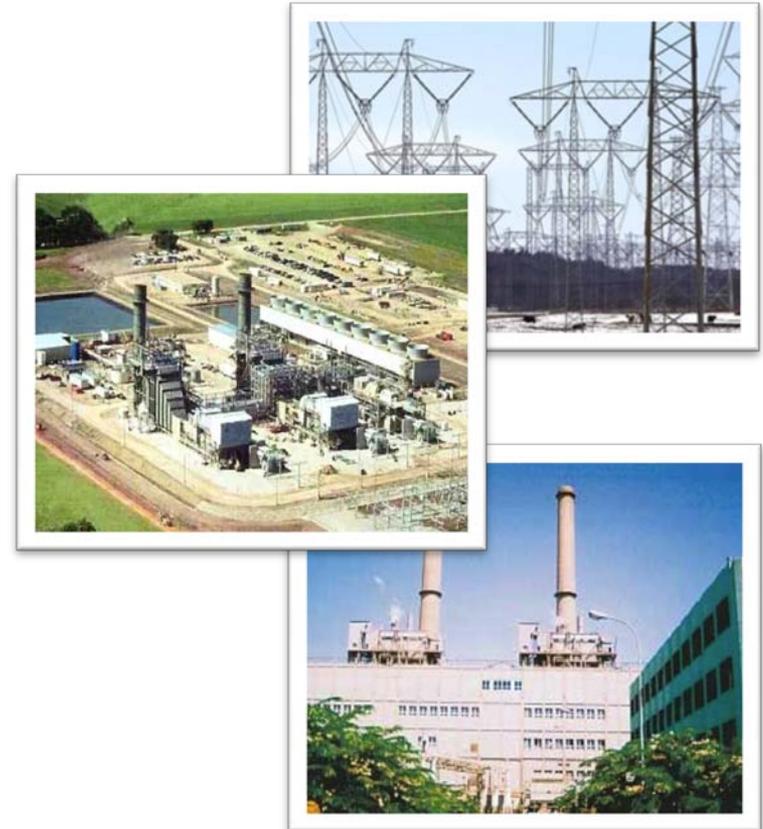
Importance of Water in Energy Security

- Critical – Energy supply to the water pumps
- The longer the power outage, the more water becomes the issue
 - Potable water
 - Waste and waste water
 - Local supplies



Electrical

- Most important energy system
- On-site and grid vulnerabilities
- Grids
- Power lines
- Power plants
- Substations
- Local distribution



Microgrids Can Integrate Grid Technologies

Microgrid - Interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity

A microgrid can connect and disconnect from the grid to operate in both grid-connected or island-mode

Microgrid Exchange Group, October 2010



Sandia National Lab

Petroleum for Energy Production

- Refineries, pipelines, tank farms, transport
- Aviation fuel
- Fleet fuel
- Fuel oil (generators, etc.)



Natural Gas for Energy Production

- Vulnerabilities from production to distribution
- Transportation



Renewables

- Solar (PV)
- Solar Assist
(solar-assisted
water heating, etc.)
- Wind
- Geothermal



Continuing with our Quiz...

Ask yourself –

When was the last time
you tested your
back-up power system?

- Write down the date



Security

- Physical
- Cyber
 - Computer systems operate the infrastructure – energy, telecommunications, etc.
- People and Personnel
- Equipment



Key Issues for Any Strategy

Don't discount the simple stuff

- Storage
- Maintenance
- Parts
- Quality of equipment
(especially the backup devices)





Developing a Site Energy Security Plan

Operational Energy

- Operational energy – key phrase defining DoD’s concept and doctrine towards how the military uses energy
- Making **planning** and **force development** an important operational energy focus



Approaching an Energy Security Strategy

- Identify threats to your energy supply
- Ensure that energy supply is always available for critical functions
- Determine mission critical



Energy Security Strategy - Vulnerability

Geographically specific

- Electricity
- Natural gas
- Fuel oil
- Renewables
- Storage



Approaching an Energy Security Strategy Risk

- Risk assessment-how to use it effectively
- Risk registers and mitigating risk
 - List all the risks
 - Response to each risk varies by the types of energy sources



Risk / Vulnerability

An energy system that relies on a single fuel, transmission line, computer, or telecommunication system is inherently more vulnerable



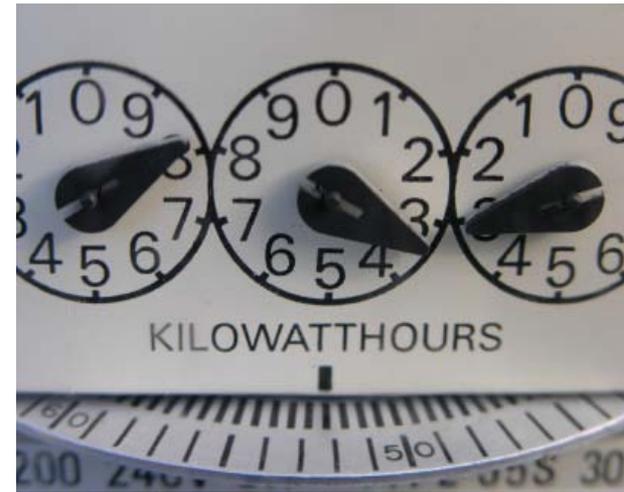
Principles for Mitigating Risk

- **Reduce demand**
- this needs to be foremost in our thinking
- Redundancy
- Diversity
- Proper planning (and emergency management)
- Transfer
- relying on local municipality for services and b/u, etc.



Demand Reduction

- The balance of supply and demand
- Energy demand by facility
- Capacity for demand side response
- Peak loads



Diversity

- Small-scale energy systems
- Multiple sources of energy



Continuing with our Quiz...

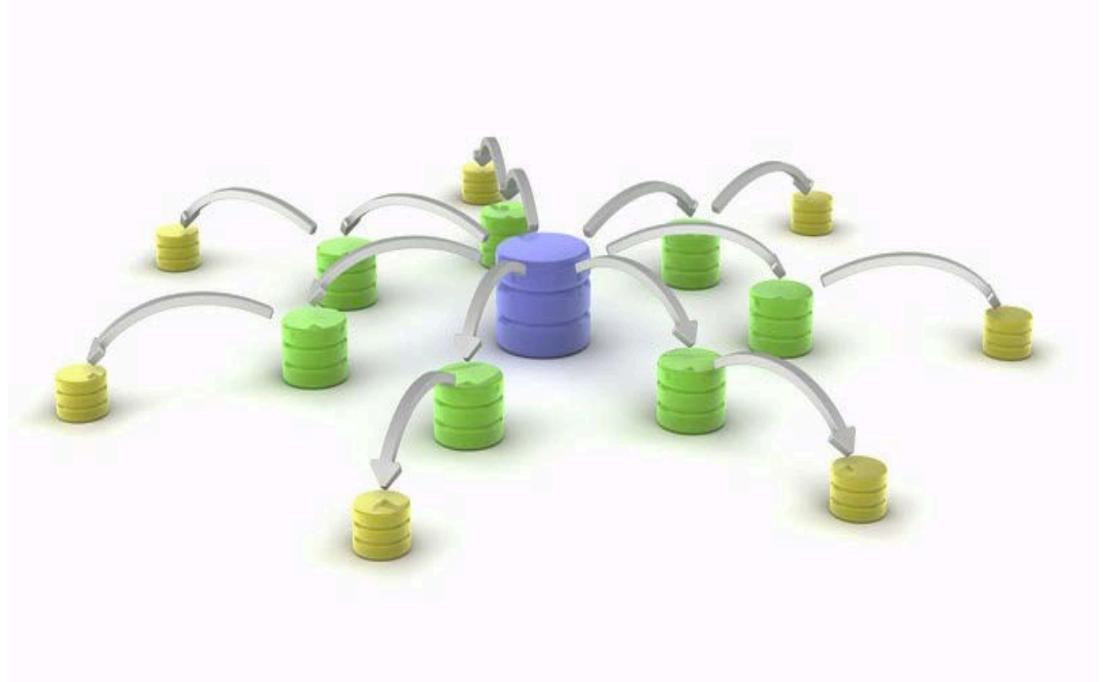
Ask yourself –

If you have renewables on-site, do you know if they will work without the grid?



Redundancy

- Grid-tied
- Fuel sources
- Fuel storage
- Transmission



Planning and Emergency Management

- Energy Security as part of overall emergency management plan
- Coordination within site and with federal, state, and local departments



Storage Issues

- Make the most of what you have
- What to store; how long, how much?
- Can the fuel be moved?
- Use fuel to get fuel
- Moving fuel can add risk to personnel
- Tanks with tanks to move fuel for tanks
- Cost of inventory
- Shelf life



Maintenance Issues

- Won't function when you need it
- Change from simple occasional use to constant/full use
 - Need more robust equipment



Parts

Parts inventory

- Enough
- Proper training of maintenance team
- Prepare for heavier use of equipment
- Getting parts to the need

Costs

- Storage
- More robust B/U equipment
- Logistics
- Getting parts to the need



Facility Energy Plan Requires Partnership

Work securely with your partners

- Utilities
(electricity, gas, water, sewage, etc.)
- State and Local government
- FEMA
- Other emergency response

**It is vital to include these partners
in the discussion**

Ask these questions

- How early?
- How much?
- How often?
- Can add variability
and other issues/risks

Partnerships

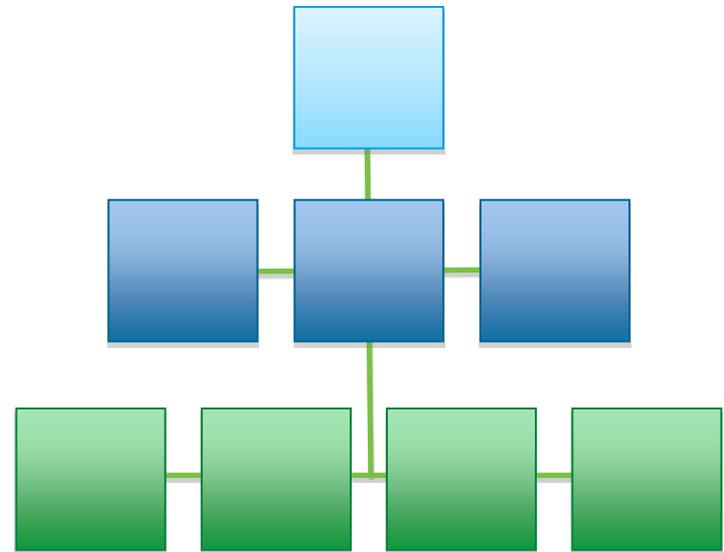
- Using local agencies for fire, police, medical
- How much joint training with agencies?
- Who foots the bill?
- Changing our thinking
 - Bringing the local team into your trusted space/area
 - Making decisions in a critical situation – who?



How to Make Decisions

What level of support is needed to make a solid decision?

- Use existing metering and data
- Assessments and audits
- ***Tribal*** knowledge
 - Before they retire
- Upgrade the quality of B/U equipment (possibly longer run times)



Protecting Critical Processes

- Protecting critical processes
 - energy sources, water, computing, national security
- Processes over people sometimes
- What degree of protection?
- Force, separation, redundancy, etc.
- MORE open or MORE closed?
- What is the mission?



Consider Energy Security

- New construction
- Deep retrofits
- ESPCs and UESCs
- Enhanced Use Leases
- Equipment upgrades



Wrapping it up

- **EACH SOLUTION IS LOCAL!!!**
 - i.e., **your solution is unique!**
- Your site **needs** an assessment
 - Get outside perspectives
- Backup equipment...test, test, and retest
- Most important and immediate goal: ***REDUCE DEMAND!***



Resources

Resources

FEMP Website

*Performing Energy Security Assessments –
A How-To Guide for Federal Facility Managers*

http://www1.eere.energy.gov/femp/program/energy_security.html

Contacts and Questions

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