

MAY
17-20
2021



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U.S. DEPARTMENT OF
ENERGY



Innovative Strategies for Resilience at Critical Facilities

Tuesday, May 18th, 2021

2:00 – 3:15 pm

Housekeeping Items

- Please note, today's session will be recorded and archived on the Better Buildings Solution Center. We will follow up when today's recording and slides are made available.
- Attendees are in listen only mode, meaning your microphones are muted. If you experience any audio or visual issues anytime throughout today's session, please send a message in your "chat" window located on the bottom of your zoom panel.



Shannon Zaret

U.S. Department of Energy

Weatherization & Intergovernmental Programs Office

Agenda

- 1 Welcome and Introduction
- 2 Expert Insights: ***Data Centers*** – Jim Henry, Iron Mountain
- 3 Expert Insights: ***Wastewater Treatment Facilities***– Jason Grant, Miami-Dade County
- 4 Expert Insights: ***High Security Facilities/ Other***– Chris Halpin, NV5 Energy Efficiency Services
- 5 Q&A Session

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using your mobile device, or by opening a new window

Enter Event Code

#DOE

What sector are you from?

Where are you joining us from today?

Poll #3

What critical facilities do you work with the most?

Today's Presenters



Jim Henry
Iron Mountain Data Centers



Jason Grant
Miami-Dade County Water &
Sewer Department



Chris Halpin
NV5 Energy Efficiency Services



Jim Henry

Iron Mountain Data Centers

Submit Questions

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Iron Mountain Data Centers

- 14 Facilities across 4 countries
- **Global ISO 50001** Certification
- **Global ISO 14001** Certification
- **Global ISO 27001** Certification
- ISO 45001 implemented at (3) sites
- Also compliant with NIST 800-53/FISMA HIGH, PCI-DSS, HITRUST, SOC 2, HIPAA



Iron Mountain Data Centers, Manassas Campus, Prince William County, VA



Jim Henry, CISA, CISM
Manager, Global Compliance



What is a data center?

- Provide power and internet connectivity to customers for their IT gear (servers, storage arrays, compute)
- Secure highly confidential information, and ensure that availability and uptime is 100%, without fail
- A large majority of customers utilize data centers for Business Continuity and Disaster recovery purposes, which depend largely on well thought out plans and processes for availability
- Data centers support: Tech & Entertainment Platforms, Hospitals, Banks/Finance, Telecommunications, Government & Other Regulated Sectors



Energy Use, Efficiency, and Improvements



Geothermal cooling underground lake at WPA-1



Cold aisle containment at WPA-1



Beta testing containment at AZP-2



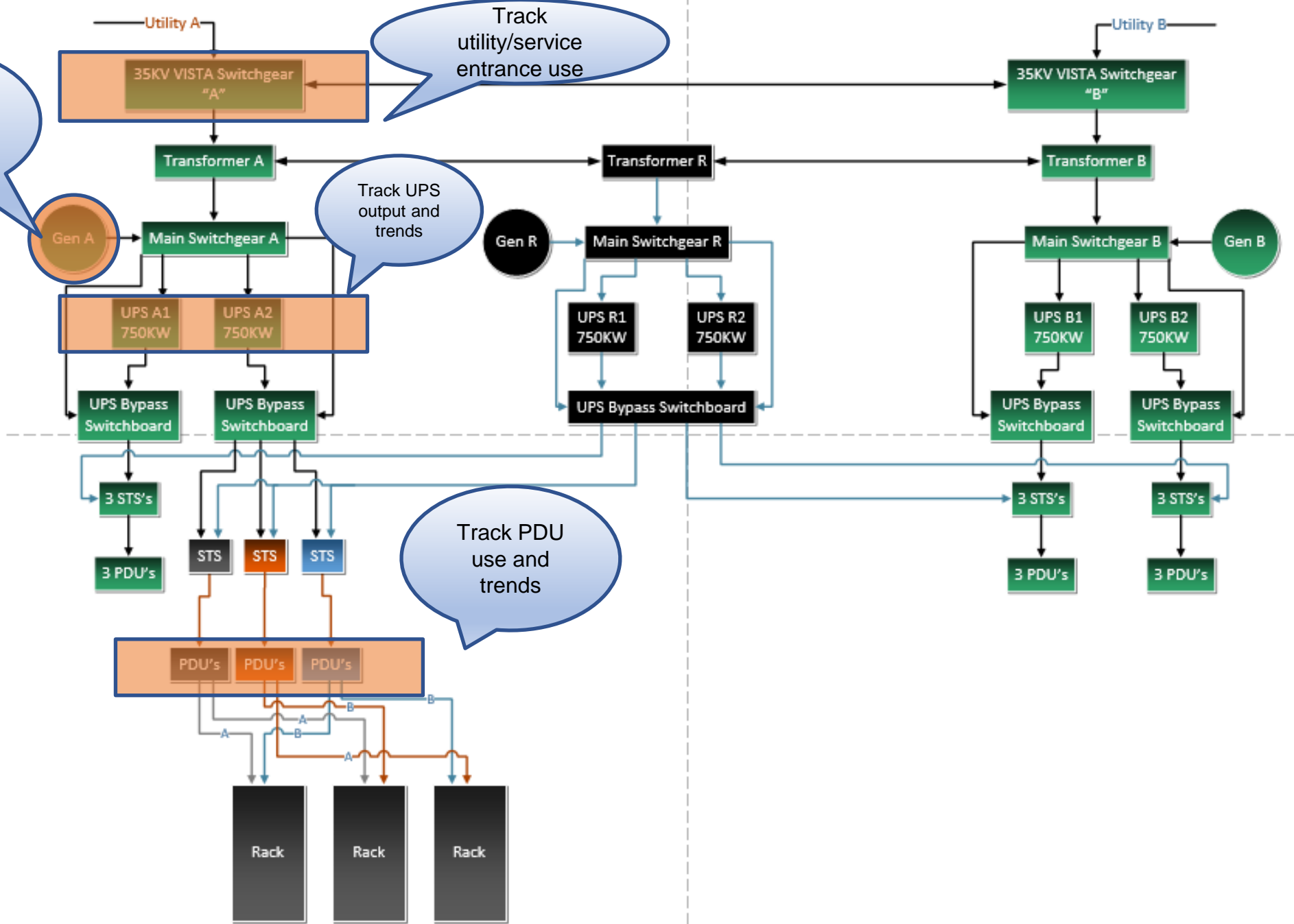
Energy Use, Efficiency, and Improvements



ISO 50001 and Resiliency

- Knowing and reviewing relevant variables affecting SEU
- In depth knowledge of energy sources and dependency per source
- Increased emphasis on significant energy users (SEUs) and associated upkeep/maintenance
- Monitoring equipment for energy performance and forecasting energy performance for the EnMS
- Top Management involvement, and requirement to continually improve

Track diesel use and emissions



Track utility/service entrance use

Track UPS output and trends

Track PDU use and trends

Benefits of Resiliency/Business Continuity Planning

while being more energy efficient

/18

- Operationalize incident/issue/corrective action reporting for SEUs that can trend over time
- Track components of SEUs for adequate maintenance activities and replacement plans in order to reduce break/fix risk and capital-intensive projects that “appear”
- EnPI’s can be valuable for both efficiency reporting, and risk management
- Predicting energy use can quantify uncertainty and risk
- ISO 50001 can serve as an excellent gap analysis tool for M&A
- Adopting the ISO 50001 standard can act as a “gateway” to other valuable standards like ISO 14001, ISO 22301, and ISO 45001
- Discover opportunities for improvement and raise concerns to leadership
- Reassurance for containing operations during periods of stress



Jason Grant

Miami-Dade County Water & Sewer Department

Submit Questions

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OPERATIONALIZING UTILITY RESILIENCE

*-a roadmap to a
resilient utility of
the future*

MD-WASD Energy Efficiency and Energy Management Initiatives

- Ad-hoc energy efficiency projects
 - Efficient motors, pumps, LED lighting, process improvements
- Cogeneration
 - 12.8 MW of cogeneration capacity using biogas
 - Waste heat for anaerobic sludge digestion
- EnergyCAP - utility billing management system
- Wastewater Energy Master Plan
 - Created as part of USDOE SWIFt Accelerator
 - Energy Management System (EnMS) development
 - ISO 50001 development
 - initiating with USDOE ISO 50001 Ready Program at one plant

Energy Policy Commitment Statement

Miami-Dade Water & Sewer Department is committed to achieving continual improvement of its energy systems, including energy efficiency, energy security, energy use and consumption by maintaining and improving an energy management system that reduces energy use, cost of energy and greenhouse gas emissions via:

- Establishing, adhering to, and reviewing performance targets and programs for energy conservation and efficiency.
- Integrating energy conservation into planning and operating decisions by informing, training and making all employees accountable for energy conservation.
- Supporting the purchase of energy efficient products and services wherever possible including the design for energy performance improvement throughout operations.
- Increasing the percentage of renewable energy in the long term.
- Energy performance indicators (EnPIs) to evaluate progress and results on a regular, periodic basis and strive for continuous improvement by implementing objectives and targets with well-developed action plans.
- Use ISO 50001 Energy Management System (EnMS) as a guide.
- Utilize a Plan-Do-Check -Act framework (Six Sigma Approach).



MD-WASD Resilience Program Mission

Operationalize the efficient use of resources and build capacity to anticipate, adapt and improve the delivery of capital projects and services in the face of natural and manmade shocks and stresses.



Why Resilience? Water Utility Challenges

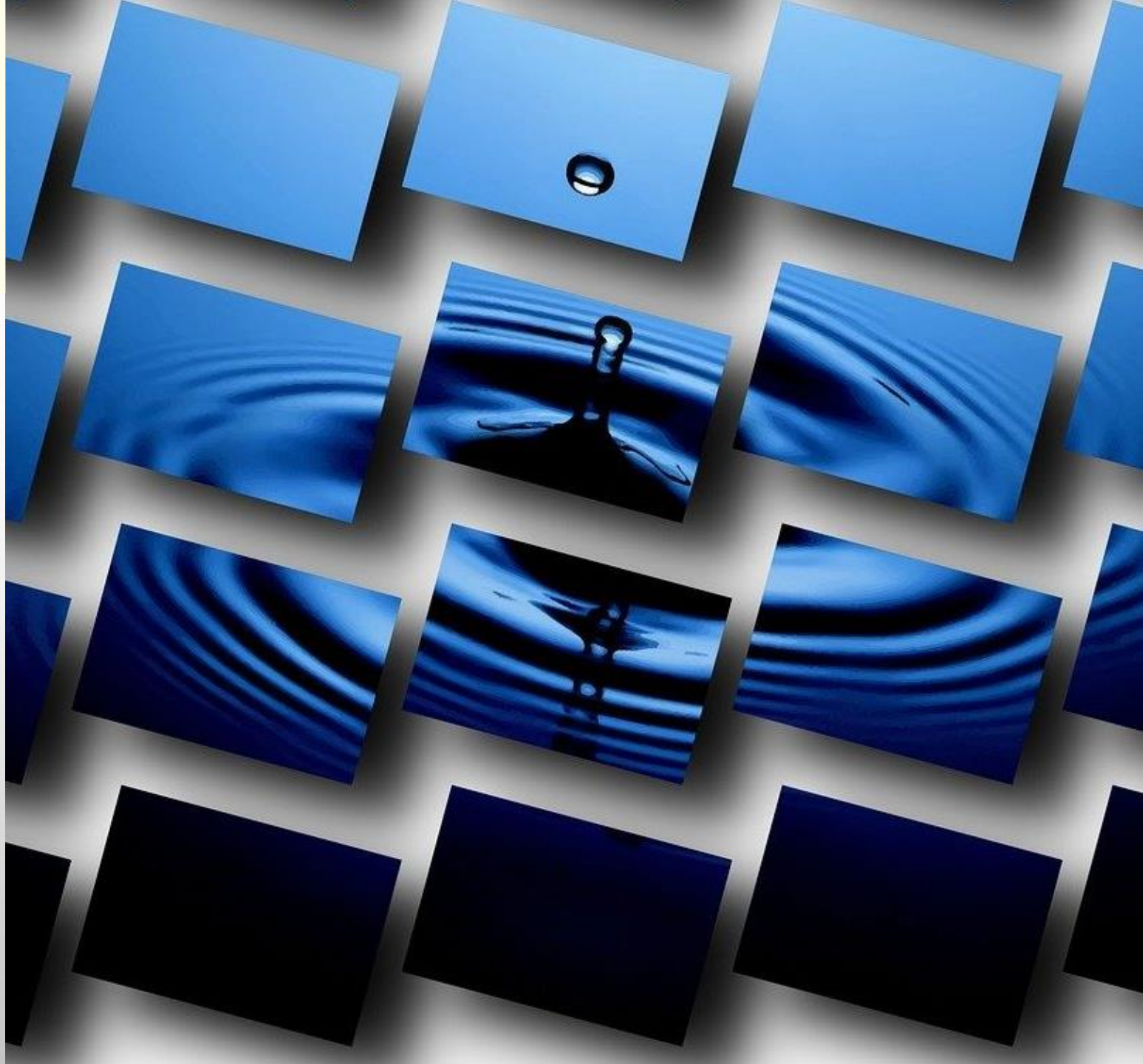
- Aging infrastructure
- Regulatory requirements
- Sea level rise (SLR)
- Limited resources
- Saltwater intrusion
- Precipitation frequency and intensity
- Natural disasters
 - Storm surge, etc.
- Cyberterrorism
- Data reliability
- Reliable electrical power
- Workforce attrition
- Population and development pressures & patterns
 - Including de-population



Mainstreaming resiliency into planning, design, construction, operations, and policy

Qualities of a Resilient Utility

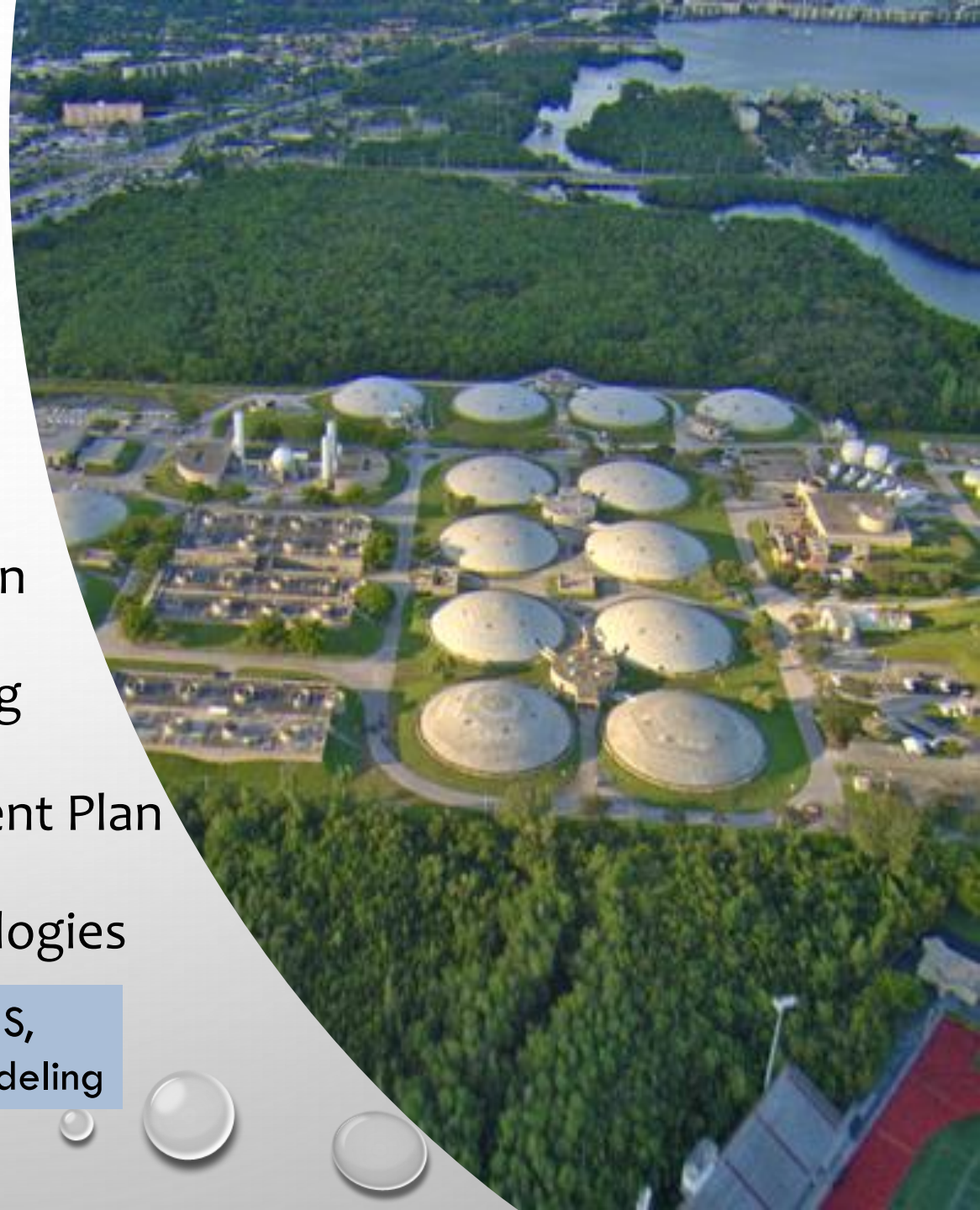
- Reliable & robust infrastructure
- Redundant energy sources
- Reduced energy costs
- Reduced carbon footprint
- Regulatory compliance
- Data-driven decision-making
- Path to continuous improvement



Increasing Infrastructure Resilience

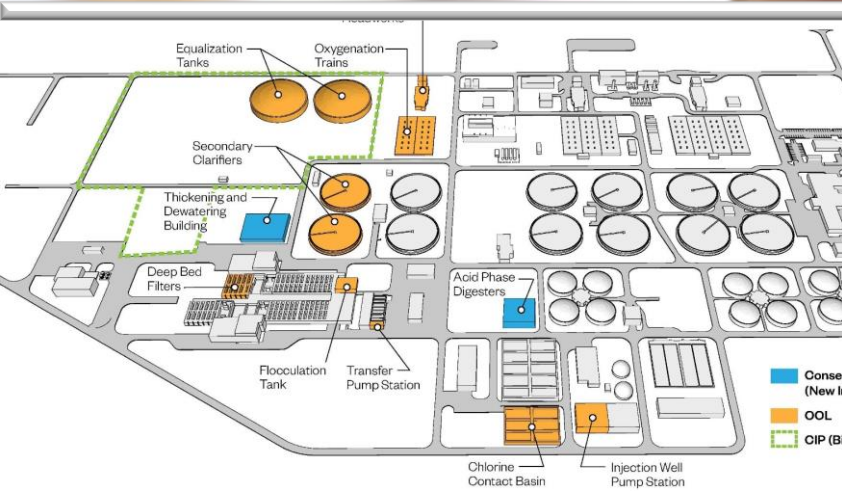
- Vulnerability Analysis and Planning Scenarios
- Envision Rating System
- Groundwater Modeling
- Design Standards
- Renewable Energy
- Energy Efficiency
- Water Conservation
- Advanced Metering
- Capital Improvement Plan
- Integrated Technologies

CCTV, SCADA, GIS,
and hydraulic modeling



Practical Outcomes with Energy Efficiency

- Cogeneration
- Plant Process Management (flow based)
- Processes
- Equipment Standards
- EnergyCAP (UBMS)



MD-WASD US DOE EERE Program Involvement

- **Better Plants Partner**
 - Joined in Dec. 2019
 - Finished baseline using 2019
- **ISO 50001 Ready Program**
 - About to initiate at one WTP
- **Sustainable Wastewater Infrastructure of the Future (SWIFt)**
 - Efficient motors, pumps, LED lighting, process improvements
- **Cogeneration Accelerator**
 - As part of 8 MW build at SDWWTP
- **NREL Virtual In-Plant Training**
 - ISO 50001
 - Pumps
- **University of Miami Industrial Assessment Center**
 - 2 WWTP energy audits
 - Ongoing engagement and research



Chris Halpin

NV5 Energy Efficiency Services

Submit Questions

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Critical Facility Resilience and Energy Management

Energy Management Strategies

- Whole Systems Thinking
- Integrative Design Approach



Critical Infrastructure Hazards

Black Sky Hazard: a catastrophic event that severely disrupts critical infrastructure in multiple regions for long durations

Natural

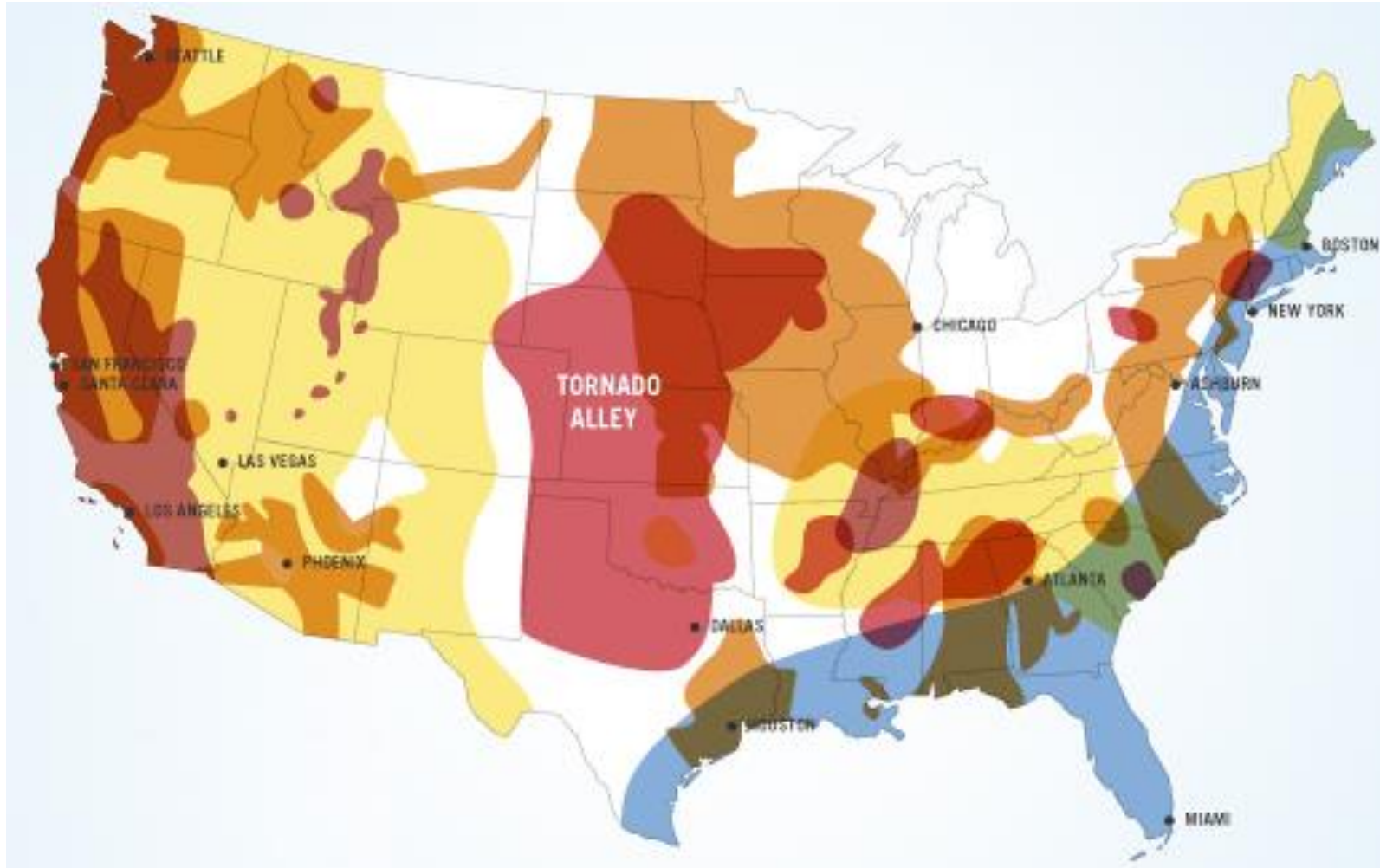
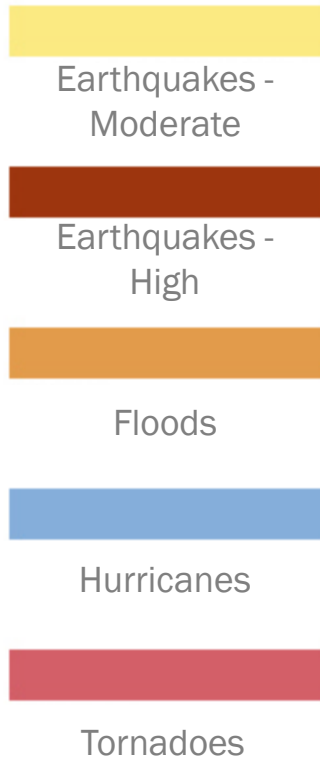
Wind, Floods, Ice, Heat
Drought
Wildfire
Earthquake or Volcano
Solar flare
Pandemic



Manmade

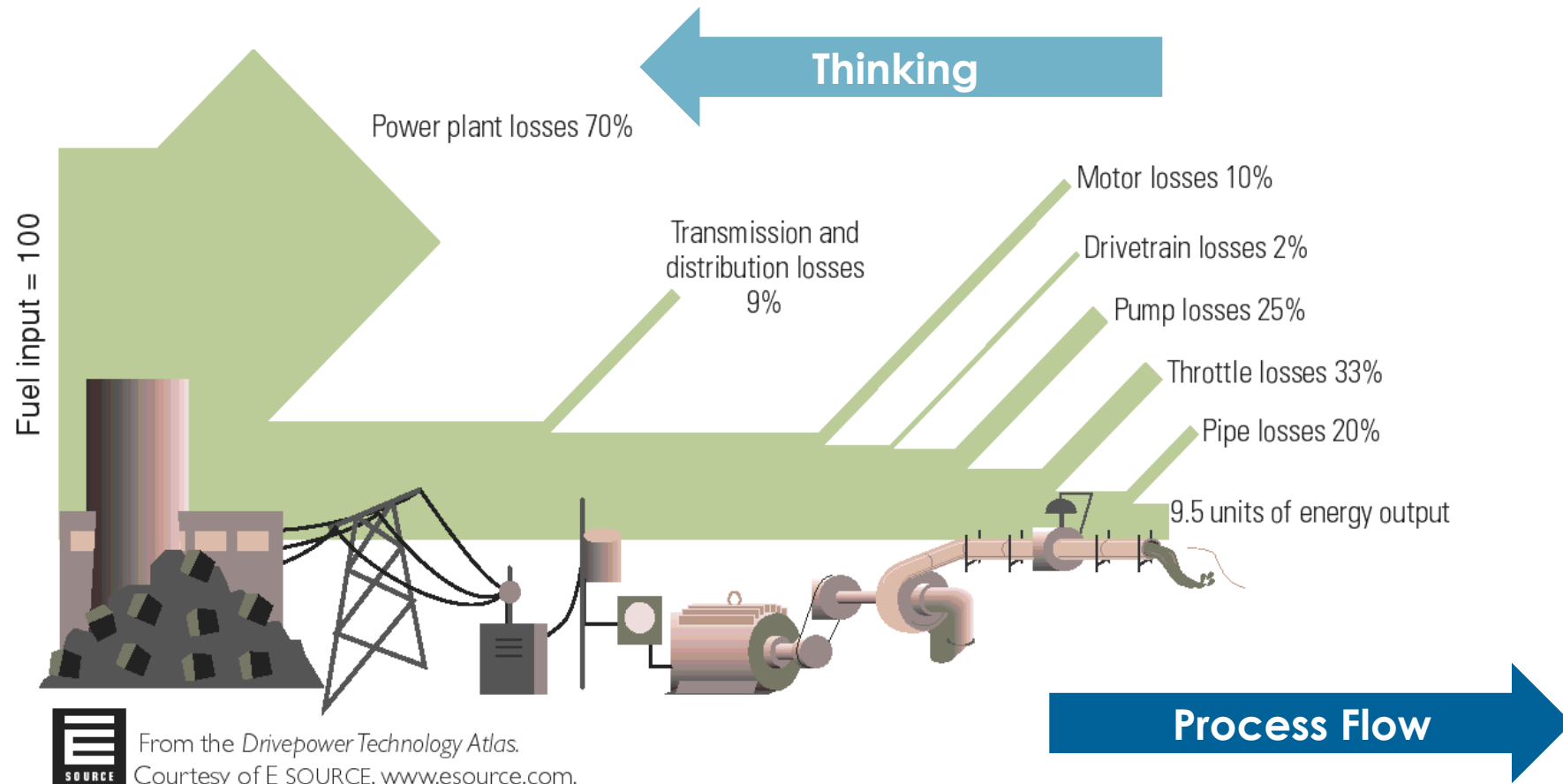
Human error
Aging infrastructure
Physical attack
Cyber attack
EMI attack
EMP attack

What Is Your Design Basis Threat?



Whole Systems Thinking

“To leap forward, think backwards”



Principles of Integrative Design

Give people what they want

What do we really want?

- Tons of coal?
- Megawatts of electricity?
- Or hot showers and cold beer?



Courtesy of Amory Lovins, RMI

Get everyone on the same page

- Begin with an integrative design workshop or “charrette”

Dual purpose

- Synergies yield many benefits from single expenditures

Efficiency first, then renewables

- *First* reduce the load, *then* size equipment to serve it
- Passive design; recover “wasted” energy; use renewables

Aim for the sweet spot

- Design to average (not peak) loads for efficient operation

See the big picture

- Optimize cost of ownership over first cost, value all benefits

Don’t cherry pick low-hanging fruit

- Portfolios of improvements yield the best payback & ROI

What Programs/Funding Can I Use?

Use cash as
“seed fund”
and utility
incentives

Fed: Consider
EERE
“Alternatively
Financing”

Non-Fed:
Utilize Fed,
State, NGO
resources

[Energy Savings Performance Contract \(ESPC\)](#)
[Utility Energy Services Contract \(UESC\)](#)
Enhanced Use Lease (EUL)
Energy/[Resilience as a Service \(E/RaaS\)](#)
Contact your [USDOE Federal Project Executive](#)

[State Energy Office, NASEO, Energy Services Coalition, CPACE](#)
[FEMA’s Pre-Disaster Mitigation Grant Program](#)
[USDA’s Rural Development Energy Programs](#)



Case Study – Joint Base San Antonio

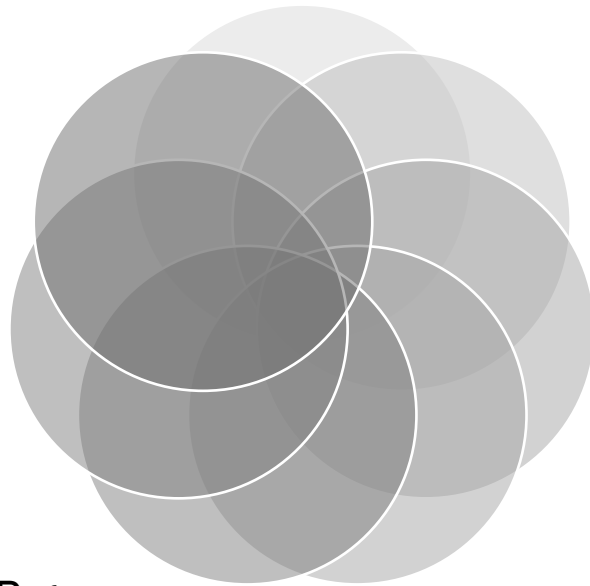


Super ESPC project financed
over 22 years

24% reduction
electric energy
use

\$133.5M in energy
infrastructure
improvements

20MW PV/CHP gen.
+4MW/8MWh storage
+MG control systems



900 buildings at
5 military bases

\$280M total cost
savings

Achieve energy
security

“Mission Assurance through Energy Assurance”

Mark Corell - Deputy Assistant Secretary of
the Air Force for Environment, Safety and
Infrastructure





Case Study – Joint Base San Antonio



Significant operational, cost and resilience benefits

LIGHTING UPGRADES

~140,000 new LED fixtures and lamps across all JBSA locations

- Significantly reduce cooling load
- Increase light quality comfort & productivity



CONTROLS

New open protocol controls systems, motors, VFDs

- Elimination of obsolete, expensive to maintain systems
- Improved HVAC performance, scheduling
- Reduced unscheduled downtime
- Increased electrical load efficiency



ONSITE RENEWABLE ENERGY GENERATION

~20MW solar arrays + 4MW/8MWh BESS

Enhanced energy security, resilience and mission assurance

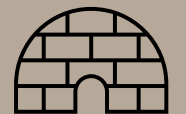
- Shaded parking for commuter comfort
- Environmental stewardship



THERMAL STORAGE

Five new storage tanks at two locations

- Permanent electrical peak load reductions
- Mission Critical back-up and fire protection reservoir
- Additional CHW capacity for site growth



Contact Information

Chris Halpin, PE, CEM, CMVP, LEED AP, DOE PF

Vice President

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860-328-0535



THANK YOU FOR YOUR TIME TODAY...

Q & A

Submit Questions
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Additional Resources

- **Data Centers Accelerator Toolkit**

<https://betterbuildingsolutioncenter.energy.gov/data-center-toolkit>

- **Smart labs Accelerator Toolkit**

<https://betterbuildingsolutioncenter.energy.gov/smart-labs-accelerator-toolkit>

- **Wastewater Energy Management Toolkit**

<https://betterbuildingsolutioncenter.energy.gov/wastewater-energy-management-toolkit>

Better Buildings Solution Center

More than 3,000 solutions are available publicly in the Better Buildings Solution Center

Showcase Projects:

- Large and small buildings
- All sectors
- Specific building types such as schools, hospitals, hotels, grocery stores, universities, civic centers, libraries, offices and labs

Implementation Models (Playbooks):

- Overcome barriers: finance, data, energy management, staff training, community and customer outreach, partnering with utilities, and more
- Multi-faceted and applicable across sectors

Additional Resources, Toolkits, Case Studies



energy.gov/bbsc

Better Buildings: Summer Webinar Series



ELECTRIFYING OUR BUILDINGS: CHALLENGES AND SOLUTIONS

June 8



BECOMING ESPC-READY

June 15



BOOSTING INDUSTRIAL AND MANUFACTURING EFFICIENCY AND RESILIENCY WITH CHP

June 17



FINANCING IN HIGHER EDUCATION

June 22



WHAT'S HOT WITH HEAT PUMPS

June 29



HOW TO IDENTIFY CHP PROJECTS THAT FIT YOUR GOALS

July 1



KICK THE TIRES: UNDERSTANDING THE ROLE OF R&D IN THE DEPLOYMENT OF BUILDING ENERGY TECHNOLOGIES

July 6



ESPC IN THE EXPRESS LANE: NEW PROJECT TRACKING TOOLS

July 13



WORKPLACE EVOLUTION: SUPPORTING OCCUPANT HEALTH WHILE ACHIEVING ENERGY EFFICIENCY

July 20



ENERGY-SAVING ENVELOPE SUCCESS STORIES

July 27



WASTE REDUCTION: LESSONS LEARNED AND WHAT COMES NEXT

August 3



VISUALIZE YOUR ENERGY FUTURE WITH 'SLOPE': THE STATE AND LOCAL PLANNING FOR ENERGY PLATFORM

August 10

Additional Questions?

Please Contact Us



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