

FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

August 21 – August 22, 2024

Welcome to the Summer 2024 FUPWG Seminar!

The opening Featured Utility Welcome from CenterPoint Energy will begin at 9:00AM CT



FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

August 21 – August 22, 2024

Featured Utility – CenterPoint Energy Welcome!

*Natalie Hedde, Vice President Strategic Business Growth and Engagement, North
– CenterPoint Energy*



DOE FEMP Welcome and Announcements

John Michael Forrest
UESC Program Manager
August 21, 2024

& Tracy Niro
Utility Program Manager



Welcome to the 2024 Summer FUPWG Seminar

- Fire exits & restrooms
- Please silence your cell phone
- Thank you, CenterPoint Energy – our 2024 FUPWG Seminar Featured Utility!
- Special thanks to Calvin Roberts for offering CenterPoint Energy as the featured utility for this event and for his excellent coordination efforts. Great job!
- Thank you to the FUPWG Fed Council for their assistance with agenda development (Burgundy Ribbons)
- Thank you to our speakers (Blue Ribbons)
- Thank you to the Utility Program FUPWG Team



Announcements

- Please wear your badge at all times and remember to bring it tomorrow. Your badge is required for entry.
- **Lunch**
 - Provided today.
 - No food or beverages are allowed in the auditorium.
 - Lunch on your own tomorrow.
- **Networking event immediately following today's meeting. See you all there!**
 - At the Spindletop Reception – Hyatt Regency.
 - An elevator Operator will assist you with getting up to Spindletop.

Slides will be posted to the FUPWG website within 2 weeks.

Announcements: Special Session



Energy Lawyers & Contracting Officers Forum

- Open to all – no registration required
- Thursday, August 22nd at 1:00PM CT
 - *Cost of Carbon and Escalation Rate – Christine Walker, PNNL*
 - *Reduce Cycle Time and Prevent Schedule Slips – Russ Dominy, BGS, LLC*
 - *Electrification Requirements – Tim Kehrli, NREL*

FUPWG Summer 2024

- **Welcome back!**
- **Who is here today?**
 - 74 Agency representatives
 - 35 Utility and Co-op representatives – are you listed on our website?
 - 46 Energy Service Company representatives
 - 47 Other
- **FUPWG Federal Council**
- **Say hello to the Utility Team**

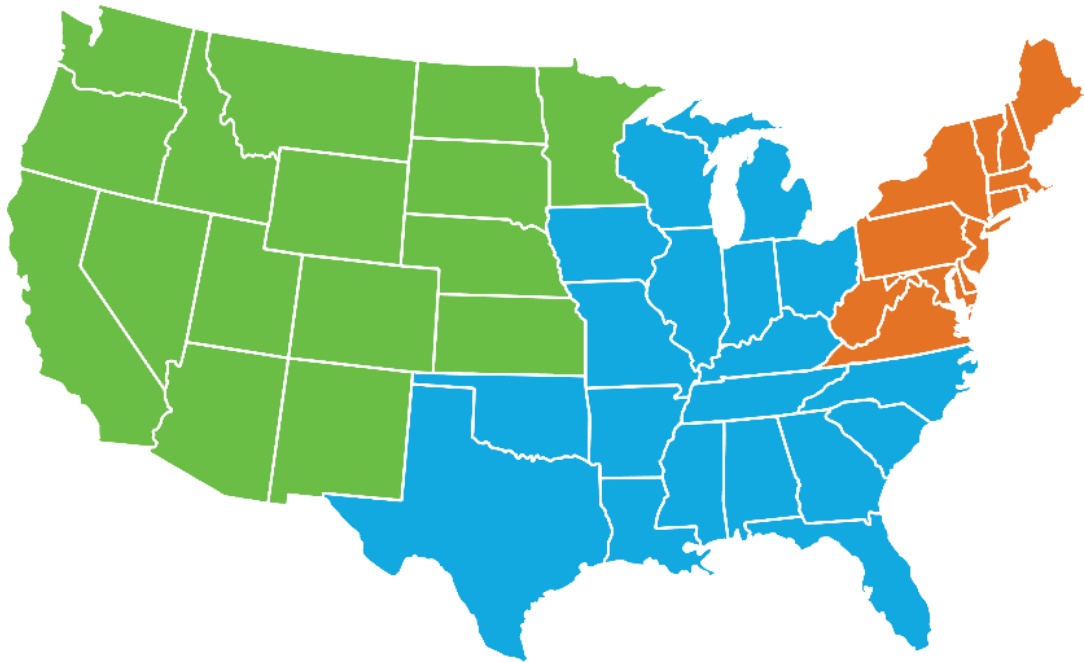
*80 first-time FUPWG
Seminar Attendees!*

FUPWG LUNCH CHALLENGE 2024

Sit next to someone you do not know at lunch and introduce yourself!

Your Federal Project Executive (FPE) Team

Help with all performance contracting:
ESPC, ENABLE, and UESCs



Western Region
+ East Asia,
Pacific; South,
and Central Asia

Scott Wolf
360-866-9163
wolfsc@ornl.gov



Southeast Region
+ Europe and
Western
Hemisphere

Michael Mungal
954-812-7082
mungalmj@ornl.gov



Northeast Region
+ State
Department

Bridgette Rodgers
703-951-3308
roddersbr@ornl.gov

[Ask FEMP a question!](#)



FUPWG Seminar Basics

- Attendees agree to follow the Federal Utility Partnership Working Group Seminar Code of Conduct:
 - Hospitality/social functions (on and off-site) **and any related meetings** must not conflict with the timing of official FUPWG Seminar activities listed on the Agenda.
 - Aggressive sales techniques are to be avoided while attending the Seminar. Signs and flyers may not be displayed or distributed in the seminar or areas of the venue reserved for FUPWG Seminar participants.



Share information in a collaborative environment



Agenda Updates

- Anna Siefken (DOE FEMP) will be joining Mary Sotos and Tyler Harris (DOE FEMP) for the “Washington Update”
- John Michael Forrest (DOE FEMP) will be speaking during the “Welcome to Day Two – Announcements”

Upcoming Training



Live Webinars and Training

- [Performance Assurance Best Practices for UESCs](#) (Registration Open!)
September 12, 2024 | 1-2:30 PM (EDT)
- FY25 Webinar Topics TBD – email us your ideas!



Trainings Upon Request

- Tailored training for agencies and utilities
- Utility Open Houses



On-Demand Courses

- New in FY24
 - [Basics of Energy Conservation Measures for Energy Performance Contracts](#)
 - [Enhancing Resilience through Utility Partnerships and Utility Energy Service Contracts](#)
- [FEMP On-Demand Webinar Series](#)
- Visit the [FEMP Training Catalog](#) for the complete list of UESC-related trainings

Stay in Touch!

- Visit FEMP's [Technical Assistance Portal](#) to ask questions ranging from general to project-specific.

Ask
Questions



- Search the [FEMP Training Catalog](#) to find upcoming live trainings, events, and on-demand courses.

Find More
Trainings



- Receive periodic emails to [stay informed](#) of FEMP news, trainings, tools, resources, and more.

Sign up for
Updates



- [Follow FEMP on LinkedIn](#) for event announcements, examples of agency success, and of-the-moment news.

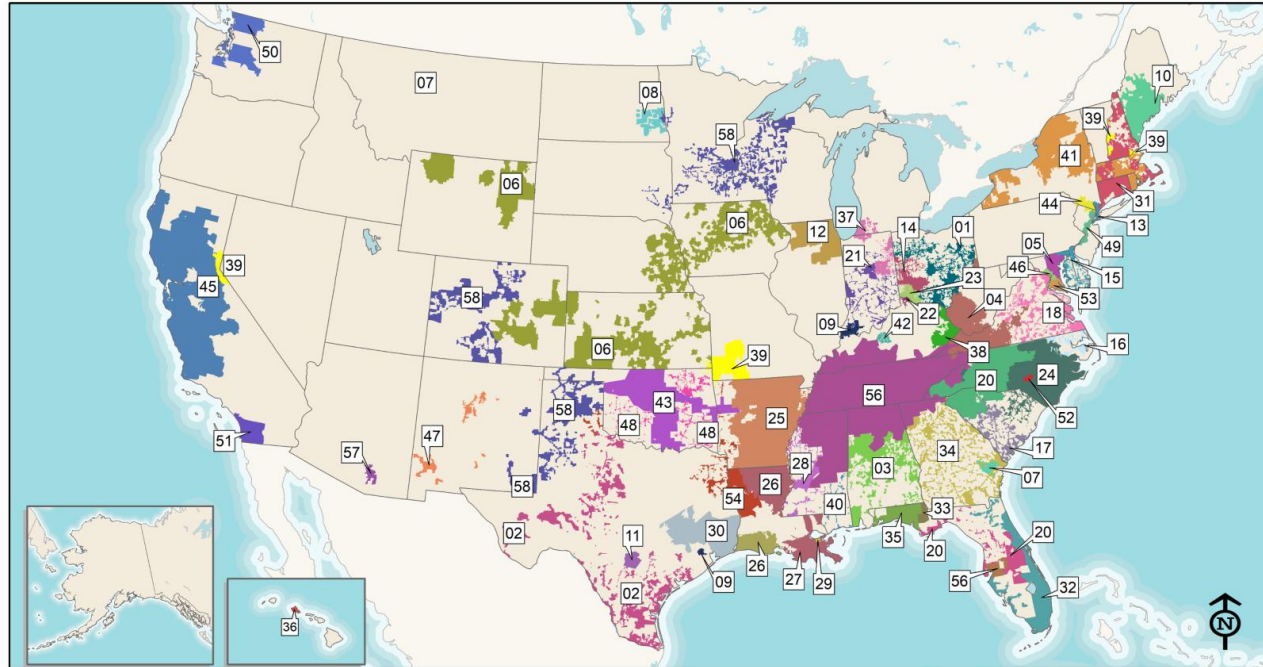
Follow
FEMP



Utilities Offering UESCs – Electric

Electric Utilities Offering UESCs to Federal Facilities

Updated
August, 2024



Utilities with UESCs

- | | | | |
|----------------------------------|-------------------------------------|---------------------------------|--------------------------------------|
| 01. AEP Ohio | 15. Delmarva Power & Light Co | 30. Entergy Texas | 45. Pacific Gas & Electric Co |
| 02. AEP Texas | 16. Dominion Energy N. Carolina | 31. Eversource Energy | 46. Potomac Electric Power Co |
| 03. Alabama Power Co | 17. Dominion Energy South Carolina* | 32. Florida Power & Light Co | 47. Public Service Co of New Mexico |
| 04. Appalachian Power | 18. Dominion Energy Virginia | 33. Florida Public Utilities | 48. Public Service Co of Oklahoma |
| 05. Baltimore Gas & Electric Co | 19. Duke Energy Carolinas | 34. Georgia Power Co | 49. Public Service Electric & Gas Co |
| 06. Black Hills Electric | 20. Duke Energy Florida | 35. Gulf Power Co | 50. Puget Sound Energy |
| 07. Canoochee EMC | 21. Duke Energy Indiana | 36. Hawaiian Electric Co, Inc | 51. San Diego Gas & Electric |
| 08. Cass County Electric Coop | 22. Duke Energy Kentucky | 37. Indiana Michigan Power | 52. Sandhills Utility Services, LLC |
| 09. CenterPoint Energy | 23. Duke Energy Ohio | 38. Kentucky Power | 53. Southern Maryland Electric Coop |
| 10. Central Maine Power Co | 24. Duke Energy Progress | 39. Liberty Utilities | 54. Southwestern Electric Power Co |
| 11. City Public Service Energy | 25. Entergy Arkansas | 40. Mississippi Power Co | 55. Tampa Electric |
| 12. Commonwealth Edison Co | 26. Entergy Gulf States Louisiana | 41. National Grid | 56. Tennessee Valley Authority |
| 13. Consolidated Edison New York | 27. Entergy Louisiana | 42. Nolin Rural Electric Coop | 57. Tucson Electric Power |
| 14. Dayton Light & Power Co | 28. Entergy Mississippi | 43. Oklahoma Gas & Electric Co | 58. Xcel Energy* |
| | 29. Entergy New Orleans | 44. Orange & Rockland Utilities | |

* = Incentives Only

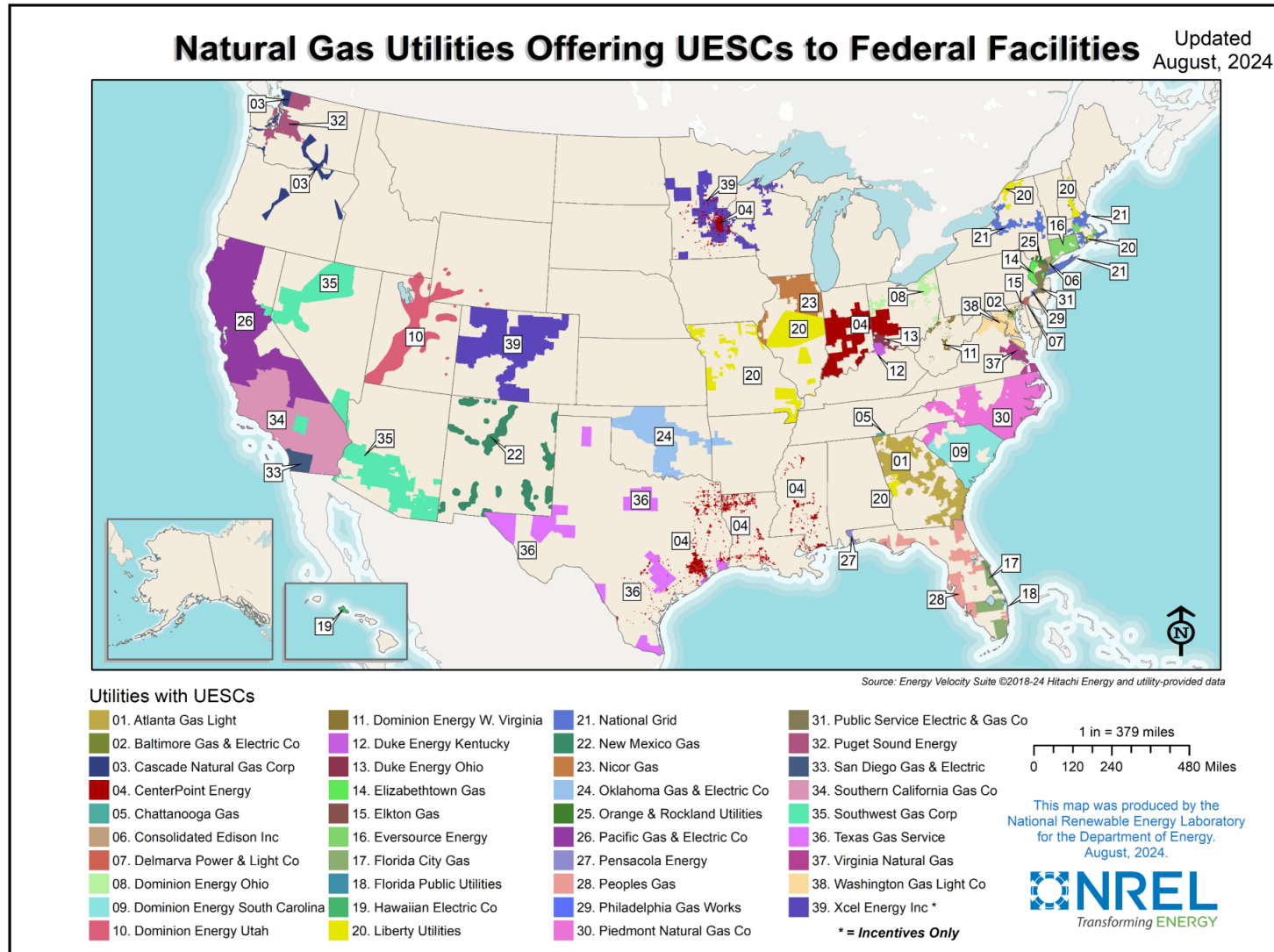
1 in = 379 miles
0 205 410 820 Miles

This map was produced by the
National Renewable Energy Laboratory
for the Department of Energy
August 2024

NREL
Transforming ENERGY

Utilities! Contact us
to request an
update.

Utilities Offering UESCs – Natural Gas



Utilities! Contact us to request an update.

Utility Partners Map – Call for Updates!

- Visit the [FEMP website](#) for a list of utilities offering UESCs or related incentives to federal customers
- Utilities! Contact us to request an update:
 - Add your company to the map and list of utility partners
 - Request an edit: remove/change company’s name, update service territory boundaries, etc.
- Feds! This list only includes utilities that have informed FEMP of an active UESC program or other related incentives.
 - Contact your utility account representative to confirm.

Companies with UESCs			
01. AEP Ohio	16. Delmarva Power & Light Co	31. Entergy Texas	46. Pacific Gas & Electric Co
02. AEP Texas	17. Dominion Energy N. Carolina	32. Eversource Energy	47. Potomac Electric Power Co
03. Alabama Power Co	18. Dominion Energy South Carolina*	33. Florida Power & Light Co	48. Public Service Co of New Mexico
04. Appalachian Power	19. Dominion Energy Virginia	34. Florida Public Utilities	49. Public Service Co of Oklahoma
05. Baltimore Gas & Electric Co	20. Duke Energy Carolinas	35. Georgia Power Co	50. Public Service Electric & Gas Co
06. Black Hills Electric	21. Duke Energy Florida	36. Gulf Power Co	51. Puget Sound Energy
07. Bonneville Power Administration*	22. Duke Energy Indiana	37. Hawaiian Electric Co, Inc	52. San Diego Gas & Electric
08. Canoochee EMC	23. Duke Energy Kentucky	38. Indiana Michigan Power	53. Sandhills Utility Services, LLC
09. Cass County Electric Coop	24. Duke Energy Ohio	39. Kentucky Power	54. Southern Maryland Electric Coop
10. CenterPoint Energy	25. Duke Energy Progress	40. Liberty Utilities	55. Southwestern Electric Power Co
11. Central Maine Power Co	26. Entergy Arkansas	41. Mississippi Power Co	56. Tampa Electric
12. City Public Service Energy	27. Entergy Gulf States Louisiana	42. National Grid	57. Tennessee Valley Authority
13. Commonwealth Edison Co	28. Entergy Louisiana	43. Nolin Rural Electric Coop	58. Tucson Electric Power
14. Consolidated Edison New York	29. Entergy Mississippi	44. Oklahoma Gas & Electric Co	59. Xcel Energy*
15. Dayton Light & Power Co	30. Entergy New Orleans	45. Orange & Rockland Utilities	

UESC Data Collection - FEMP Needs Your Help!

FEMP needs your help to track aggregate UESC investment data.

- Self-Reporting award information helps FEMP track UESC utilization trends and estimate future investment
- This data helps to ensure sufficient resources are being allocated to provide training, technical assistance, and resources in support of UESC projects
- **Project-specific information is always kept confidential** and will not be shared without Agency consent



Please send template requests and data to Andrew Grejda

Andrew.Grejda@hq.doe.gov

FY25 Technical Assistance Requests

The FEMP Utility Program is seeking to identify agency teams or sites in need of UESC support for FY25.

- **FEMP can provide support to a limited number of projects**
 - Project evaluation and prioritization (for site or program managers)
 - Preliminary assessment, investment grade audit review
 - Technical analysis
 - Contracting guidance

Contact jeffrey.gingrich@nrel.gov to submit your requests

Future FUPWG Meetings & Recruiting for the FUPWG Fed Council

How often would you like to see FUPWG Seminars?

- Please provide ideas for session topics including recommended speakers on the FUPWG website: [Link here](#)
- Your thoughtful ideas for session topics including speaker nominations are much appreciated —help us keep FUPWG interesting and relevant to you!

FUPWG Federal Council—Now Recruiting!

- Are you a federal employee with an interest in keeping the FUPWG agendas relevant and timely?
- If so, reach out to Andrew.Grejda@hq.doe.gov

FUPWG Frequency Suggestion Poll



[Microsoft Forms Survey Link](#)

Thank You!



**John Michael at the Smithsonian National
Museum of Natural History**

**John Michael Forrest
John.forrest@hq.doe.gov
202-893-4807**

Note: FUPWG slides will be posted in 2 weeks.

Washington Update

Mary Sotos, Federal Energy Management Program Director



51 Years Empowering Agencies to Lead By Example

The federal government is our nation's largest energy consumer, operating and managing more than

- 350,000 buildings
- 600,000 vehicles

FEMP has helped the federal government achieve a **50% energy intensity reduction in federal buildings** since 1975.

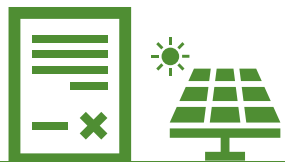


Pictured: In the largest UESC ever awarded by the U.S. Coast Guard and U.S. Department of Homeland Security, Eversource and Ameresco partnered to deliver a comprehensive energy efficiency and infrastructure project at the U.S. Coast Guard Academy in New London, CT reducing energy consumption by 48%.

Photo courtesy of Ameresco.

Federal Goals and Requirements Require Utility Partnerships

1. Achieve facility energy efficiency and decarbonization.
2. Manage facility electric loads and energy sources in cost-effective ways that increase carbon pollution-free electricity (CFE) and improve resilience.
3. Strengthen energy management fundamentals and excellence with a focus on workforce, recognition, and data management.



Energy Act of 2020



Executive Order 14057



Climate Smart
Building Initiative



Federal Building
Performance Standard

PERFORMANCE CONTRACTING SUPPORTS ALL THESE GOALS AND REQUIREMENTS

Together We Are Shaping the Energy Transition

**More than \$16 billion in project investments awarded
(UESC, DOE ESPC IDIQ, ESPC ENABLE)**



ENERGY

Estimated over
66.3 trillion BTU reduced
annually



ECONOMIC

Estimated over **128,000**
job-years
(direct jobs)



ENVIRONMENTAL

Estimated over
7.6 million
metric tons CO₂e*
reduced annually

Performance Contracting Paving the Way

+\$16 billion in project investments awarded

ESPCs
+\$12 billion
total investment

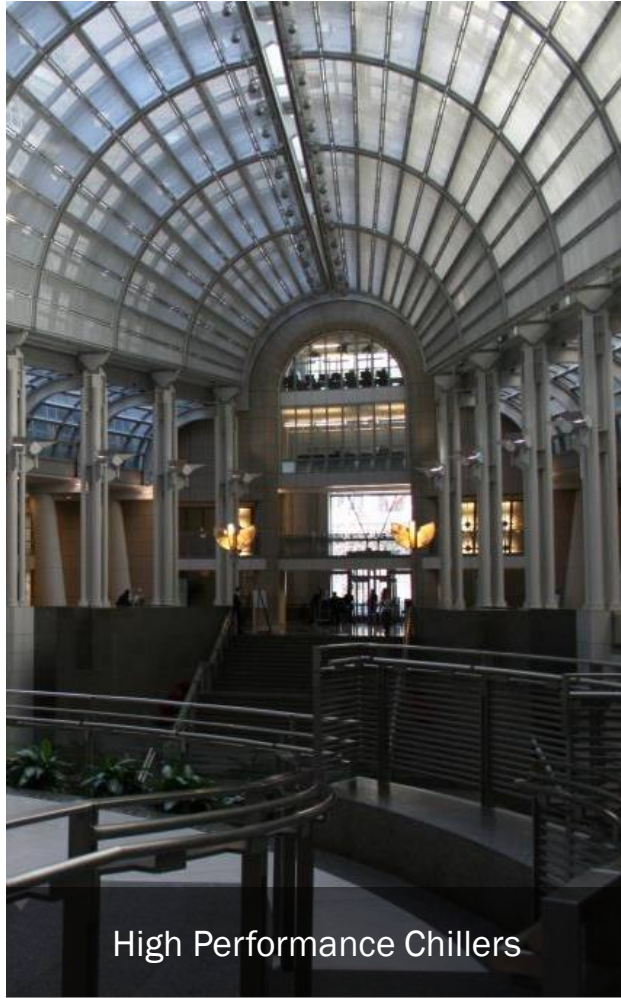
\$8.1B in DOE ESPC IDIQ · \$4B Army MATOC/VA
\$95M ESPC ENABLE

UESCs
\$4.56 billion
total investment

+\$300M average annual
investment since 2020



Geothermal Heat Pumps



High Performance Chillers



Electric Heat Pumps



PV + BESS

Underutilized Technologies in Federal Facilities

Federal and Utility Collaboration Are Critical for Success



Training



Collaboration



Federal Goals



Case Studies



New
Technologies



New
Approaches



Industry
Awareness

GET INVOLVED

- Join FUPWG's Federal Council to drive the focus of these seminars.
- Tell us about your projects and lessons learned!

Washington Update

Anna J. Siefken, Federal Energy Management Program Deputy Director



Demonstrated Need for Speed, Savings, and Investments

Our Nation's Critical Infrastructure in Need

- **\$7.7 billion** in agency-identified energy conservation measures ready for action
- **\$283 billion** in deferred maintenance for our nation's critical infrastructure

AFFECT Grant Program

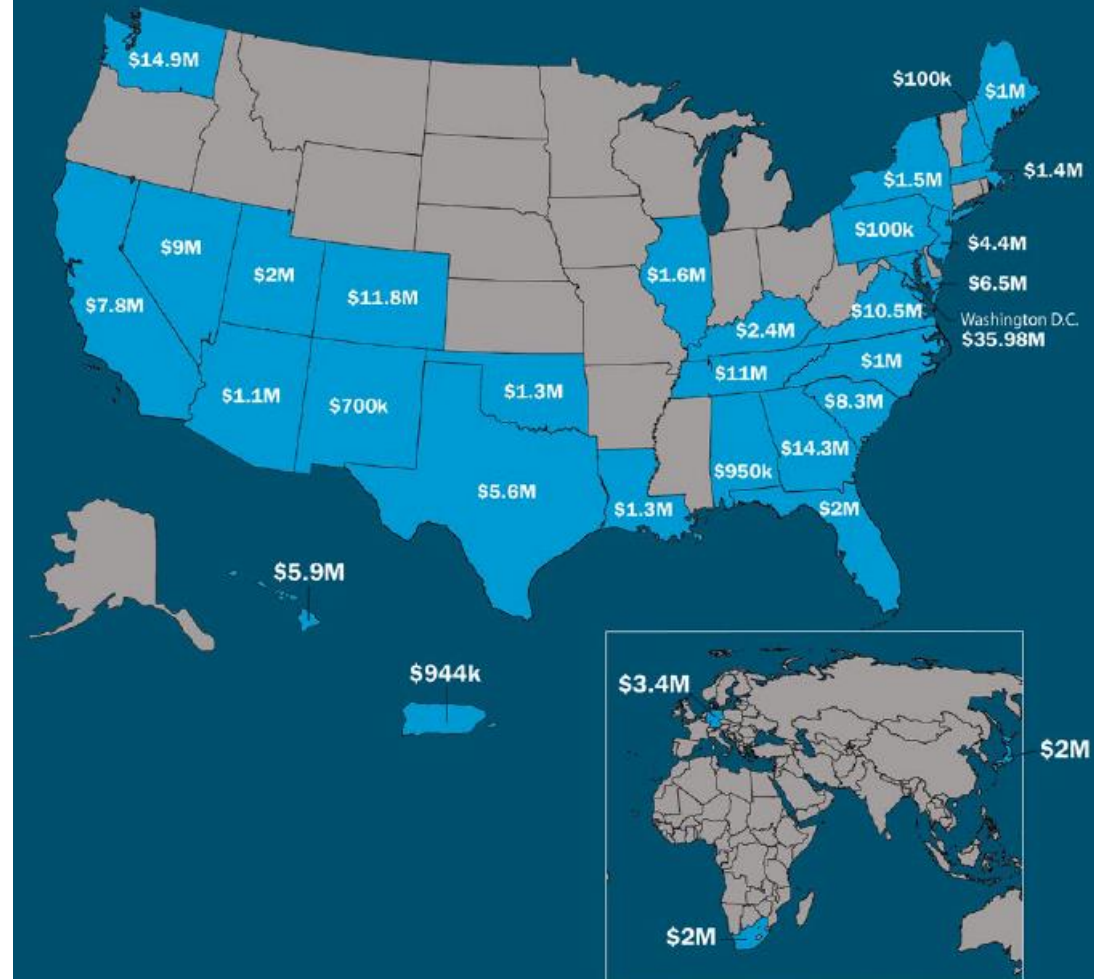
- AFFECT provides grants for the development of energy and water efficiency projects and processes at U.S. federal government-owned facilities.
- Historic **\$250 million in BIL funding** announced in 2023.

AFFECT Program At-A-Glance

AFFECT's \$173 million, when combined with \$2.8 billion from industry, resulted in **\$3 billion total investment in America's critical federal infrastructure.**

- More than **\$82 million** energy costs saved annually
- **3.3 trillion Btu** saved
- **27 agencies**
- **110 projects** focused on energy efficiency, renewable energy, and operational resilience
- **\$1** of AFFECT funding is met with **\$17** from industry

AFFECT Grant Selections: Project Investment by Location
(2014-AFFECT BIL Phase 1)





AFFECT grants can catalyze and expand net-zero projects.

Phase 1 Project Selections

- \$104 Million in Grants
- 31 Project Selections
- 11 Agencies

Phase 2 Closed June 27, 2024

Phase 3 Opens Spring 2025

January 17, 2024, Secretary of Energy Jennifer Granholm announced AFFECT BIL Phase 1 project selections at the Pentagon's Hall of Heroes.

AFFECT BIL - Phase 1 & 2 Updates

Tyler Harris, AFFECT Program Lead



AFFECT BIL – Focus on Net-Zero Buildings

AFFECT BIL FAC relies on related definitions provided in the Implementing Instructions for E.O. 14057:

Net-Zero Emissions

- Designed and operated so that, when connected to a regional electrical grid fully serviced by carbon pollution-free electricity, the scope 1 and 2 greenhouse house emissions from all operational end uses are zero on an annual basis.

Net-Zero Waste

- Operated to reduce, reuse, recycle, compost, or recover solid waste streams (with the exception of hazardous and medical waste) thereby resulting in zero waste disposal.

Net-Zero Water

- Designed, constructed, or renovated and operated to greatly reduce total water consumption,
- Uses non-potable sources as much as possible, and
- Recycles and reuses water in order to return the equivalent amount of water as was withdrawn from all sources, including municipal supply, without compromising groundwater and surface water quantity or quality.

AFFECT BIL Phase 1 Tracking

	Topic Area 1	Topic Area 2	Topic 3
Focus	Assistance with Net-Zero Projects	Modification of Existing Projects for Net-Zero	New/In Development Net-Zero Projects
Phase 1 Selections	\$1.2M, 12 Projects	\$37.8M, 7 Projects	\$65.3M, 12 Projects
Anticipated <u>Maximum</u> Timeframe from Kick-Off to Closeout	6 months	18 months	24 months
Risks	Agency Funding, Timing, Project Management	Agency Funding, Contracting	Project Viability, Scope Change, Timing

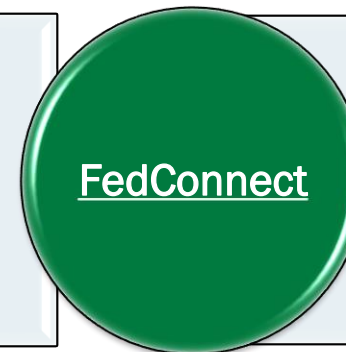
Maintain access and accounts in the required systems.



System for finalization of NEPA determination.



Register for a Unique Entity Identifier (UEI) with a Purpose of Registration as "Federal Assistance Awards" or "All Awards."



Grants issued using the Intra Governmental Payment Collection (IPAC) payment method and all award documents.

AFFECT BIL Phase 2 Funding Updates Overview

- Bolstered by \$250M from the Bipartisan Infrastructure Law (BIL), the AFFECT BIL grant funding has 4 topic areas and will be disbursed over 3 phases.
- During Phase 1, FEMP selected 31 net-zero projects across federal facilities, totaling a \$104M investment.

	Topic Area 1A	Topic Area 1B	Topic Area 2	Topic Area 3
Focus	Assistance with Net-Zero Buildings Project Development	Assistance with Net-Zero Buildings Program/Procedures Development	Modify Existing Projects for Net-Zero Buildings	New/In Development Net-Zero Buildings Projects
Anticipated Total Funding Distribution	\$6.25M	\$6.25M	\$95M	\$142.5M
Anticipated Award Size	\$0-200K	\$0-200K	\$0-10M	\$0-10M

AFFECT Process Timeline

Application Period

- **3 months**
- March 22 – June 27, 2024



Negotiation

- Approximately **2-3 months**



Evaluation & Selection

- Approximately **6 months**



Award Performance

- Depends on several factors and varies by Topic Area.



Fund Disbursement

- Dependent on meeting the conditions for distribution in FAC, including deliverables



Project and Congressional Reporting

- Ongoing throughout the timeline of the project



Federal Utility Partnership Working Group DoD Update Session



Ms. Rebecca Isacowitz
Deputy Assistant Secretary of Defense for Energy Resilience and Optimization (DASD(ER&O))

21 Aug 2024



Agenda

- Installation Energy Portfolio
- DoD Priorities
- Utility Related Posture
- CFE Procurements
- Next Steps

BLUF

- Resilience and security driven decision making
- Service led work; aggregated and supported by OSD
- Enabled and authorized by statutes
 - 10 USC 2911 and 2920 [Energy Resilience]
 - Energy Act of 2020 / Inflation Reduction Act of 2022 / Bi-Partisan Infrastructure Law
 - National Security Strategy [Oct 2022]
 - E.O. 14008 , E.O. 14057



Installation Energy Portfolio

Energy, Installations, and Environment

Overarching Lines of Effort

Energy and Water Resilience

Reducing Demand

Optimizing Efficiency

Clean + Reliable Energy

- Utility Scale Procurement
- Nuclear & Geothermal investments
- On-Site Generation and Storage

Resilience Initiatives

- Microgrids
- ERCIP
- Cybersecurity
- Black Start Exercises

Third Party Financing

- Utility Privatization
- Performance Contracting
- Enhanced Use Leases

Adjacent/Overlapping OSD Efforts

- Building Decarbonization
- Building Electrification
- Operational Energy

Facility Audits

EV/EVSE Deployment

Enablers

Data Driven Decision Making

Innovation

Workforce Development

Policy and Strategy



2022 National Defense Strategy

“Resilience – the ability to withstand, fight through, and recover quickly from disruption. The Department will improve its ability to operate in the face of multi-domain attacks on a growing surface of vital networks and **critical infrastructure**, both in the homeland and in collaboration with Allies and partners at risk.”

DoD Memorandum on Electrification of Standard Building Operations

“Leverage the Department’s growing investment in microgrid technology to support mission assurance.”

DoD Resilient and Healthy Defense Communities Strategy

“It is both a national security imperative and our moral obligation to ensure the spaces where our people live, work, and train are healthy, functional, and resilient.” – Kathleen Hicks, DSD



Utility Related Posture

Energy, Installations, and Environment

Performance Contracting

- UESCs

Utility Privatization

Electrification

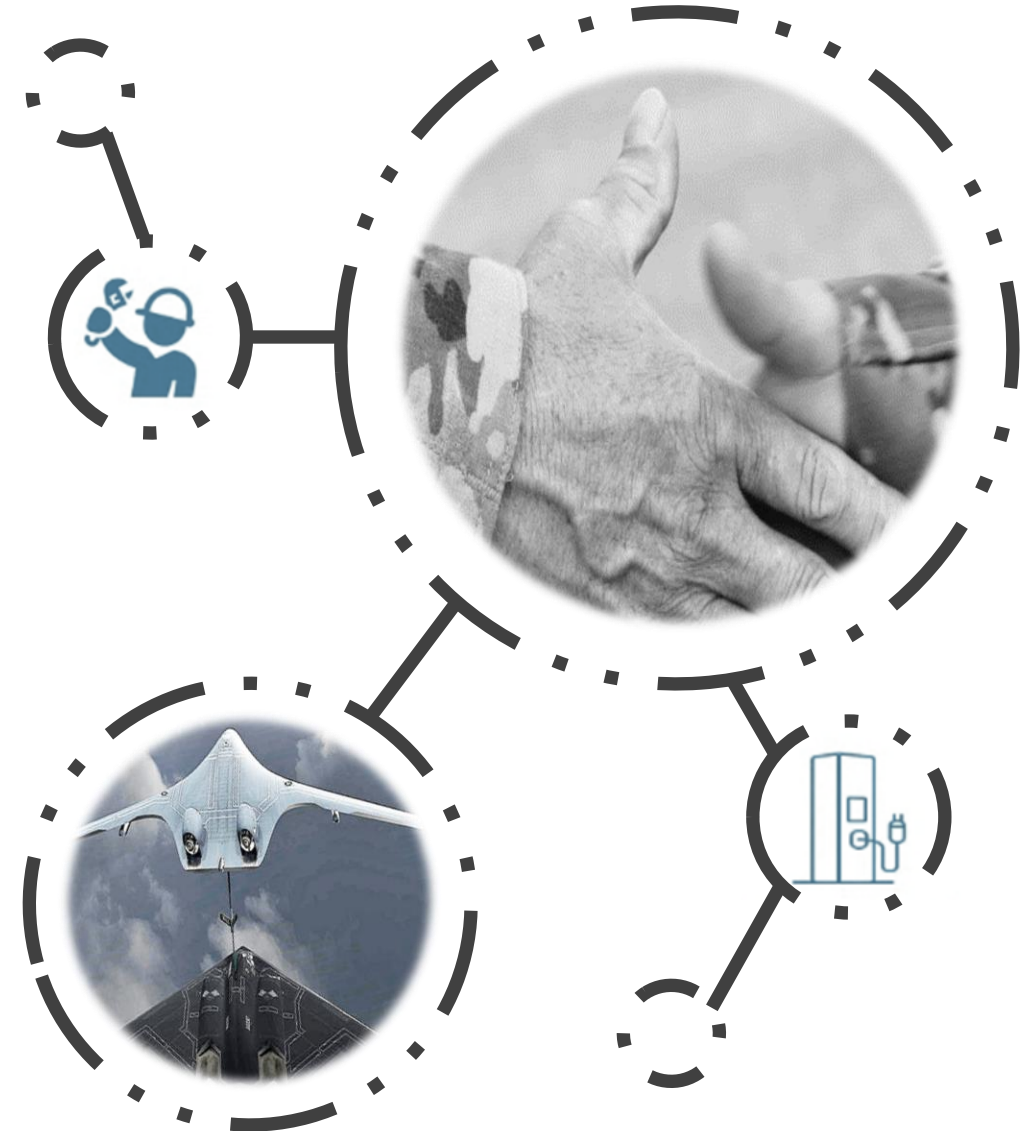
- Diversification
- EVSE

New Technology Incorporation

Tax Credits / Incentives

- AFFECT
- DOE
- 3PF

Carbon Pollution Free Electricity

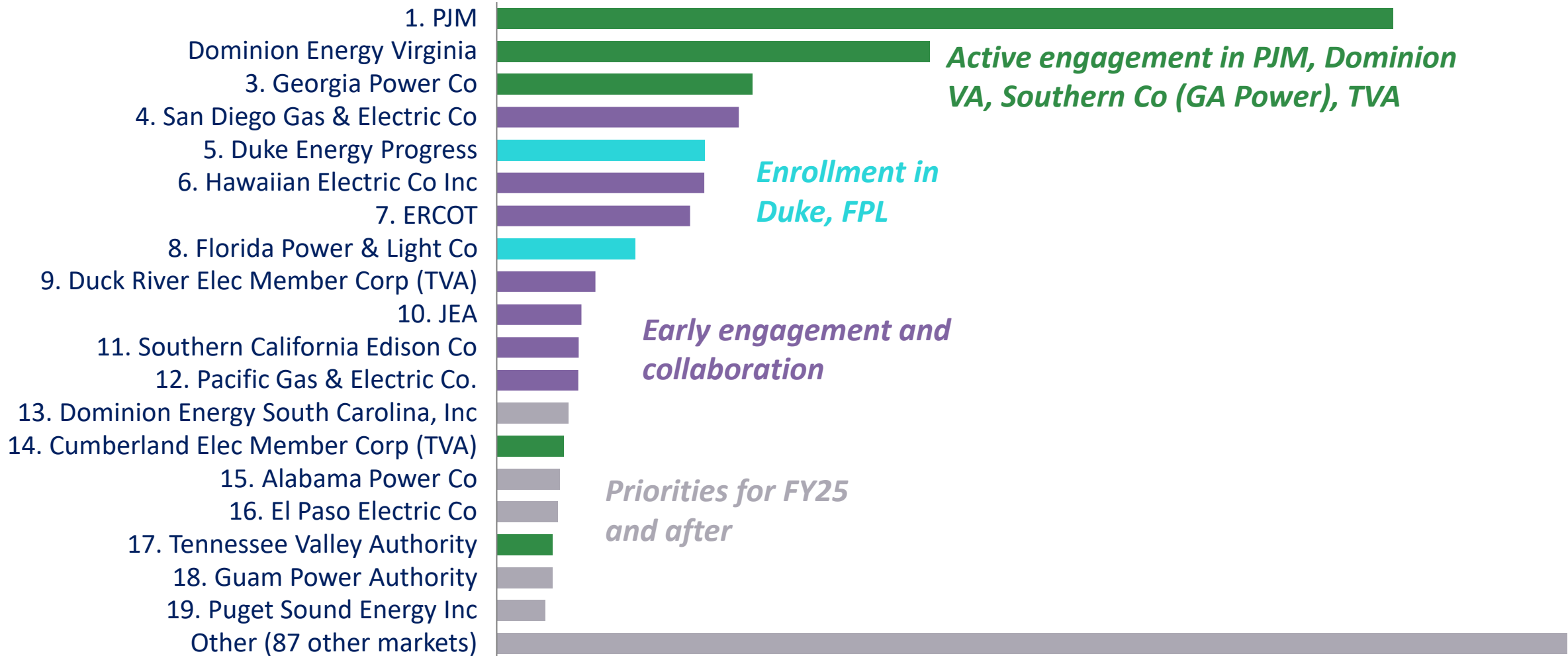




DoD is Engaging the Top Market Areas by CFE Need

Energy, Installations, and Environment

Illustrative: Total FY30 CFE Need by market (GWh)





We Are OSD and We Are Here to Help!

- Support of Service-led programs and initiatives
- Continual development of policy and governance solutions to remove impediments and enable success
- Drive resilience focused strategies to achieve mission readiness





Department of the Navy

ASN(EI&E) Shore Energy Overview

Walter Ludwig, Principal Deputy & Chief of Staff DASN(Energy)

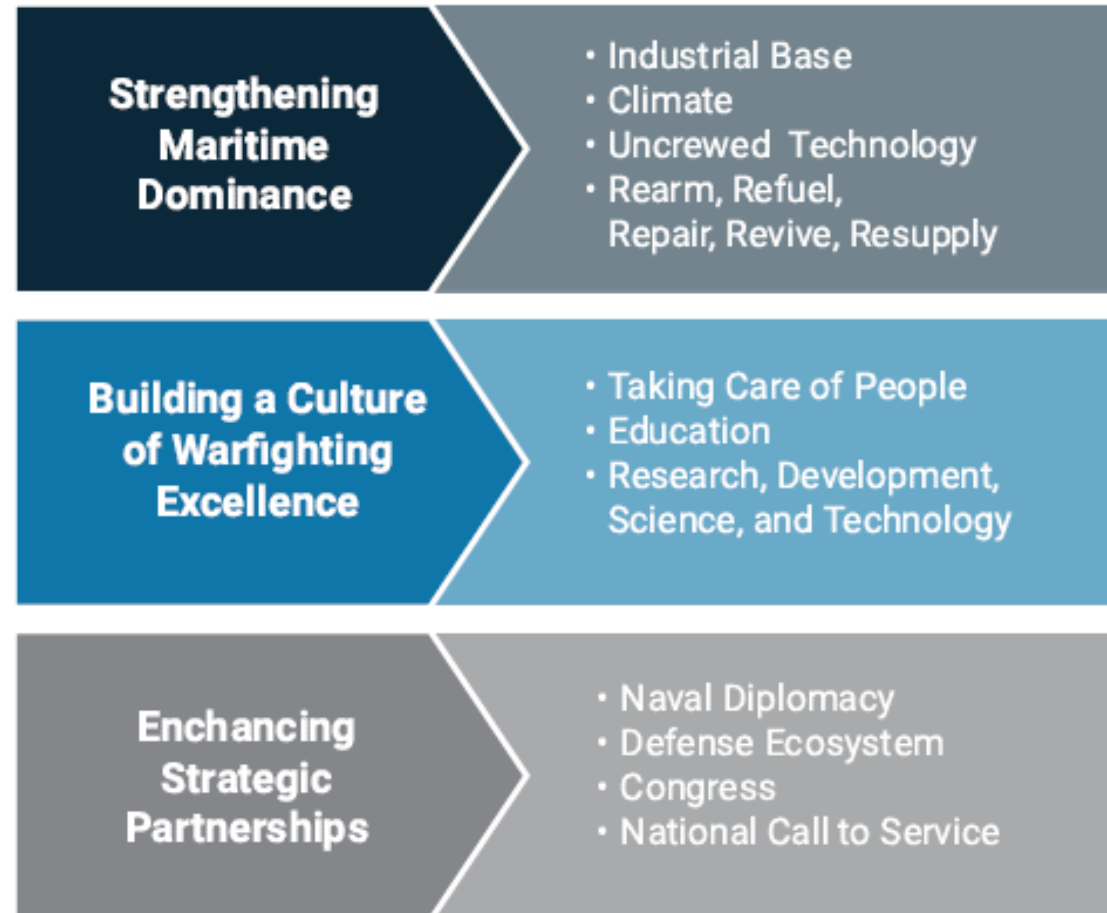
FUPWG Seminar

21 August 2024



Department of the Navy (DON) Priorities

Maintain capability to deter high-end conflict with a rapidly improving peer competitor while simultaneously protecting and advancing the global maritime interests of the Nation

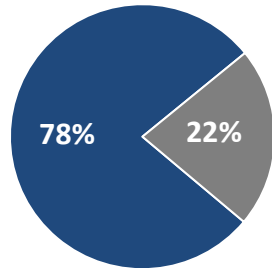


“One Navy-Marine Corps Team: SECNAV Strategic Guidance” October 2023

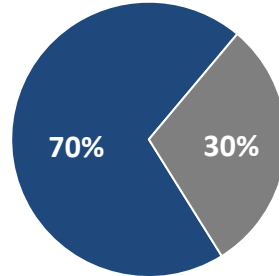


DON and DOD Energy Profile Has Remained the Same on Average for the Past 10+ Years

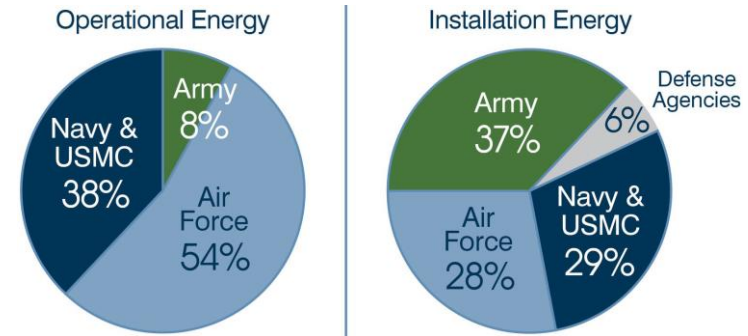
Cost
DON Shore Energy and Operational Energy Split



Consumption
DON Shore Energy and Operational Energy Split



Consumption
DOD Services Split

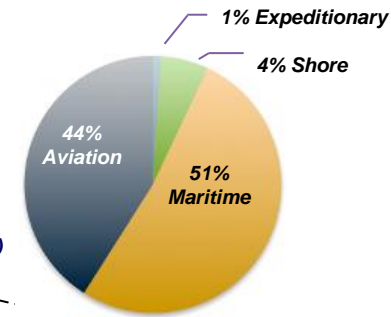
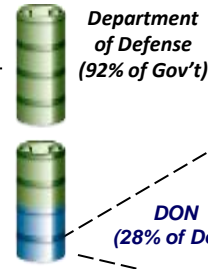


- Operational Energy
- Facility Energy

Total U.S. Petroleum Consumption



DON Petroleum Consumption in Perspective



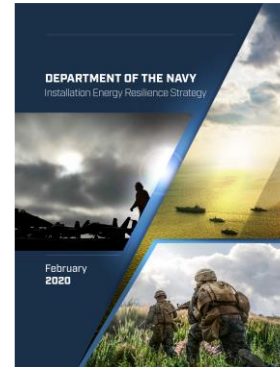


Key DON Strategies Impacting Shore (Installation) Energy

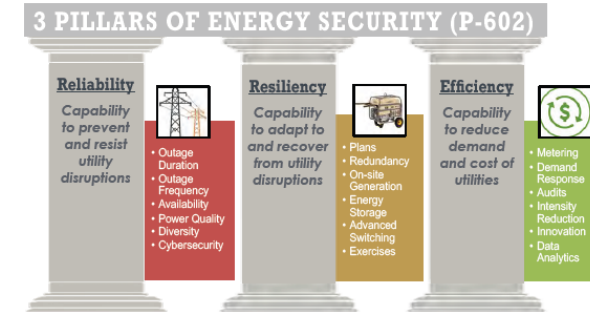
Installation Energy Resilience Strategy

Assured energy whenever and wherever it's required to enable mission accomplishment

1. Goal 1: Resiliency
2. Goal 2: Reliability
3. Goal 3: Efficiency



February 2020



Climate Action 2030

Build Climate Resilience and Reduce Climate Threat across 5 Lines of Effort:

1. Climate-informed decision-making
2. Train and equip for climate resilience
3. Resilient built and natural infrastructure
4. Supply chain resilience and innovation
5. Enhance mitigation and adaptation through collaboration



May 2022





Chief Sustainability Officers (CSO) Serials

CSO Series

- Serial 1: Infrastructure**
- Serial 2: Water Security**
- Serial 3: Nature Based Resilience**
- Serial 4: Sustainability Acquisition and Procurement**
- Serial 5: Shore Energy**



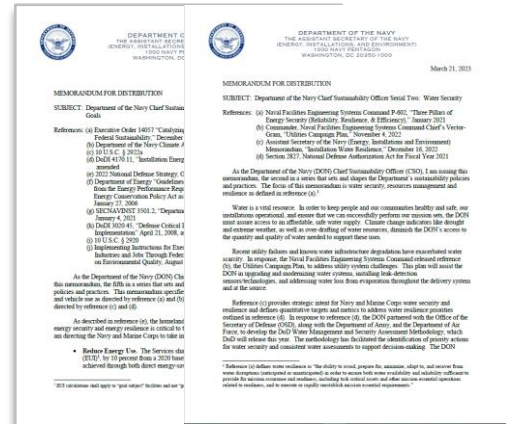
Serial 1: Infrastructure

- **CSO Serial 1.1 Update**
 - 5 November 2023
 - Department of the Navy Policy for Inclusion of Electric Vehicle Charging Infrastructure in Project Documentation
- **CSO Serial 1.2 Update**
 - 14 November 2023
 - Building Electrification Policy
- **CSO Serial 1.3 Update**
 - DRAFT
 - Policy on Electric Vehicle Charging Infrastructure and Equipment in the Military Housing Privatization Initiative (MHPI) Portfolio

Serial 2: Water Security

Serial 5: Shore Energy

- **CSO Serial 5.1 Update**
 - DRAFT
 - Policy on Personally-Owned Electric Vehicle Charging, Electric Vehicle Energy Use Accounting, and Electric Vehicle Charging Equipment Ownership Costs



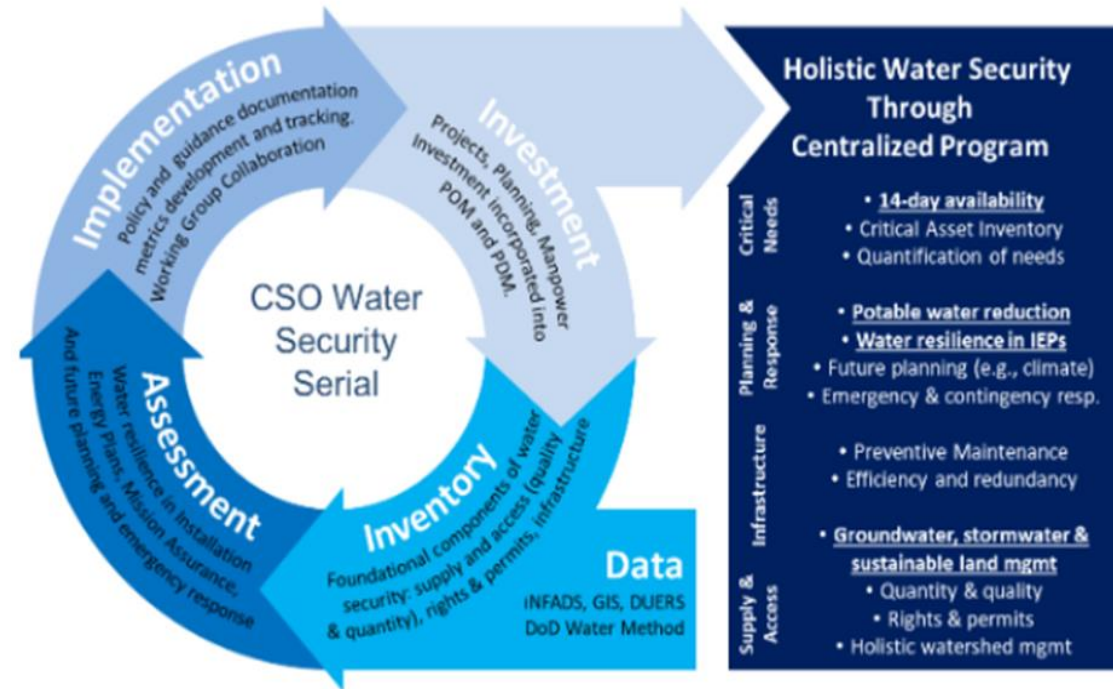
CSO Serials articulate vision, goals, and long-term strategy from ASN-level.



Serial 2: Water Security Goals

Goal: Address water resources management holistically through centralized programming that ensures:

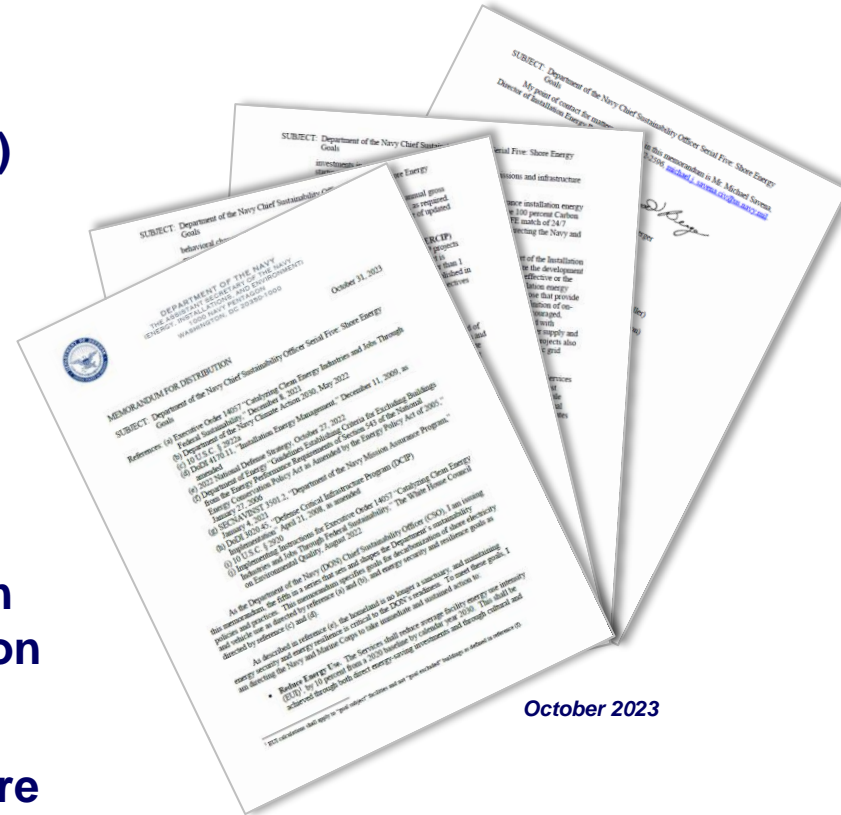
- 1) Adequate water supply and access to water resources
- 2) Hardened water infrastructure that conveys, distributes, and supplies
- 3) Strategic short and long-term planning and emergency response
- 4) Understanding of critical installations water demands





Serial 5: Shore Energy Goals

- Reduce Energy Use
- Maximize Energy Resilience and Conservation Investment Program (ERCIP) Funding
- Maximize Third-Party Financing
- Develop an Energy Resilience Plan
- Complete 8 energy Resilience and Readiness Exercises (ERRE) per Year
- Prioritize Development of Carbon Pollution Free Electricity (CFE) for On-site Generation and Maximize Procurement of CFE
- Modernize Installation Energy Infrastructure



October 2023



Shore Energy Challenges

- **Potentially higher costs for carbon pollution-free electricity and sustainability investments**
- **Additional sustainment costs and complexities for microgrids and energy resiliency investments**
- **Aging energy infrastructure**
- **Increasing electrical demand and transition to electrification**
- **Climate Change (resilience and reduce emissions)**
- **Homeland no longer a sanctuary**
 - **Terrorists, cyber attacks, information subversion, etc.**

The DON spends approximately \$1.2B on procured energy (utility bills)



Energy Security Projects Global Reach

Navy is pursuing over 300 projects across the globe, in pre-award, construction, or sustainment.
 Microgrids – 52 Sites; Battery Energy Storage Systems (BESS) – 12 Sites; Distributed Generation – Over 70 Sites



** Locations are not exact / some have multiple projects*

\$7.2B Infrastructure Improvements:



- 60 ESPCs – \$3,042M
- 72 UESCs – \$934M
- 31 EULs – \$261M
- 154 ERCIPs – \$2,771M
- 6 PPAs – \$370M
- 3 USCs – \$40M
- 11 UPs – \$4M
- 45 2912s – \$53M
- 1 IGSA

Acquisition & Funding:

- ESPC – 3rd Party Financing via consumption savings
- UESC – Utility financing via consumption savings
- EUL – Real estate action with energy, water and/or climate benefits
- PPA – Negotiated utility delivery contract
- USC – Utility contract with ancillary services
- ERCIP – DOD MILCON for energy & water Resilience
- UP – Utilities privatization with recap of system
- 2912 – Energy savings invested 50/50 into enterprise energy & installation QOL
- 2916 – Geothermal revenue funding 50/50 China Lake & DON energy and water resilience

Programs & Tools:

- ANCCR – Rate/usage analysis and negotiations
- UICAP – Utility condition & mission impact assessment
- FRCS Standardization – Rationalization and cyber protection of control systems
- AMI – Smart energy meters
- Smart Grid – data integration and business analytics
- FEOC – Smart Grid control center for facilities and utilities
- IEPS Tool Suite – Six modules to empower shore energy programs



Thank you!

Questions?

Mr. Walter Ludwig

Principal Deputy & Chief of Staff
DASN(Energy)

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FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

August 21 – August 22, 2024

U.S. Department of Veterans Affairs – Agency Updates

David Wagner, Department of Veterans Affairs



EO 14057

- Several of the EO's goals are directly relevant to utility services:
 - Carbon pollution-free electricity (CFE)
 - Fleet electrification
 - Building energy and water efficiency
 - Building electrification
 - Energy performance contracting, Climate Smart Buildings Initiative
- Agencies must coordinate major load changes with their utilities, and work with utilities for necessary changes to the services provided

Agency Approach

- VA created Sustainability Task Force (STF)
 - Enterprise-wide, senior membership, chaired by the VA Chief Sustainability Officer
 - Ensures awareness of initiatives and policy with interdisciplinary influences and effects
 - Topic-specific working groups report monthly to the STF
- STF is consulted on all major agency actions and policies relating to sustainability
- Governance structure allows for elevation to Department leadership

CFE Updates

- VA actively participates in all government-wide pathfinders. GSA, DOD and DOE are lead-agencies
- VA policy requires facilities to purchase CFE where available and not cost-prohibitive
- CFE can provide greater energy assurance, whether provided by a third party, or generated on-site
- Budgeting for CFE is challenging
 - Future year need, (sometimes) uncertain cost
 - But longer-term contracts provide greater price certainty
 - VA is building these costs into its annual budget
- VA reviewing its existing portfolio and programmed projects to identify best opportunities for new, expanded, or refreshed on-site CFE generation
- VA's Energy, Environment, and Fleet Program Service to begin comprehensive outreach to utilities regarding CFE – **but you can always call us first!**

Fleet Electrification Updates

- VA currently has 17,149 light-duty vehicles and 5,734 medium and heavy-duty vehicles
- VA has 647 confirmed EV orders in FY24, with 1,122 planned for FY25 – electric vehicle supply equipment (EVSE) is a limiting factor
- In 2023, VA installed 140 solar EVSE at 38 medical centers
- Also in 2023, VA awarded a contract to identify infrastructure and budgetary needs to prepare for full electrification
 - Studies are ongoing. 61 completed studies show a need of 56,548 KVA. 110 studies are outstanding
 - VA will award a contracts in FY24 and FY25 for construction of EVSE at up to 16 medical centers
 - Additional funding will be needed
 - Coordination with electric utilities is critical

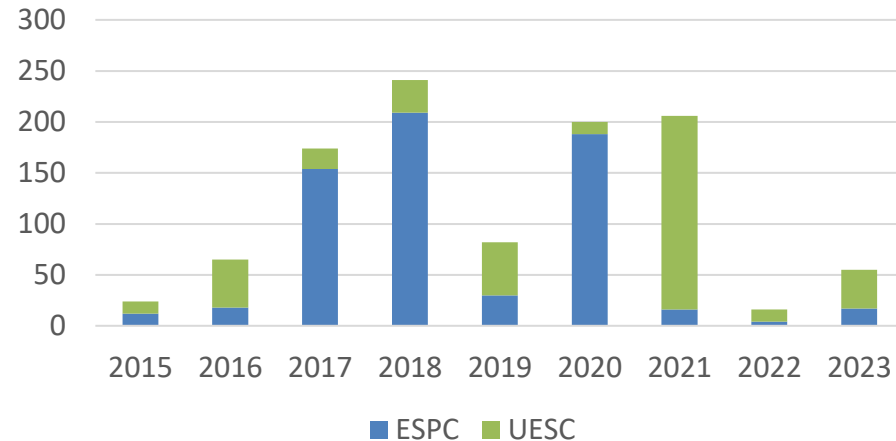
Net-Zero Buildings Updates

- New construction and major renovations of VA owned buildings over 25,000 gross square feet to be designed, constructed, and maintained as net-zero emissions buildings by 2030, and to fully comply with the Guiding Principles for Sustainable Federal Buildings.
- Feasibility analysis of fossil fuel-using equipment over \$5 million shall include an analysis of no or low-carbon alternative technologies and include the social cost of greenhouse gas emissions in the financial analysis.
- Facilities are encouraged to reduce freshwater consumption to greatest extent possible through metering, reduced landscape water use, and alternative water sources – water reduction is particularly challenging in a healthcare environment.
- Deep energy retrofits and Federal Building Performance Standard are targeted through building and campus replacement, and through comprehensive energy performance contracting.

Performance Contracting Updates

- \$1.19 billion awarded to date at 90 medical centers.
- 3 (anticipated) awards (approximately \$91 million) and six new starts in FY24.
- FY25 new start pipeline in development.

ESPC/UESC Investment since 2015 (\$, millions)



- Energy performance contracting allows VA to maximize its appropriations and see major gains in efficiency
- Not every energy and water challenge can be solved through performance contracting
- On-site CFE has proven particularly challenging in terms of cost effectiveness

Metering

- VA Metering Implementation Plan is VA's plan for metering buildings and sub-systems for electricity, water, chilled water, steam and natural gas
- VA anticipates awarding a contract to assess all campus-level utility meters and identify necessary work for improved reporting in FY24
- Accurate, precise metered data is needed to inform investment decisions and reporting, optimize building operational efficiency, and comply with 24/7 CFE requirements

Questions?

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Edison Electric Institute

Industry Update

Alexandra Young

August 21, 2024

2024 Industry Priorities



Clean Energy & ESG



Customer Affordability



Industry Financial Health



Policy & Regulatory Implementation



Preparing for Increased Electrification



Resilience & Grid Security



Siting & Permitting Reform

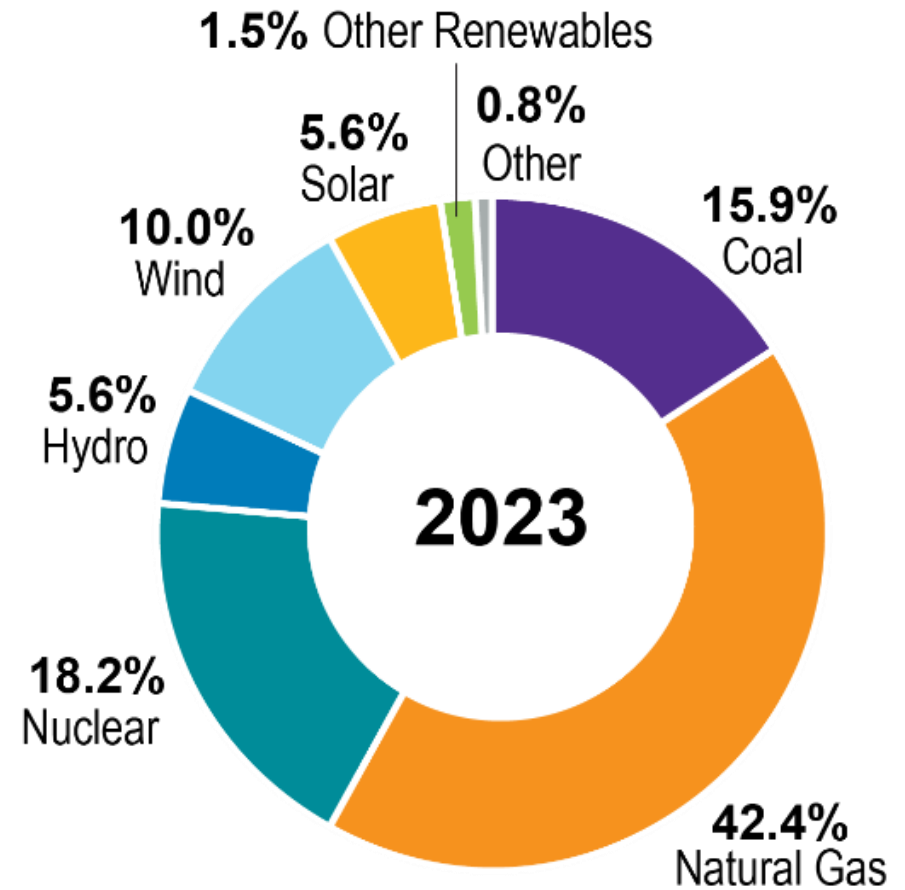
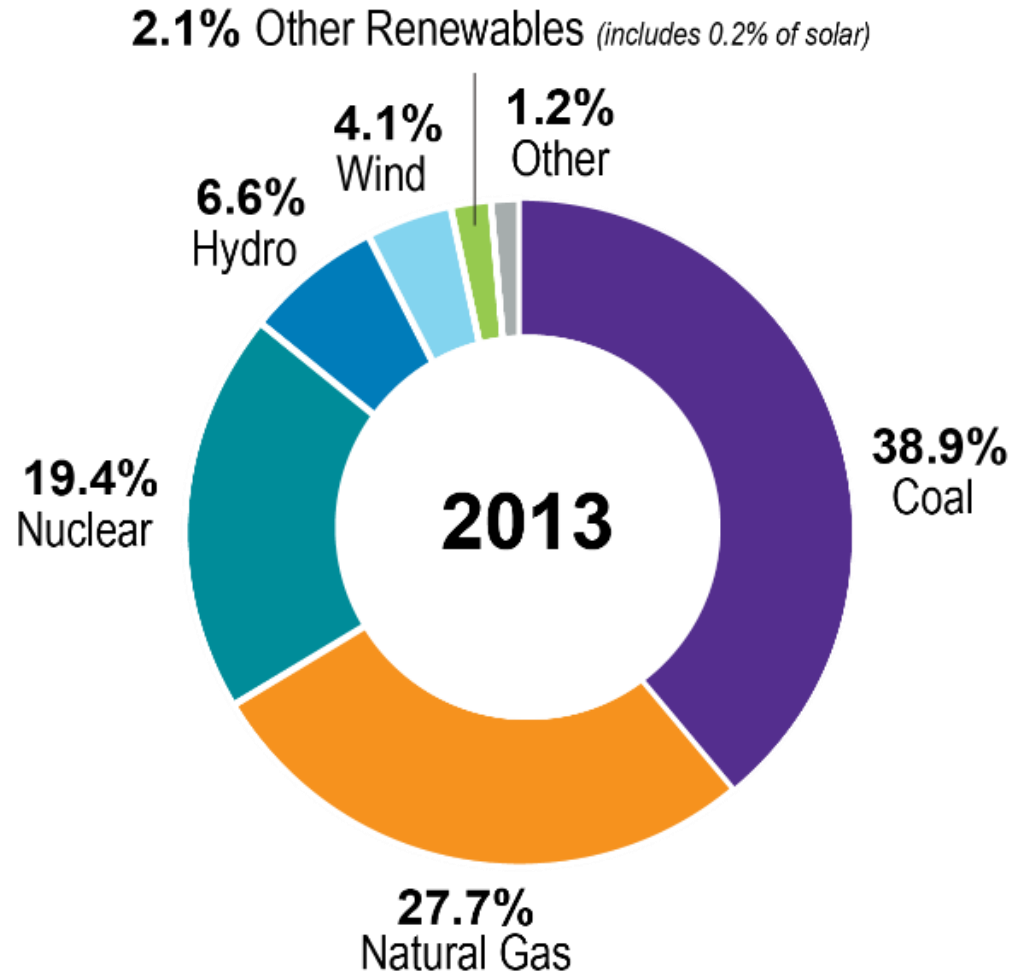


Storm Response & Wildfire Mitigation



Workforce Development

Transforming the Energy Mix



Note: In 2023, "Other Renewables" includes geothermal and generation from biomass sources (agricultural waste, landfill gas recovery, municipal solid waste, wood, non-wood waste). In 2013, "Other Renewables" also includes universal (or large-scale) solar and private (or rooftop) solar. Source: U.S. Department of Energy, Energy Information Administration.

Enhancing Grid Security & Resilience

EI and its members work across the industry, with other sectors, and with government partners to prepare for events.

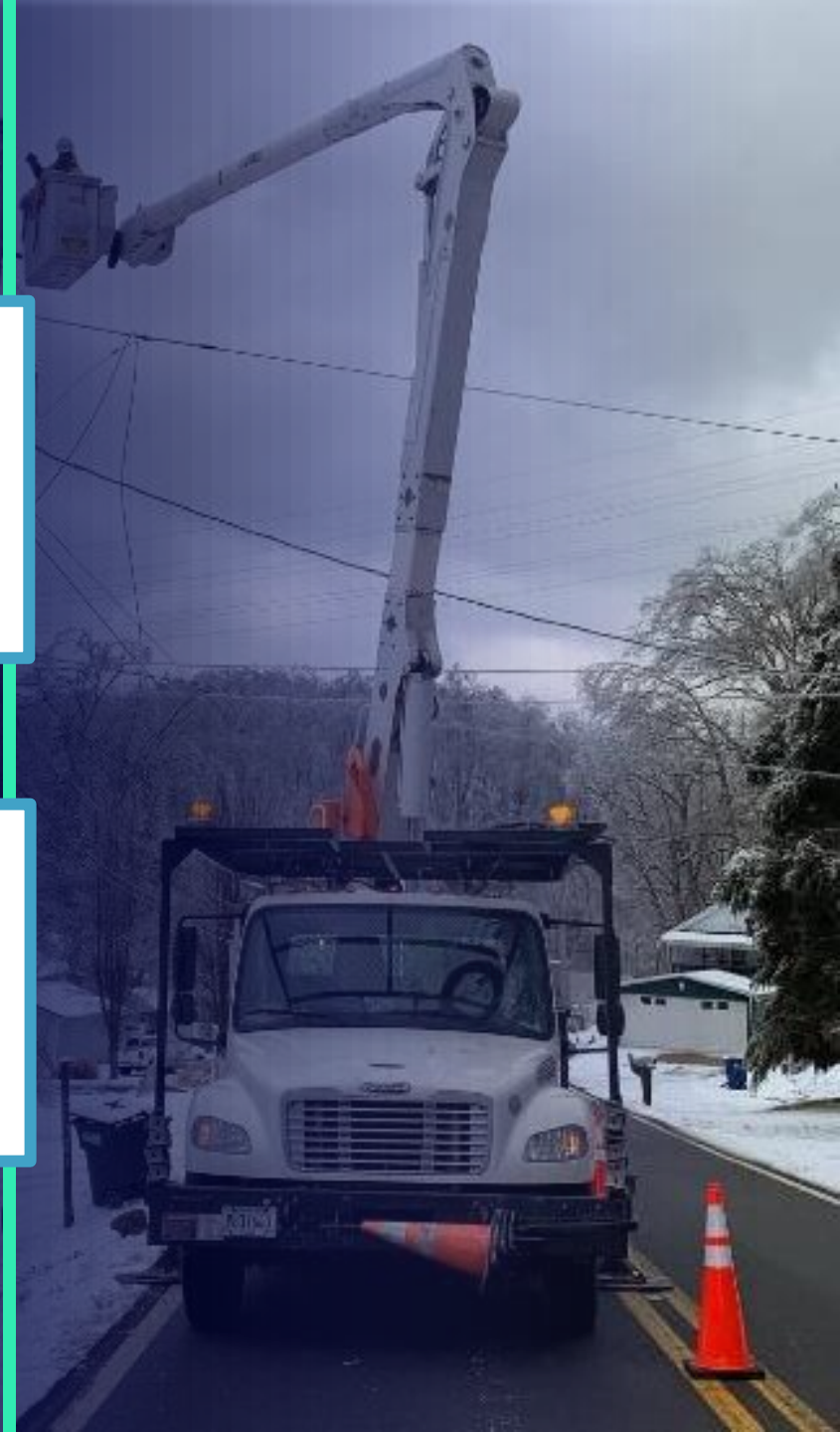


Storm Response & Wildfire Mitigation

The industry's mutual assistance network – a voluntary partnership of electric companies from across the country – helps with speeding up restoration.

**Mutual
Assistance**

**Spare
Equipment**



Meeting Increasing Demand for Electricity Over the Next Five Years



“Electricity peak demand and net energy growth rates in North America are increasing more rapidly than at any point in the past three decades.”

Efficiency

Electrification

Clean Energy

Resilience

Energy Project Authorities

GSA Areawide

Joint Resilience Planning

UESCs

Utility Privatization

Carbon-Free Energy

Nov. '22 - MOU between GSA and Entergy Arkansas

June '23 - GSA MOU with Xcel Energy

Oct. '23 - Southern Company and GSA MOU

April '24 - GSA MOU with El Paso Electric

June '24 - DoD joins Duke Energy's Green Source Advantage Program

April '23 - DOE and Xcel Energy MOU

Aug. '23 - Pepco and GSA working together to advance sustainability and decarbonization goals

March '24 - DoD announces participation in Florida Power & Light's SolarTogether Program

May '24 - DoD on behalf of all Federal agencies, partnership with Dominion Energy Virginia

Partnership Opportunities

**Joint
Resilience
Planning**

**Emergency
Response**

**Onsite
Generation
& Storage**

**Efficiency &
Demand
Response
Programs**

**Resilience
& Clean
Energy
Tariffs**

**EVSE
Support**

**SMR &
Technology
Exploration**

**Evolving
Energy
Needs**



EEI

Edison Electric
INSTITUTE

Power by Association™

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Public Power and Federal Partnerships

Paul Zummo

Director, Research and Development

American Public Power Association

Federal Utility Partnership Working Group Seminar

August 21-22, 2024

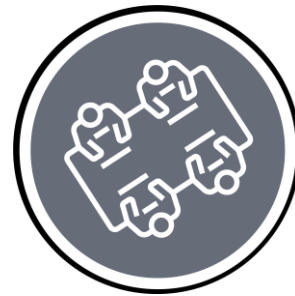
About APPA

The voice of not-for-profit, community-owned utilities that power 2,000 towns and cities nationwide

We serve our nearly 1,500 utility members & 220 corporate members through:



Offering education and professional development opportunities



Sharing information and building connections across the industry



Advocating for policies and regulations that support public power

About Public Power

Public power is:



Community-owned



Not for profit

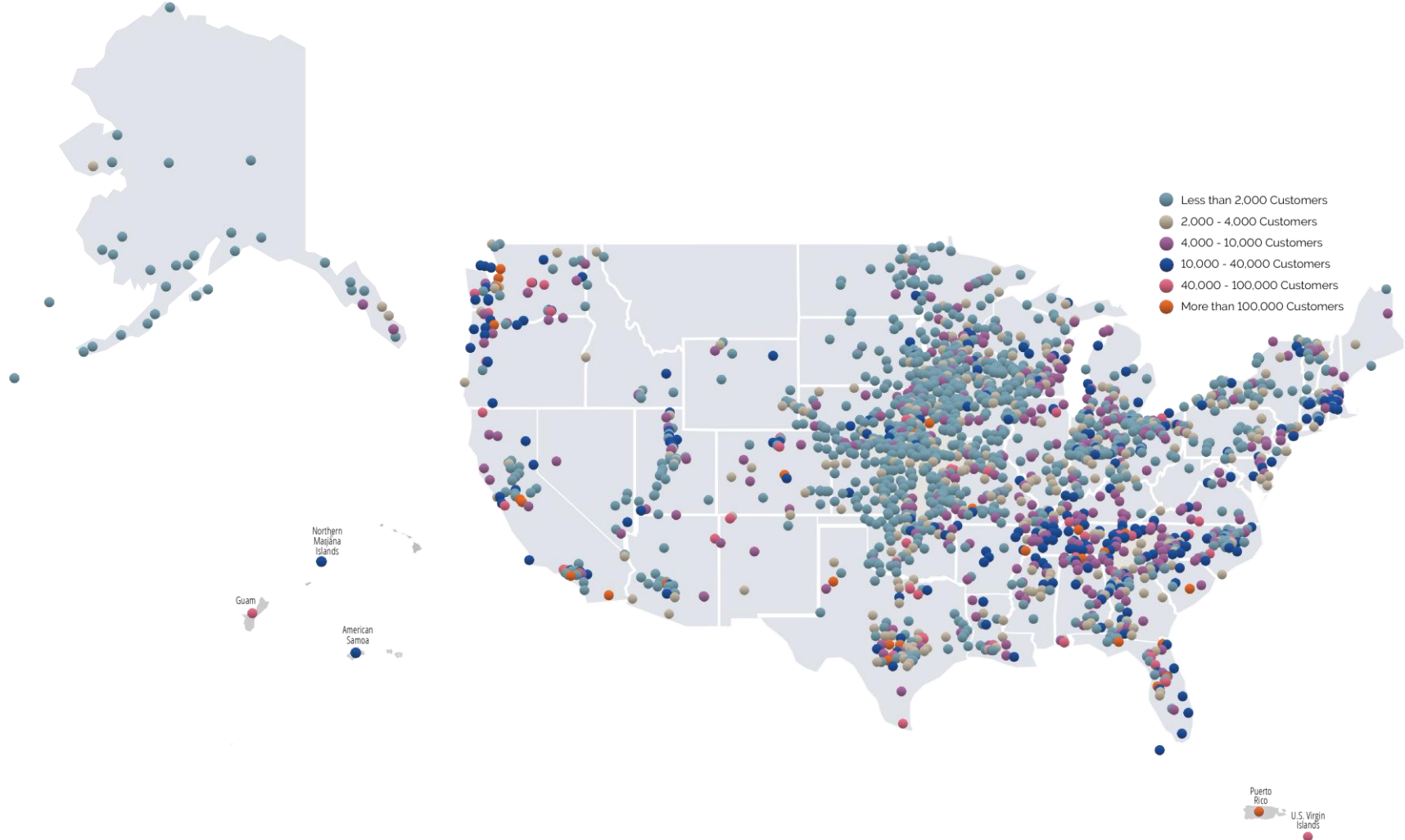


Locally operated

Public power employs **96,000** people



Public Power Serves 1 in 7 Americans



Key public stats

- 60% of electric utilities
- 49 of 50 states, plus five U.S. territories
- 15% of electric customers
- 10% of electric generation
- Serves approximately 54 million Americans
- Median customer count: 2,000

Public Power Diversity

- From the small (Burlington, OK – 76 customers) to the large (Puerto Rico Power Authority – nearly 1.5 million customers)
- Geographic diversity – all over the country, but concentrated on west coast, Midwest, and Southeast
- Different resource needs – some own all power generation needs, others totally reliant on wholesale purchases (either through JAA or market)
- Different approaches and attitudes towards energy transition

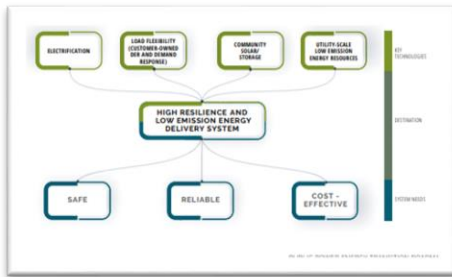
APPA-Federal Partnerships and R&D Efforts

R&D team leading two working groups under cooperative agreements

Energy Transition Community (ETC)

DE-OE0000928 “Programmatic Collaboration and Coordination with Public Power Utilities”

- A community addressing grid operations, reliability, resiliency and recovery in a future low emission electricity delivery system.
- Envision and communicate how public power will achieve low emissions goals and continue to deliver safe, reliable, and cost-effective electricity.



Energy Storage Working Group (ESWG)

DE-FE0032026 “Energy Storage Accessibility for Public Power Utilities”

- A working group designed to facilitate discussion, evaluate opportunities, and define barriers to integrating energy storage technologies.
- Promote successful deployment of energy storage technologies within public power through collaborative discussions, data capture, analysis, and best practices.

Organization	Project	Capacity	Status	Notes
Resolute Electric Light Department, Massachusetts	Battery Energy Storage for Transmission Cost Savings	2 MW (2x1 lithium-ion batteries)	Providing a transmission system benefits	A B C D
Landing Board of Heat and Light, Michigan	Energy Storage Options for Meeting Capacity Obligations	To be determined	Simulation and modeling to support storage investments	A B C D
Madisonville Public Utilities, Wisconsin	Battery Storage Pilot Project for Exploring System Dynamics	24.26 MWh lithium-ion batteries	Deploying pilot-scale test system	A B
New York Power Authority	North Country Energy Storage Demonstration Project	20 MWh lithium-ion batteries	Maximizing the use of carbon-free generation	C D E
Warefield Municipal Gas & Light, Massachusetts	Battery Energy Storage and Managed Technologies Improve Resilience and Reliability	5 MWh (2x1 lithium-ion batteries)	Exploring different options for storage	A B C D E

	Total Points Earned	Total Points Possible	Percentage Earned	Questions in Category	Maturity Level
Solution Development	18.75	30	62.5%	6	MS
System Impacts	14.00	25	56.0%	5	MC
Operational Changes	14.00	25	56.0%	5	MC
Project Economics	18.00	25	72.0%	5	MS
TOTAL	64.75	105	61.67%	21	MC

Table 10. Original Maturity Level Scoring Methodology

Maturity Level	Interpretation	Corresponding Evaluation Response
M1	Very low maturity level	Strongly Disagree
M2	Low maturity level	Disagree

Public Power Energy Transition Roadmap v2.0

- Roadmap serves as a guide for public power utilities looking to explore options and define their own path forward based on the needs of the communities they serve.
- Roadmap development relies on public power utility input.
- Roadmap will be evergreen and updated yearly.
 - Defining the Public Power Landscape
 - Defining the Destination
 - Defining the Road Forward
 - Benchmarks and Milestones
 - Refining the Roadmap



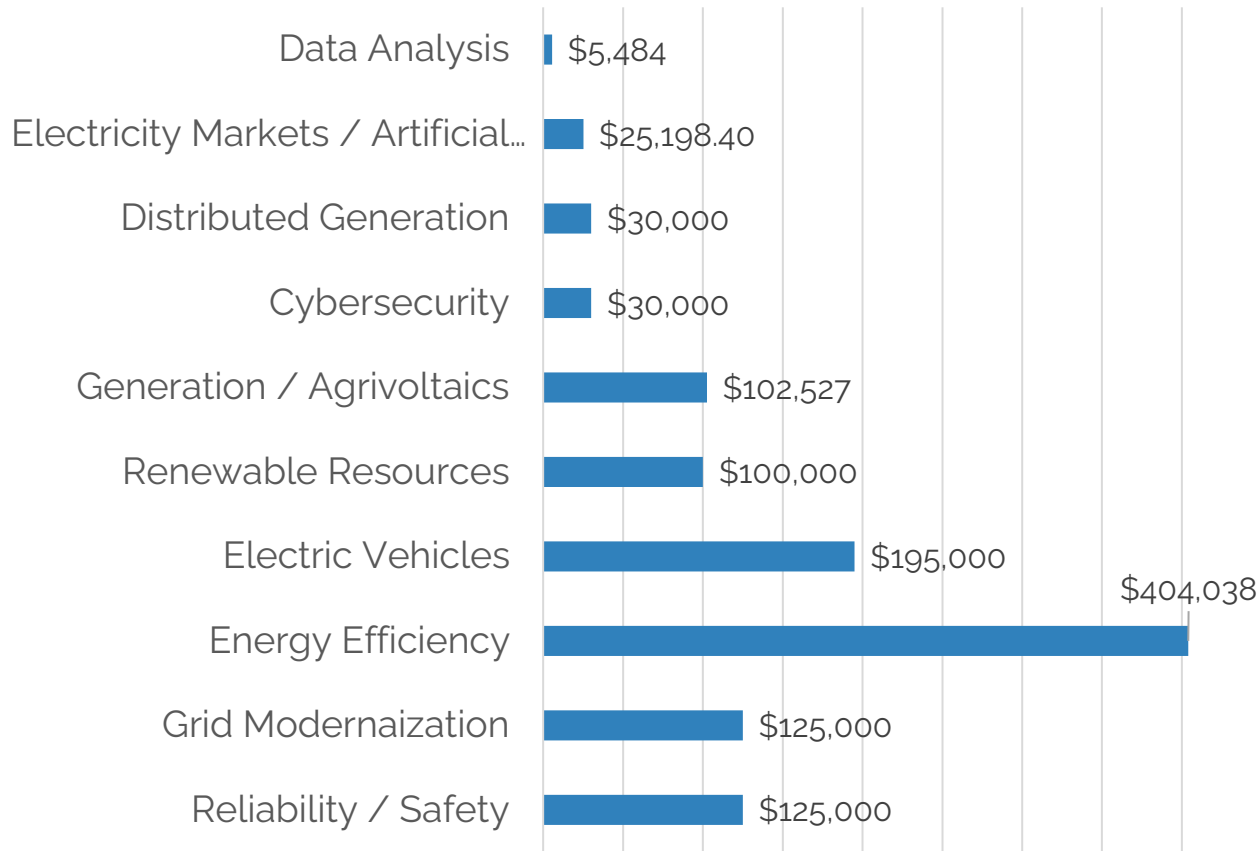
DEED supports and demonstrates public power's innovative activities through research, funding, and education

- **DEED Project Library** with over 750 projects' findings & deliverable
- **R&D co-funding** helps utility staff at 950 DEED member utilities try out new ideas
- **Scholarships** establish a pipeline for new talent & assist utility hosts
- **Technology transfer:** project results, reports & resources shared on webinars, monthly newsletter, listserv, and during APPA conferences
- **New APPA products** are often developed using DEED project findings

Completed Grants in 2023

- 15 grant projects were completed in 2023, totaling \$1,142,247

Completed Project Categories

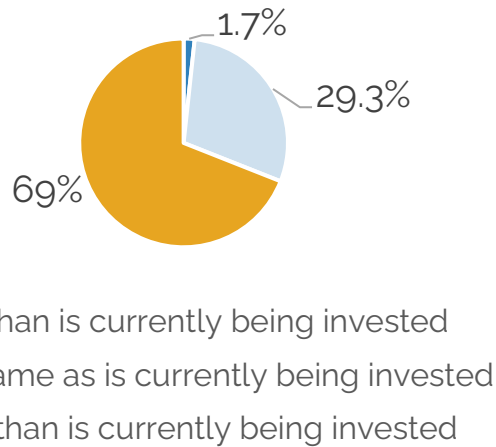


Project Name, Organization

- Overcoming Customer Barriers to Heat Pump Adoption with Customized Coaching Services, CMLP
- Solar Ecosystem and Agrivoltaics Leading Practices Guide, NYPA
- A Simplified Utility Program to Fight Climate Change, Tacoma Power
- Hydrogen Project Development Plan, NCPA
- Demonstration of Portable Solar Carport with Integrated EV Charger, NCSU FREEDM Systems Center
- Residential Line Voltage Smart Thermostats - A Joint Action Approach, WPPI Energy
- Smart Pole Solutions, KUA
- Efficient Electrification of Indoor Food Production, MRES
- ISO Data Integrated Generator
- Control Software using Artificial Intelligence, Littleton Electric
- Critical Infrastructure Lightning Protection (CILP), KUA
- 2nd Drive – Used EV Dealer Program, Energy New England
- Joint Action Agency Delivery of Cybersecurity Services to Small Utilities, MEAN
- Measuring Carbon-Based Incentives for Electrification, MMWEC
- Stochastic Modeling of Extreme Temperature Events, Huntsville Utilities
- Self-Service Ride & Drive and Rural EV Sharing, Northern Wasco PUD

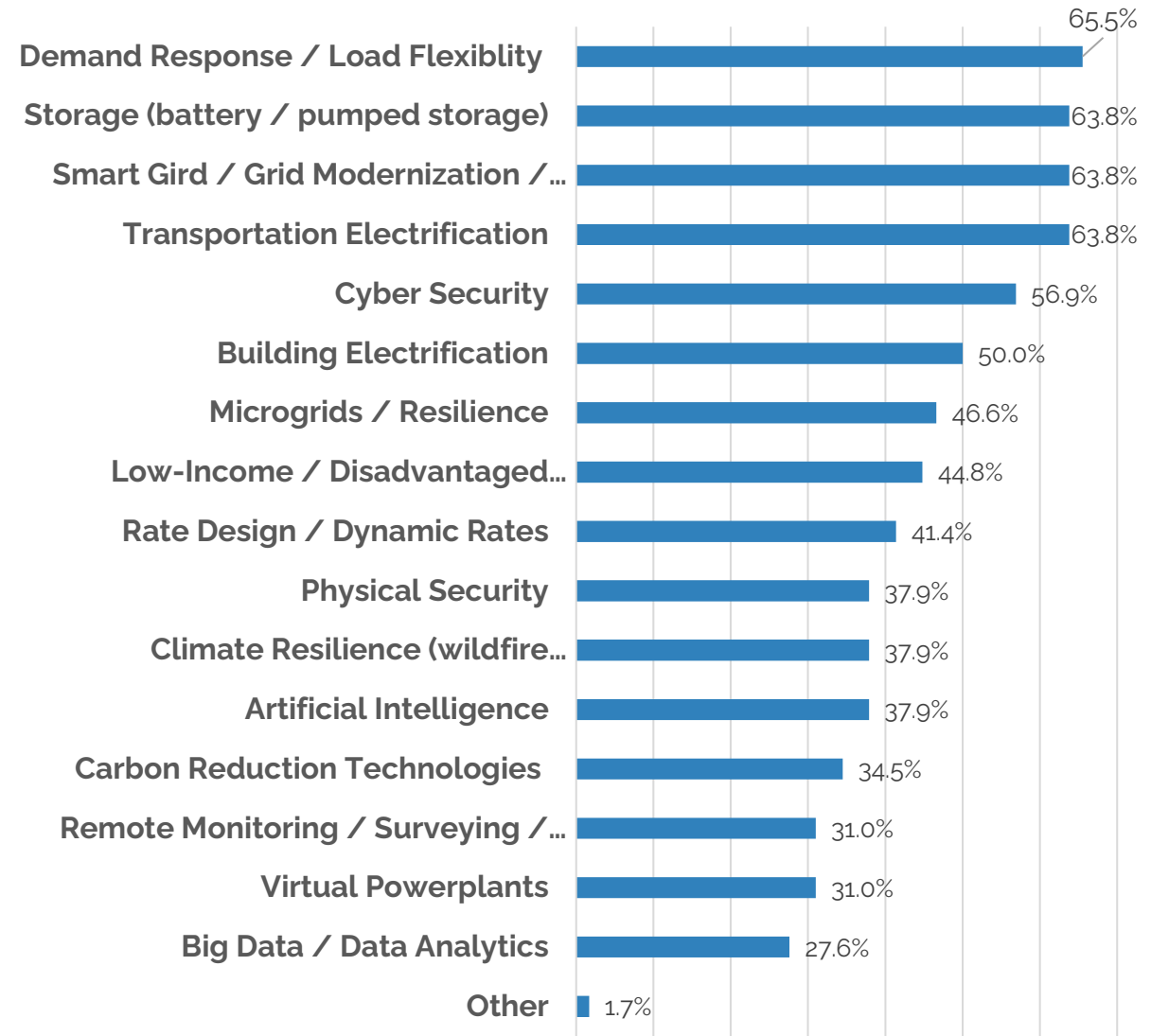
Investment for Public Power R&D

- A majority of respondents (69%) strongly believe that the level of investment in public power research and development needs to increase.



- Respondents noted that the following research topics would benefit their organizations in the next five years. The top five selections were:
 - Demand Response / Load Flexibility (65.5%)
 - Smart Grid / Grid Modernization / Grid Edge Intelligence (63.8%)
 - Storage (Battery / Pumped Storage) (63.8%)
 - Transportation Electrification (63.8%)
 - Cybersecurity (56.9%)

Research topics that would most benefit DEED members in the next five years:



FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

August 21 – August 22, 2024

Case Studies: Energy Recovery – Based IAQ, Efficiency and Decarbonization HVAC Technology

Scot Duncan, Conservant Systems

Hossam Kassab, Washington Headquarters Services



What We'll Discuss

- Technology Creation Reasoning and Proven Need
- Savings Summary
- SoCalGas/DoD UESC Results, over \$927,000 Annual Savings
- DoE/National Renewable Energy Laboratory Summer and Spring Testing
- Combining Heat Pumps and HEDS can 100% Decarbonize HVAC Systems
 - @ 20% to 50% Lower Energy Needs
- USACE-CERL – ESTCP Summer Season Testing
- Federal Laboratory – Puerto Rico Annual Testing
- Smallest Physical Equipment Room Needs, Can be Least 1st Cost Option
- Reduced LCC Adds Long Term Margin to UESC and ESPC Projects
- Complex Systems Fail in a DoD Maintenance Environment
- EPRI “IMPROVING HUMAN AND CLIMATE HEALTH” HEDS Discussion
- Savings Summary
- Contact Information

Technology Creation and Proven Need

- A USACE and NAVFAC HVAC SME discovered HVAC systems that were creating significant biological growth, wasting natural gas and electrical energy and causing maintenance backlogs.
- All the energy recovery HVAC systems that were evaluated were failing to perform, or literally failed, typically within 3-to-5-years after installation.
- A USACE Engineer requested that a low maintenance, energy efficient and cost-effective solution be developed to solve these reliability and performance problems.
- A highly effective technology was developed and demonstrated by USACE-CERL via ESTCP at two DoD bases in 2016, It is called the “High Efficiency Dehumidification System” (HEDS).
- The technology continues to be tested, demonstrated and vetted by the DoD-ESTCP, NAVFAC EXWC, NREL, NREL HQ Laboratory testing, DoE “High Impact Technology” Catalyst, USAF, California Energy Commission, AFWERX, Electric Power Research Institute and others.

Savings Summary

ESTCP has Demonstrated Numerous Technologies That Enhance UESC and ESPC Projects, This is One of Them

Project Description	Savings
SoCalGas / DoD UESC, Annual Savings	59% HVAC kWh, 97% Summer Nat Gas, 76% Annual Nat Gas
DoE HIT / NREL, Spring and Summer Tests	Chiller kWh Savings 38% to 78%, Natural Gas Heating/Reheating 56% to 99%
ESTCP – USACE CERL Summer Test Season, Two Bases	57% to over 70% HVAC savings 100% Natural Gas Savings
Federal Laboratory, Puerto Rico, Annual Savings	Over 50% HVAC Savings 100% Energy Recovery for reheat

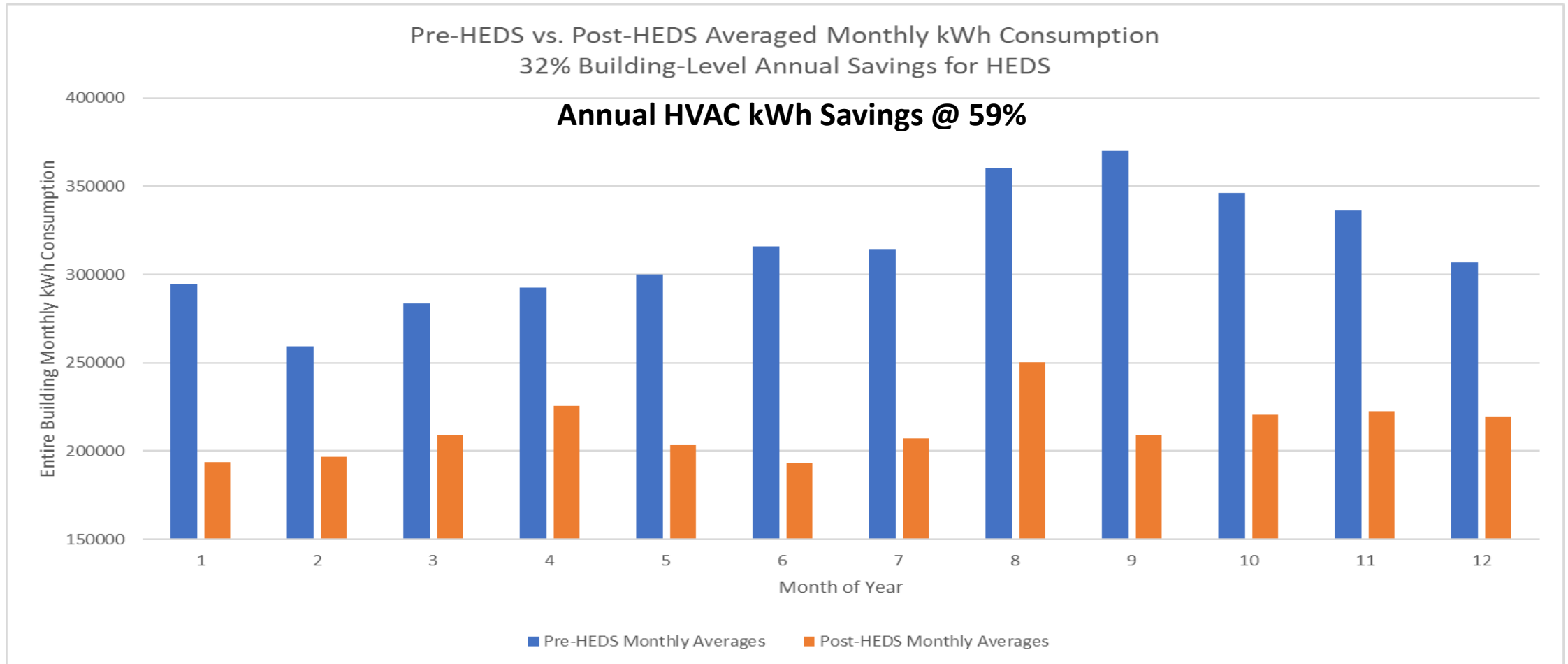
SoCalGas/DoD UESC Project Produces \$927,000/Year Savings

- The DoD and Southern California Gas Company teamed up to create an award-winning energy-recovery-based UESC project at a mission critical facility.
- The project was able to substantially improve resiliency and IAQ, while cutting natural gas, electricity and labor costs by over \$927,000.
- **This is 70% higher savings than the calculated savings in the UESC.**
- Annual HVAC electrical consumption was reduced by 59%.
- Summer natural gas use was reduced by 97%.
- Annual total building natural gas use was reduced by 76%.

SoCalGas UESC - Monthly kWh Consumption Profiles

Blue, Pre-HEDS Consumption Profile

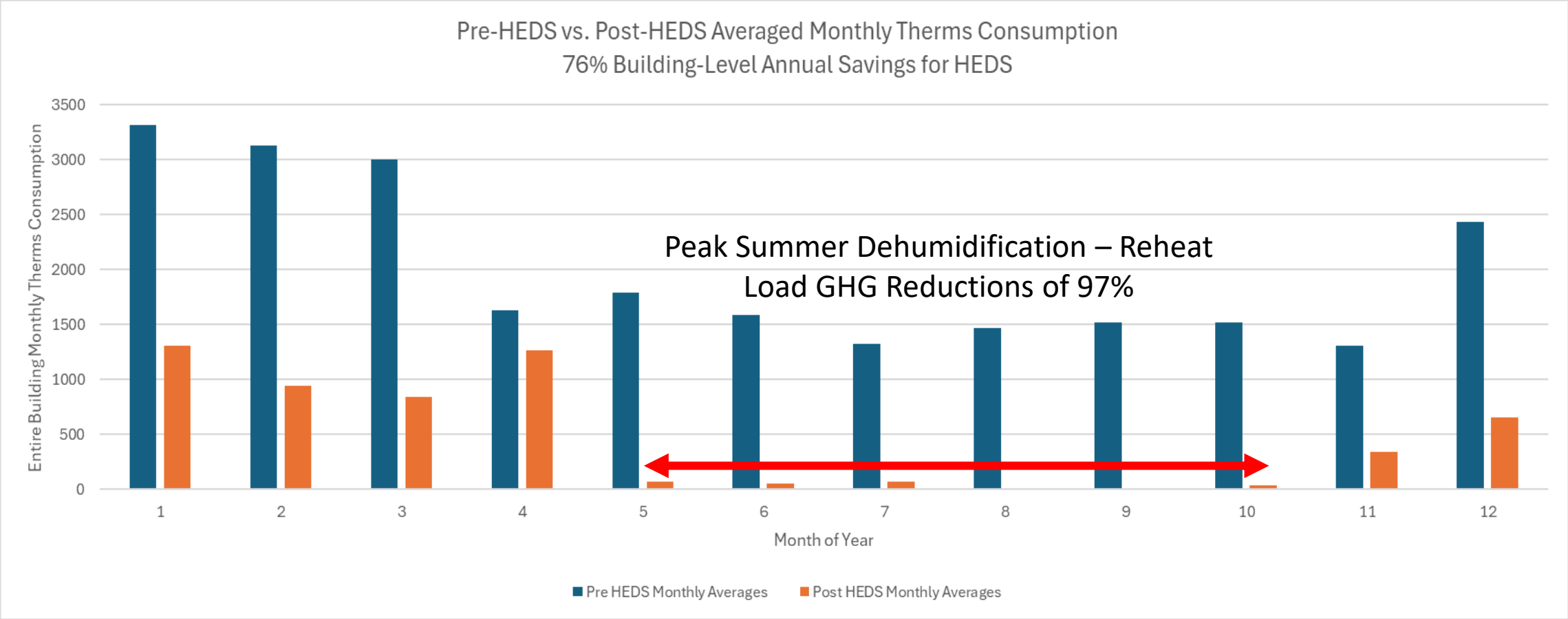
Orange, Post-HEDS Consumption Profile



SoCalGas UESC - Monthly **Therms** Consumption Profiles

Blue, Pre-HEDS Consumption Profile, Orange, Post-HEDS Consumption Profile

Annual HVAC Fossil Fuel Savings @ 76%



DoE High Impact Technology Catalyst (DOE-HIT)/NREL HEDS Field Testing

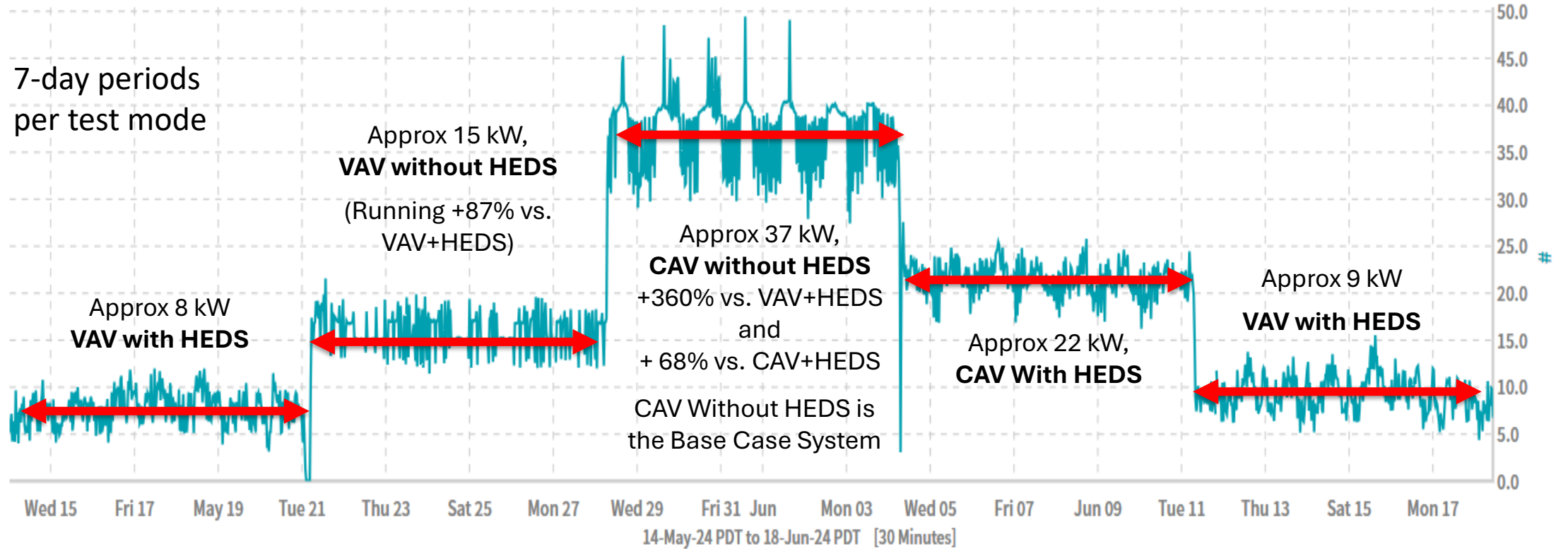
Summer Season / Spring Season

Chiller kWh Savings, **38%** to **78%**, Boiler Therms Savings **56%** to **99%**
(raw trend data comparison, not weather corrected, not yet peer-reviewed)

Modes Being Compared	Chiller kWh Consumption Savings with HEDS	Boiler kBtu Consumption Savings with HEDS
VAV without HEDS Energy Recovery vs. VAV with HEDS Energy Recovery	42% savings 47% savings	98% savings 56% savings
CAV without HEDS Energy Recovery vs. VAV with HEDS Energy Recovery	71% savings 78% savings	99% savings 82% savings
CAV without HEDS Energy Recovery vs. CAV with HEDS Energy Recovery	38% savings 41% savings	74% savings 59% savings

Chiller Plant kW - DoE - NREL

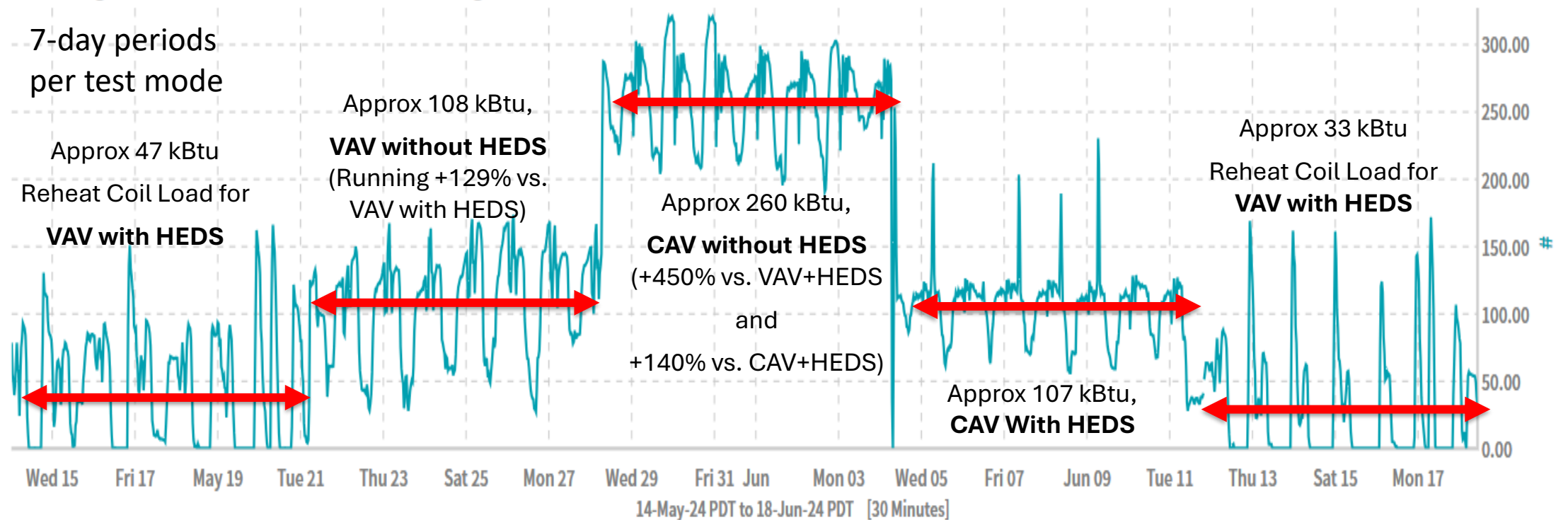
■ data_FromEMSkWChiller
 □ data_FromEMSkWCHWP1
 □ data_FromEMSkWCHWP2



Chiller Electrical Load Profile

- During VAV testing, chiller kW power draw increased by about 87% when HEDS was switched off.
- When the system was tested in its base case CAV W/O HEDS operation, kW draw was increased by about 360% vs. VAV+HEDS and approximately 68% more chiller kW than CAV with HEDS in operation.

Heating Load Total DoE & NREL Testing Reheat Zone kBtu Load

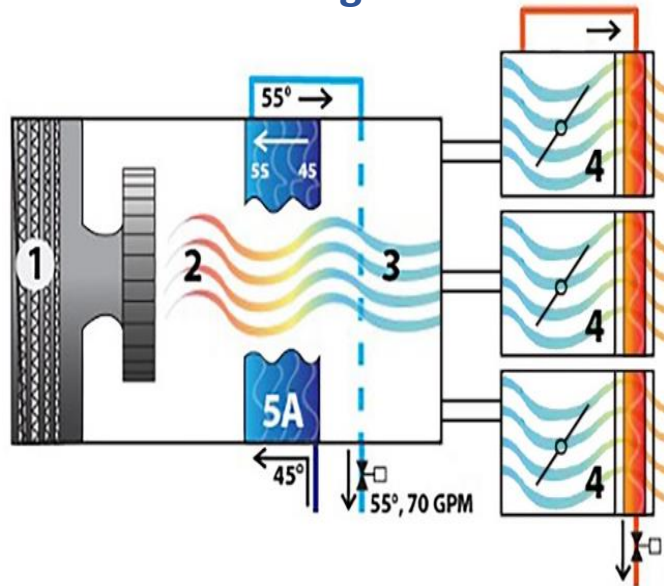


Reheat Zone Total kBtu Load Profile

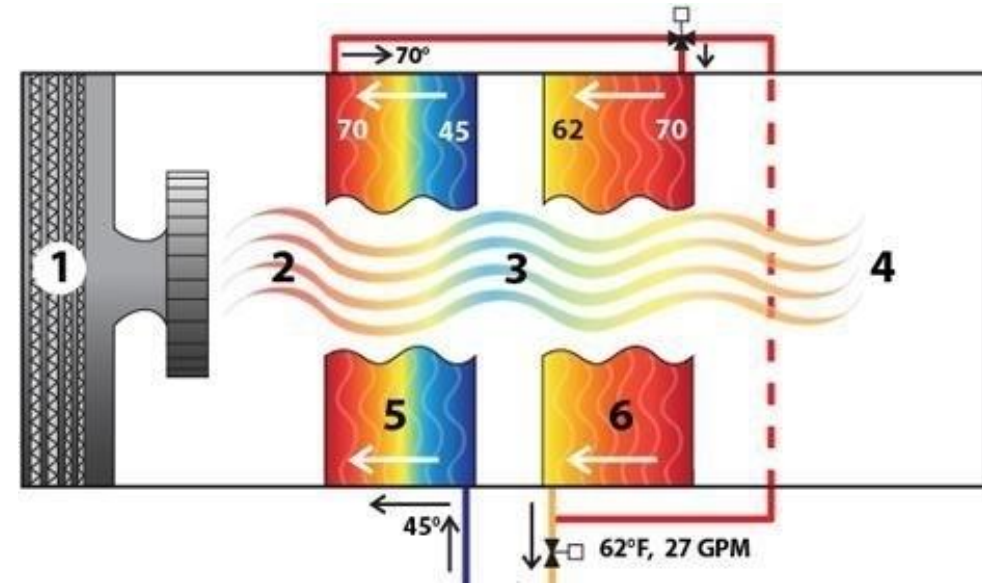
- During VAV testing, reheat coil kBtu use increased by about 129% when HEDS was switched off.
- When the system was tested in its base case CAV W/O HEDS operation, kBtu was increased by about 450% vs. VAV+HEDS and approximately 140% more kBtu than CAV with HEDS in operation.

Heat Pump Systems Can Be Great. Energy Recovery AHUs + Heat Pumps are Far Better.

Typical Base Case Sub-Cool /
Reheat AHU Diagram



HEDS Case Sub-Cool / Energy Recovery /
Reheat AHU Diagram



**HEDS Energy Recovery and HVAC Optimization System Can
Improve Heat Pump System Efficiency by 20% to Over 50%**

2016 ESTCP Proof of Concept Was Successful

US Army Corps of Engineers – Construction Engineering Research Laboratory
Environmental Security Technology Certification Program (ESTCP)

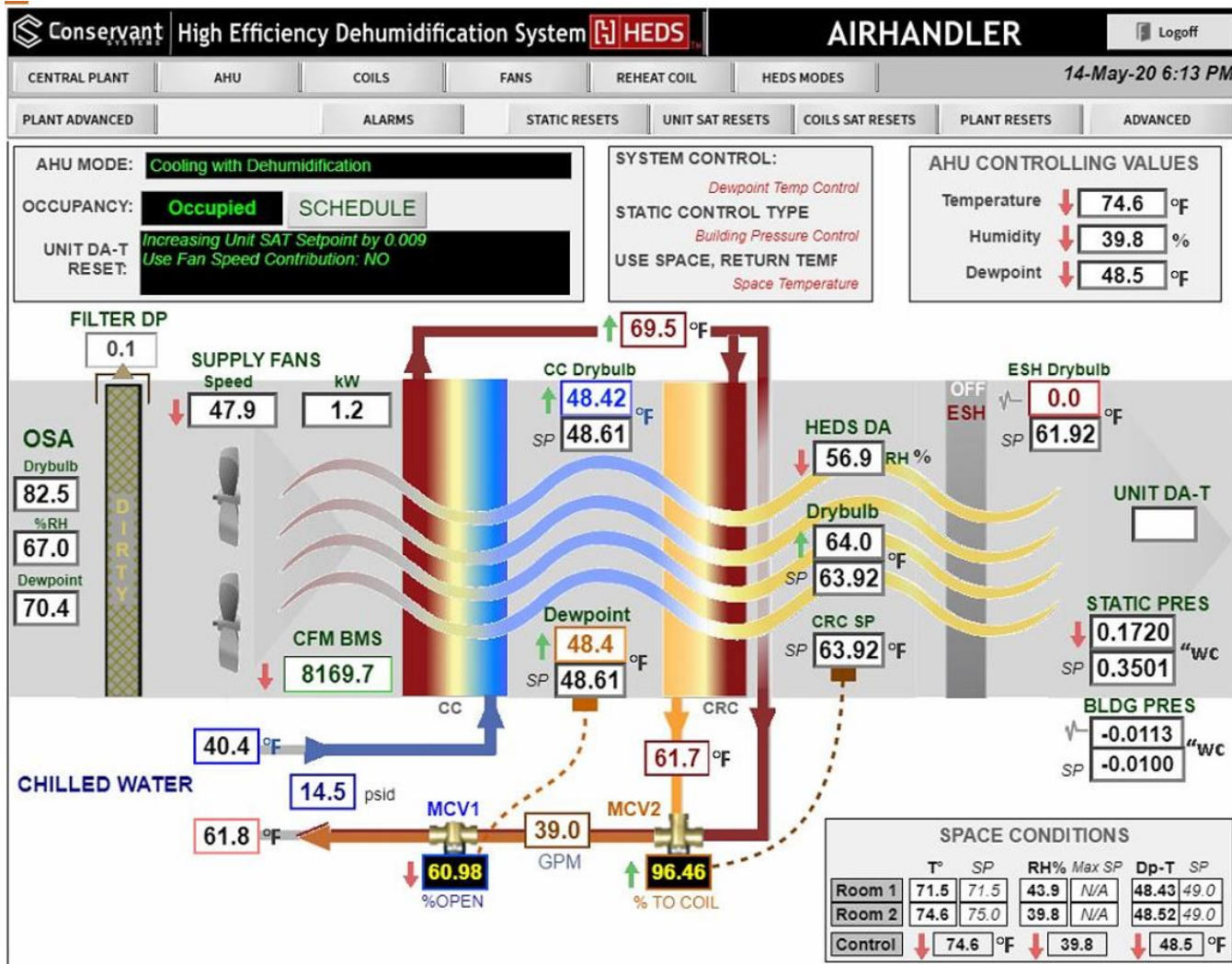
FIELD PERFORMANCE RESULTS FOR HEDS – Six Month Summer Test Duration

LOWEST DEHUMIDIFICATION/REHEAT SAVINGS IS STILL >57%

APPLICATION	SUPPLY DEWPOINT TEMPERATURE RANGE (LOWER = DRIER)	COOLING LOAD % REDUCTION	RE-HEATING LOAD % REDUCTION	TOTAL DEHUMIDIFICATION-RELATED COOLING + HEATING SAVINGS
OPERATING ROOMS, CLEAN ROOMS	< 50°F	20%	100%	> 57%
DINING FACILITIES, BARRACKS, DOAS, GENERAL HOSPITAL AREAS, LABS	50 - 52°F	31%	100%	> 63%
LESS HUMID ENVIRONMENTS	52 - 56°F	37%	100%	> 67%
OFFICE & ADMINISTRATIVE	50 - 56°F	27-29%	100%	> 70%

100% OSA Puerto Rico Lab @ 40% Indoor Relative Humidity

Energy Recovery HVAC performance in a 100% OSA Federal Lab facility on Coastal San Juan Puerto Rico. Relative Humidity Mimics Guam RH.



Screen shot data shown keeping the 100% OSA lab on Puerto Rico at **40% RH**, supplying 48.4°F dew point air at 64°F dry bulb, **using 100% recovered energy for reheat, saving >40 kW of electric strip re-heat energy use.**

Cooling coil CHW TD is 29.1°F : Cuts CHW pump energy by >75%.

26.5% cooling load reduction.

100% reheat load reduction – providing 15.6°F of carbon-free recovered reheat energy.

2-pipe system provides both dehumidification and reheat using recovered energy.

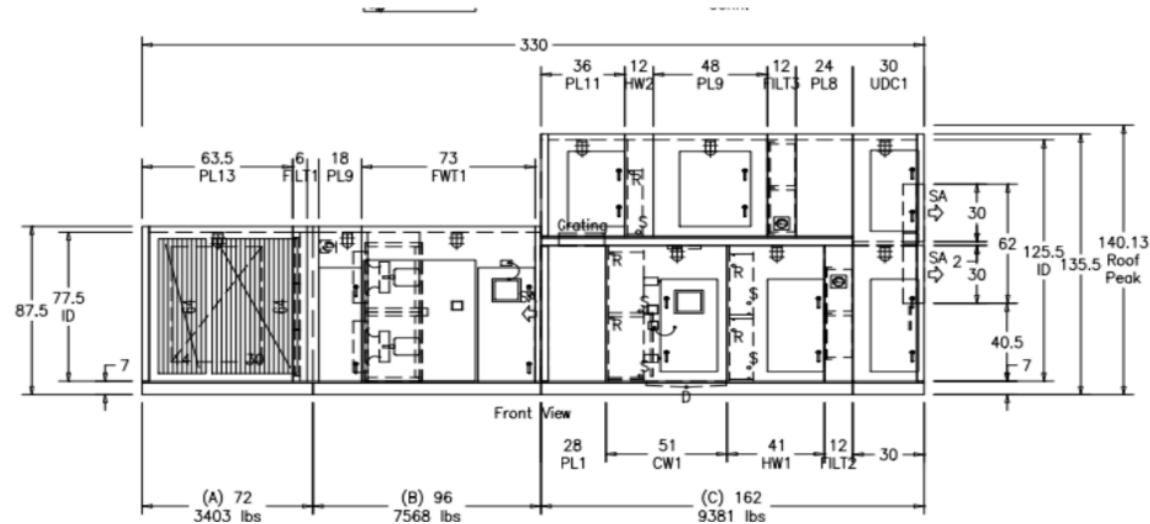
Physically Smallest/Lowest Maintenance

Compared to Most Energy Recovery HVAC Systems, HEDS is a Smaller, Simpler, Lighter, Easier to Install and Maintain Energy Recovery – Based Decarbonization Air Handling System

This is a real-world example of how small HEDS can be and how it compares to the smallest, but energy intensive, sub cool-reheat AHU.

A medical office building was fully designed using sub cool-reheat AHUs, with no energy recovery for temperature and relative humidity control. The week before bids were due, the energy manager discovered the project and requested that HEDS be an option. The same AHU manufacturers representative for the base case design sized up the HEDS energy recovery-based AHUs based on the HEDS performance and construction requirements.

**ROOFTOP AHU #1 LAYOUT:
HEDS AHU SIZE VS TRADITIONAL AHU SIZE
SAME AS ORIGINAL FOOTPRINT, 12" TALLER, 1,633 LBS. (9%) HEAVIER**



AH Unit Name	Increased Height	Increased Width	Increased Length	Increased Weight
AHU-1	140" vs 128", 9.5%	0"	0"	1,633 #, 9%
AHU-2	152" vs 139", 9.5%	0"	0"	2,694 #, 11.5%
AHU-3	84" vs 82", 2.5%	0"	2", 0.5%	1,450 #, 11%

The results surprised everyone: minimal height increase of 2" to 13" (2.5% to 9.5%), no increase in width, maximum increase in length of 2" (0.5%), maximum weight increase of under 12%:

Can be the Least First Cost Option

- **For each of the projects described in this training, HEDS was the least first cost option relative to other energy recovery technologies.**
- For many other sites, the HEDS technology can be the least first cost option for both new construction and retrofit/ repair/ replace projects.
- A HEDS based chiller plant or heat pump-based system can be designed, built and operated with 20% less cooling capacity than a “typical” chiller or heat pump.
- HEDS can fit into most retrofit AHU mechanical rooms, where other technologies will not fit, reducing infrastructure upgrade and equipment/ duct/ pipe relocation and augmentation costs (\$\$\$).
- HEDS can deliver twice the cooling Btu per gallon of chilled water delivered, reducing the need to upsize the installed CHW piping infrastructure (\$\$\$) when facilities are added to existing CHW loops.

Complex Systems Fail in a DoD Maintenance Environment

- Many bases don't have the manpower or funding to keep complex systems running properly. **ESPC projects try to run lean maintenance teams to enhance cash flow, UESCs rely on base maintenance teams.**
- When starved of maintenance, systems fail to perform or completely fail, causing \$100's of millions of damage each year to facilities, munitions, weapons platforms and stored equipment.
 - Troop health, productivity, readiness and resiliency suffer as a result.
- The HEDS technology described in this training, is a simple, straightforward energy recovery RH control solution designed to “Survive and Thrive” in the DoD maintenance environment.
- **Maintaining, repairing and replacing complex, maintenance and failure-prone HVAC systems will drain ESPC Contractor bottom lines.**

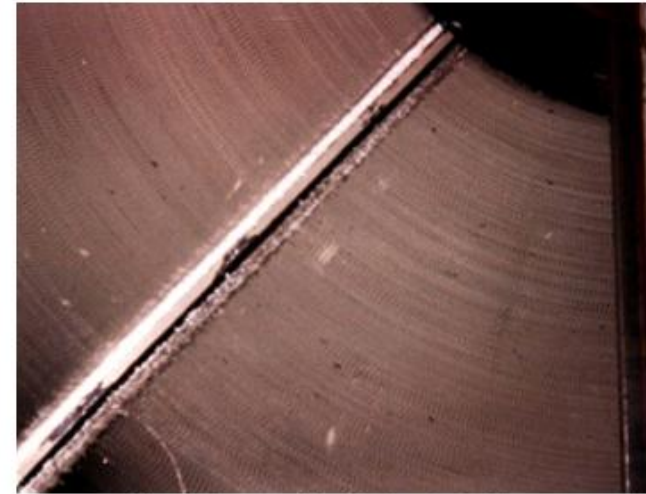
A Few Rotating Wheel Failure Pathways



Wheel with Permanently Lubricated Bearing in the Outside Airstream



Wheel Damaged by Spoke Deflection



Wheel Damaged by Spoke Deflection

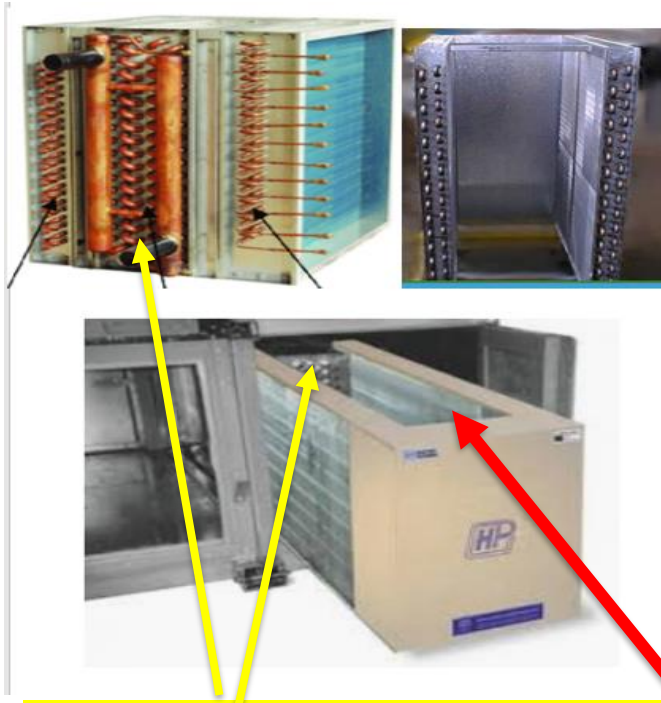


Wheel with Deformed Media Due to Lack of Glue

The two wheels shown above both failed due to abrasion of the media caused by spoke deflection. The maintenance staff had tried securing the loose media of the wheel with silicone and expansion foam. The wheel pictured to the right media had moved enough to cause the wheel to stop rotating. Spoke deflection should not exceed $\pm 1/32$ " when measured at the outer radius. There is another advantage to limiting spoke deflection. The less deflection the closer to the rotor the seals can be set, reducing bypass and increasing performance. There is also no metal fatigue in a spoke designed to limit deflection.

Wrap Around Refrigerant Heat Pipes (WAHP)

How do you clean all faces of the cooling coil when you can't even see the coil? You need a HUGE mechanical room, and you need to disassemble the AHU every time.



For even partial temp. and RH control across a range of conditions, you need to add 6 coil rows upstream and 6 coil rows downstream.

- The cooling coil is in there someplace!
- No room for UVGI...
- If installed with access doors to allow cleaning, this adds 6' to 7'+ to the length of an AHU.
- Width of the mech. room must include ability to pull and rotate WAHP coil sections. Room is probably 2.7X the AHU width. Ask any maintenance person if they think this looks like a good idea...

How often does disassembly of the AHU to clean all six of the coil faces happen in the real world?

That is a cooling coil buried in there...the AHU has to be taken apart to clean the coils.

Is the Mech room wide enough? How can you eventually replace the U-shaped coils? How do you find and repair refrigerant leaks?

How do you get UVC lights in there?



🕒 MONDAY, DECEMBER 5, 2022

IMPROVING HUMAN AND CLIMATE HEALTH

- Electric Power Research Institute (EPRI) Journal

“IMPROVING HUMAN AND CLIMATE HEALTH”

- The Electric Power Research Institute (EPRI) Journal article titled “IMPROVING HUMAN AND CLIMATE HEALTH” includes great explanations on how the HEDS electrification energy recovery system works:

- <https://eprijournal.com/improving-human-and-climate-health/>

Savings Summary

ESTCP has Demonstrated Numerous Technologies That Enhance UESC and ESPC Projects, This is One of Them

Project Description	Savings
SoCalGas / DoD UESC, Annual Savings	59% HVAC kWh, 97% Summer Nat Gas, 76% Annual Nat Gas
DoE HIT / NREL, Spring and Summer Tests	Chiller kWh Savings 38% to 78%, Natural Gas Heating/Reheating 56% to 99%
ESTCP – USACE CERL Summer Test Season, Two Bases	57% to over 70% HVAC savings 100% Natural Gas Savings
Federal Laboratory, Puerto Rico, Annual Savings	Over 50% HVAC Savings 100% Energy Recovery for reheat

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EESI
Environmental and
Energy Study Institute

**Federal Utility Partnership Working Group Seminar
Utility Energy Service Contracts Best Practices**

The Broad Impact of Performance Contracts

Daniel Bresette

Wednesday, August 21, 2024

About EESI



Non-partisan Educational Resources for Policymakers

107

A bipartisan group of members of Congress founded EESI, which since 1984 has provided essential, non-partisan information about environmental, energy, and climate topics to policymakers



Direct Assistance for Equitable and Inclusive Financing Program

In addition to a full portfolio of federal policy work, EESI provides direct assistance to utilities to develop and implement on-bill financing programs in rural areas



Commitment to Diversity, Equity, Inclusion, and Justice

We recognize that systemic barriers impede fair environmental, energy, and climate policies and limit the full participation of Black, Indigenous, people of color, and legacy and frontline communities in decision-making



Sustainable Solutions

Our mission is to advance science-based solutions for climate change, energy, and environmental challenges in order to achieve *our vision of a sustainable, resilient, and equitable world*

The Broad Impact of Performance Contracts

Performance Contracts Deliver a Lot of Benefits



- ✓ Reducing Waste
- ✓ Stewarding Taxpayer Dollars
- ✓ Advancing Agency Missions and Goals
- ✓ Reducing Greenhouse Gas Emissions

- ✓ Adapting and Improving Resilience
- ✓ Demonstrating Leadership by Example
- ✓ Creating Jobs and Providing Training Opportunities
- ✓ Facilitating Investments in Other Priorities

- ✓ Improving Facility and Fleet Operations
- ✓ Leveraging Private Sector Capabilities
- ✓ Strengthening Critical Infrastructure
- ✓ Innovating and Transforming Markets

The Broad Impact of Performance Contracts

Climate Change—We Have a Lot of Work to Do

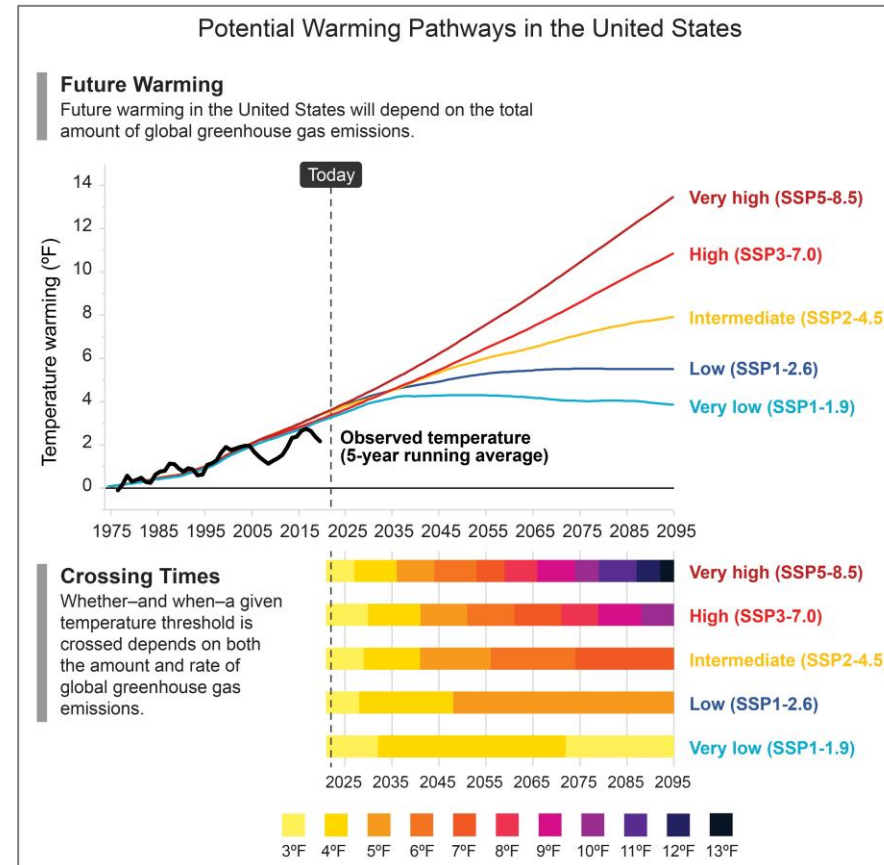
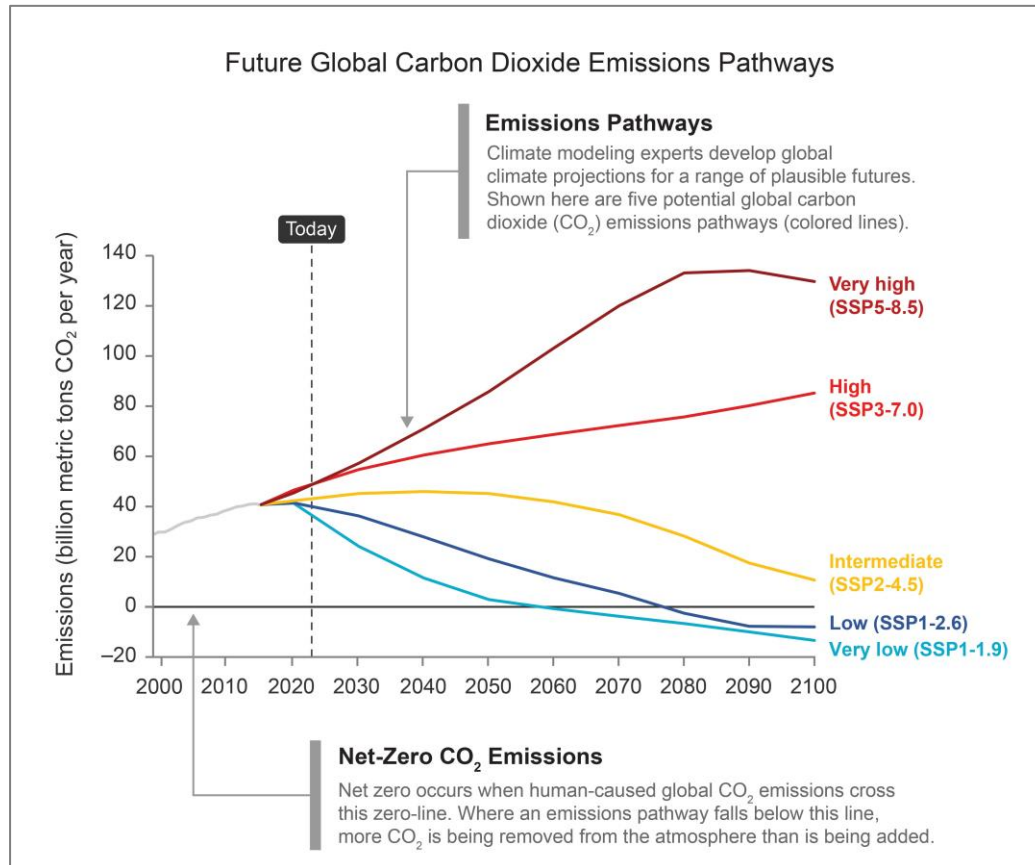


EESI
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We Have to Reduce Greenhouse Gas Emissions by a Lot

109

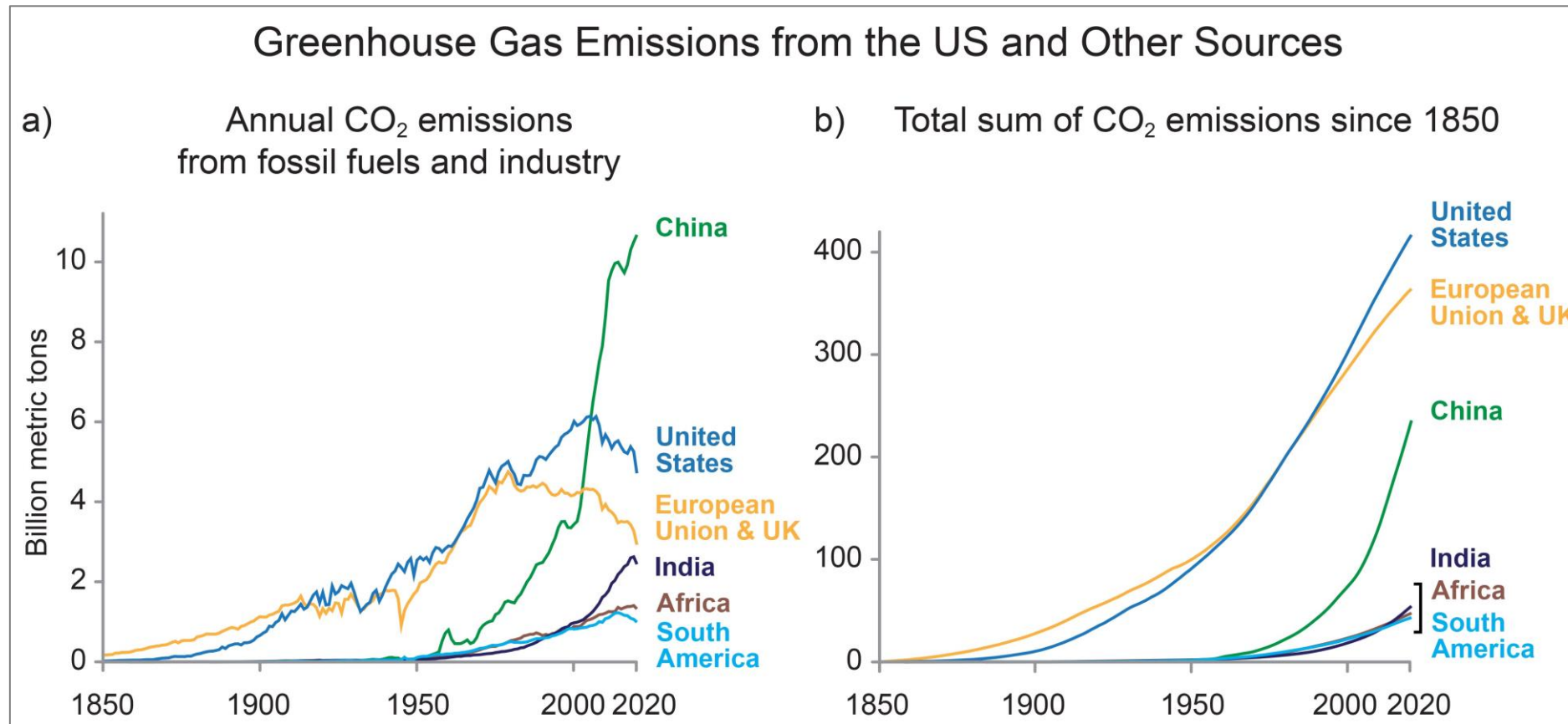


Learn more: <https://www.eesi.org/briefings/view/011824nca>



We Have to a Lot of Responsibility to Demonstrate Leadership at Home and Abroad

111



☑ Reducing Greenhouse Gas Emissions



These public-private partnerships leveraged \$480 million in FY2023 for clean energy projects that will reduce GHG emissions by about 73,000 MT CO₂e

☑ Reducing Greenhouse Gas Emissions



What are
performance
contracts?

☑ Investing in Adaptation and Resilience



Helping federal agencies manage energy and water infrastructure, adapt to meet critical mission objectives, and decarbonize buildings and fleets are among this DOE program's responsibilities

✓ Investing in Adaptation and Resilience



What is
FEMP?

☑ **Leading by Example**



The government of this country used about 1.2 quads of primary energy and emitted about 63 million MTCO₂e of GHG in FY2022, which are actually reductions compared to FY2008

☑ Leading by Example



What is
the
U.S. ?



Reducing Greenhouse Gas Emissions...

...with the Potential to Reduce Greenhouse Gas Emissions by Even More!



Investing in Adaptation and Resilience...

...with the Potential to Contribute Even More to Energy System and Community Resilience!



Leading by Example...

...with the Potential to Contribute Even More to U.S. Climate Change Commitments!



Delivering Multiple Other Benefits...

...with the Potential to Provide Even More Benefits and Value to U.S. Taxpayers!



EESI

Environmental and
Energy Study Institute

Thank you!

**Daniel Bresette
President**

(202) 662-1881

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www.eesi.org

FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

August 21 – August 22, 2024

Best Practices and Considerations with Escalation Rates

Christine E. Walker, PhD, PE, CEM, CMVP

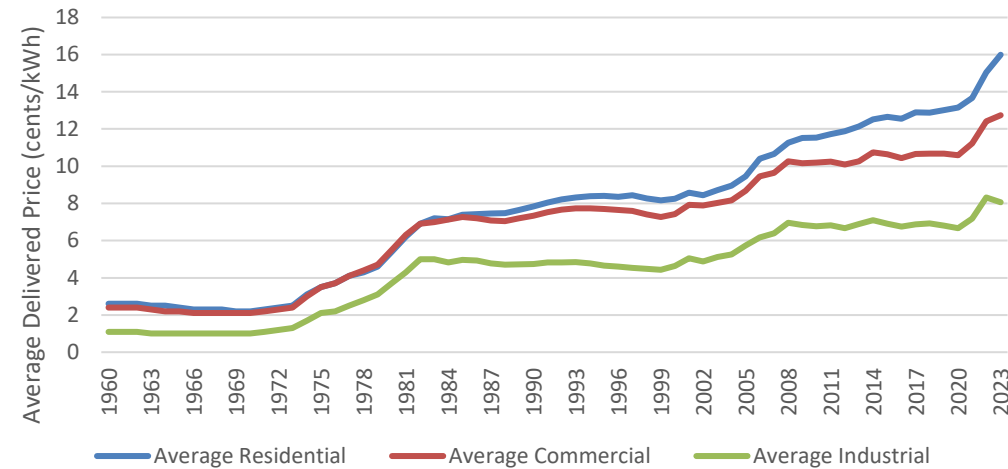
Pacific Northwest National Laboratory



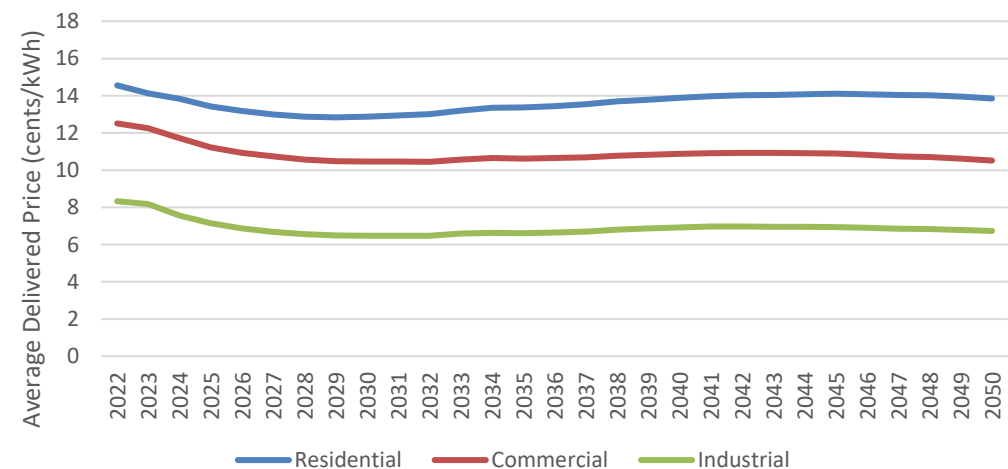
Escalation Rates – So What?

- Utility rates change (typically increase) over time
- Agency typically accepts energy price risk
- Escalation rates are critical in determining value of future energy cost savings
 - Estimating future utility prices can impact project economics
 - Historical data may not accurately project future costs

Historical Electricity Prices



Projected Electricity Prices



Escalation Rates – Desired Outcome

- Future rates over term of contract are not known
 - 20+ year contract term
- Escalation rate impacts during contract term:
 - Over-estimated: payments > savings
 - Under-estimated: excess savings (could have shortened contract term and/or increased scope)
- Goal is uniform escalation rate applied over contract term
- How can we best estimate them, taking into account what we know now?



Real Escalation Rate: rate of change in price for a particular good or service (e.g., utilities)

Nominal Escalation Rate: rate of change in price, including long-term inflation

Energy Escalation Rate Calculator

- Standard for setting escalation rates for federal performance contracts (long-term)
- Developed by NIST to calculate average energy cost escalation rates given location, contract term and sector (commercial vs. industrial)
- Uses rates projected by DOE's Energy Information Administration (data and methodology defined in 10 CFR 436)
- All energy types
 - Electricity, natural gas, propane, etc.
 - Includes social cost of carbon options

NIST Energy Escalation Rate Calculator
(Loaded 2024 dataset)
To use, complete all form fields. Computed results are shown immediately at the bottom of the page.
The EERC User Guide is here: [HTML](#) [PDF](#)

Percent of Energy Cost Savings

Coal	Distillate Oil	Electricity	Natural Gas	Residual
0 %	0 %	0 %	0 %	0 %

Total
0 %
Must equal 100%

Fuel Rate Information

Location:
Sector:

Contract Term

Start Date:
Years Duration:

Social Cost of Carbon Assumptions

SCC:

Annual Inflation Rate

Annual Energy Escalation Rate

RESULTS

REAL:
NOMINAL:
Fix selections

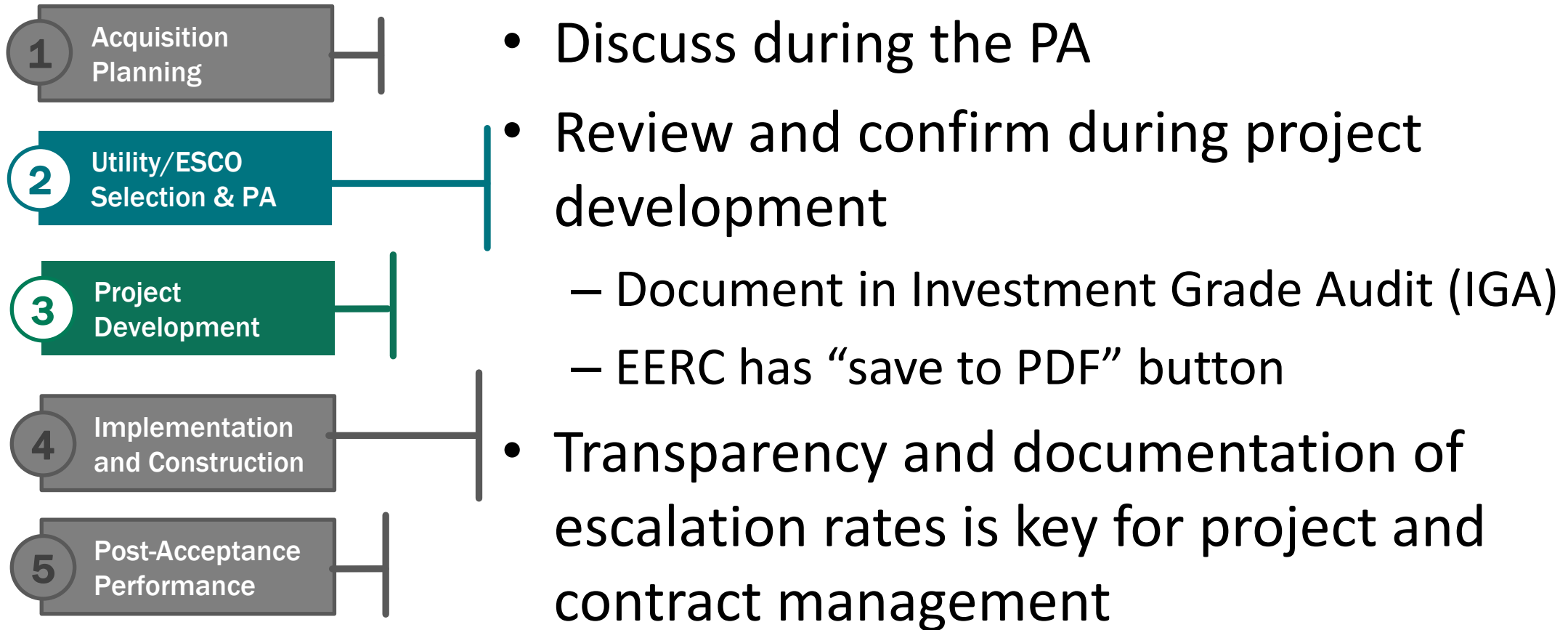
SAVE TO PDF

Water and Wastewater Escalation Rates

- Not covered by the EERC
- No governmental organization estimates future long-term changes
- Different drivers for costs (e.g., infrastructure projects)
- FEMP addresses this in guidance:
 - Use direct forecast from serving utility
 - Historical rate data, with ceiling (calculating nominal rate)
 - General inflation forecast of Council of Economic Advisors



FEMP Best Practices: Establishing Escalation Rates



FEMP Best Practices: Resources

- Energy Escalation Rate Calculator
 - For U.S.-based projects
 - Energy utilities only (does not address water/wastewater)
- FEMP [Guidance on Utility Rate Estimations and Weather Normalization in Performance Contracts \(updated March 2024\)](#)
 - Incorporating known utility increases
 - Updates water and wastewater escalation rates
- Papers evaluating EERC
 - [Recommended vs. Actual Escalation Rates for ESPCs: Is the Guidance Good? \(2023\)](#)
 - [Escalation Rates in Energy Savings Performance Contracts \(2015\)](#)

Questions

Christine Walker

E: christine.walker@pnnl.gov



FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

August 21 – August 22, 2024

IGA Lessons Learned

Tim Kehrli, National Renewable Energy Laboratory



Agenda

- UESC Summary and IGA Review
- IGA Priorities Discussion
- IGA Lessons Learned General Approaches
- IGS Lessons Learned Specific Examples
- Recommendations for improved IGA's
- Q&A

How do UESCs work?



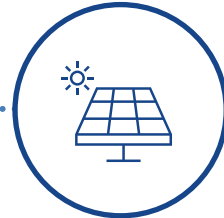
Select utility

Competition limited to serving distribution utilities



Conduct assessments to evaluate energy/water savings opportunities

Contractor identifies cost effective energy conservation measures (ECMs) via Preliminary Assessment (no cost) and Investment Grade Audit



Implement ECMs

Utility secures financing and installs measures



Make payments from cost savings

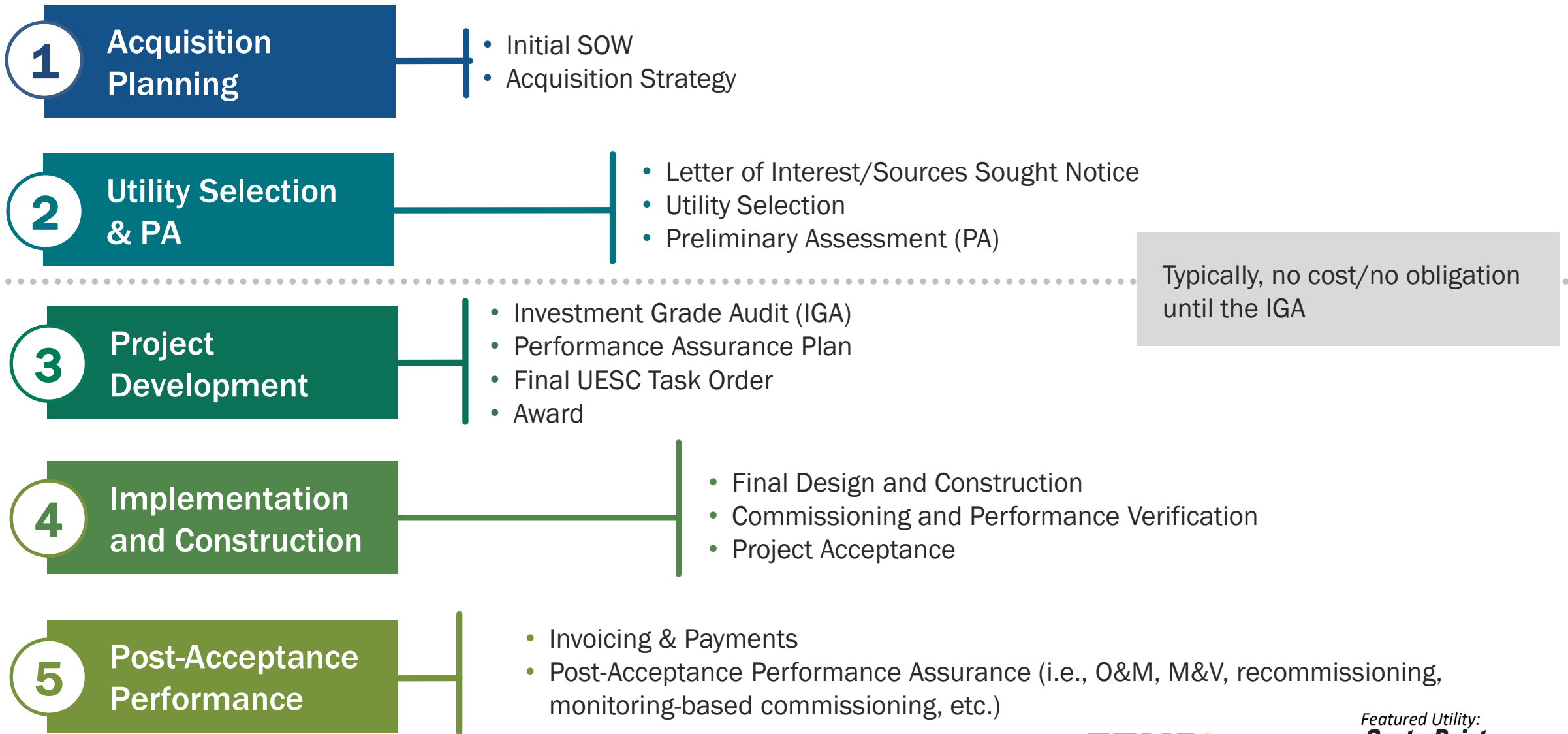
Contract term of up to 25-years to pay for ECMs and services



Implement Performance Assurance Plan to monitor and sustain savings

Via operations & maintenance / performance verification/other

UESC Development and Implementation Milestones



Investment Grade Audit (IGA)

The IGA* is a detailed engineering analysis, design, and cost estimate that serves as the technical scope for the UESC task order proposal.

** May be referred to as a feasibility study or Comprehensive Energy Audit*

- **Important to finalize scope and agree on pricing terms before proceeding**
 - Terms should address IGA payment plan and expectations if project doesn't move forward
- **IGA should address:**
 - All evaluated ECMs and rationale for ECM selection, including decarbonization impact
 - Energy savings and ECM costs with detailed supporting data
 - TO financial schedules based on indicative interest rate & premium
 - Performance assurance plan

IGA Development Priorities

Risks & Responsibilities

- Does the agency have workforce staff that it can/should/can't allocate to support ECM O&M?
- Who is responsible for overseeing project construction, completion, performance and ensuring the projected savings are achieved?
- What performance risks is the agency willing to take? Who is responsible for accepting these risks?
- Who is accountable at the agency and the contractor to ensure the project complies with UESC requirements?

Lessons Learned: Performance Assurance Plan

- Include reporting requirements to document savings and establish responsibility for report review
 - Several Inspector General reports have determined that the government has not confirmed savings before making UESC payments
- Include performance discrepancy plan in case of ECM failure after warranty period
- Ensure clear responsibilities established for O&M

Upcoming Live Webinar

Performance Assurance Best Practices for UESCs

September 12, 2024 | 1-2:30 PM (ET)

[Click here to register!](#)



Performance Assurance Best Practices for UESCs

September 12, 2024 | 1:00-2:30 PM (ET)



Lessons Learned: Examples

- Construction delays due to Agency approvals and environmental/other permits
 - Agency did not fully map out required approval process
 - Delays incurred additional construction period costs and time – impact in project payment schedule and construction period interest

IGA Lessons Learned: Baseline Accuracy

Issue/Scenario



Agency agrees to baseline energy and savings calculations utilizing incomplete and estimated usage data



Resulted in project failing to provide expected savings (project was not budget neutral)



Use of incorrect/inaccurate baseline data resulted in inaccurate saving calculations

Lessons Learned

- Do not take proposals at face value
- Read the fine print, check the math - thoroughly evaluate all data and variables used in baseline to ensure accuracy
- Obtain transparent working models to assess methodology and ensure agency understands and agrees with calculations

Outcome

- Ensures agencies understand how and what is included in the baseline
- Informs agencies about variations in operations which impact the baseline, and ensures integrity in data points used for M&V

IGA Lessons Learned: Design Flaws

Issue/Scenario



Contractor proposed ECM calling for the abandonment of “unnecessary” fans in HVAC upgrade as a cost saving measure



Proposed ECM resulted in air flow issues, improper air changes, and later resulted in related system damage (mold)



Agency had to make repairs out of its own budget, since the warranty period had passed

Lessons Learned

- Mistakes are made - not all measures proposed by contractors are fail proof
- Important for agencies to engage technical subject matter experts to evaluate project proposals and ECMs
- Use third-party professional/engineer when in-house expertise isn't available
- Ensure Cx plan will confirm proper system operation and performance
- Contract language should clearly define system performance requirements (such as air flow)

Outcome

- Lowers risk and provides better chance of positive outcome for agencies

Lessons Learned: Solutions

- Clear definition of agency roles and responsibilities
 - Each role is accountable
 - Clear path for decision process
 - Who makes decisions on acceptable risks
 - Who is responsible for review and approval of annual performance
- Intentional effort to understand project risks
 - What are the assumptions for project implementation and performance
 - Who owns the Agency responsibilities, who pays for this
 - Who decides that a project risk is not acceptable

Closing



QUESTIONS?



ANSWERS?

24/7 CFE or “Hourly-Matched Electricity 101”

Sujata Rajpurohit | August 2024



Agenda

- **Definitions and Purpose**
- **Current Status and Commitments**
- **Emerging Strategies**
- **Questions**

DEFINITIONS AND PURPOSE

Approaches to Emissions Reductions

Annual Matching

- Procuring enough clean energy to match 100% of annual electricity demand on a volumetric basis

Hourly Matching

- Matching electricity demand hour-by-hour (i.e. 24/7) with clean electricity generated within the same regional grid

“Emissionality” or Carbon-optimized Procurement

- Maximizing near-term emissions reductions through financial support and operation of a portfolio of resources

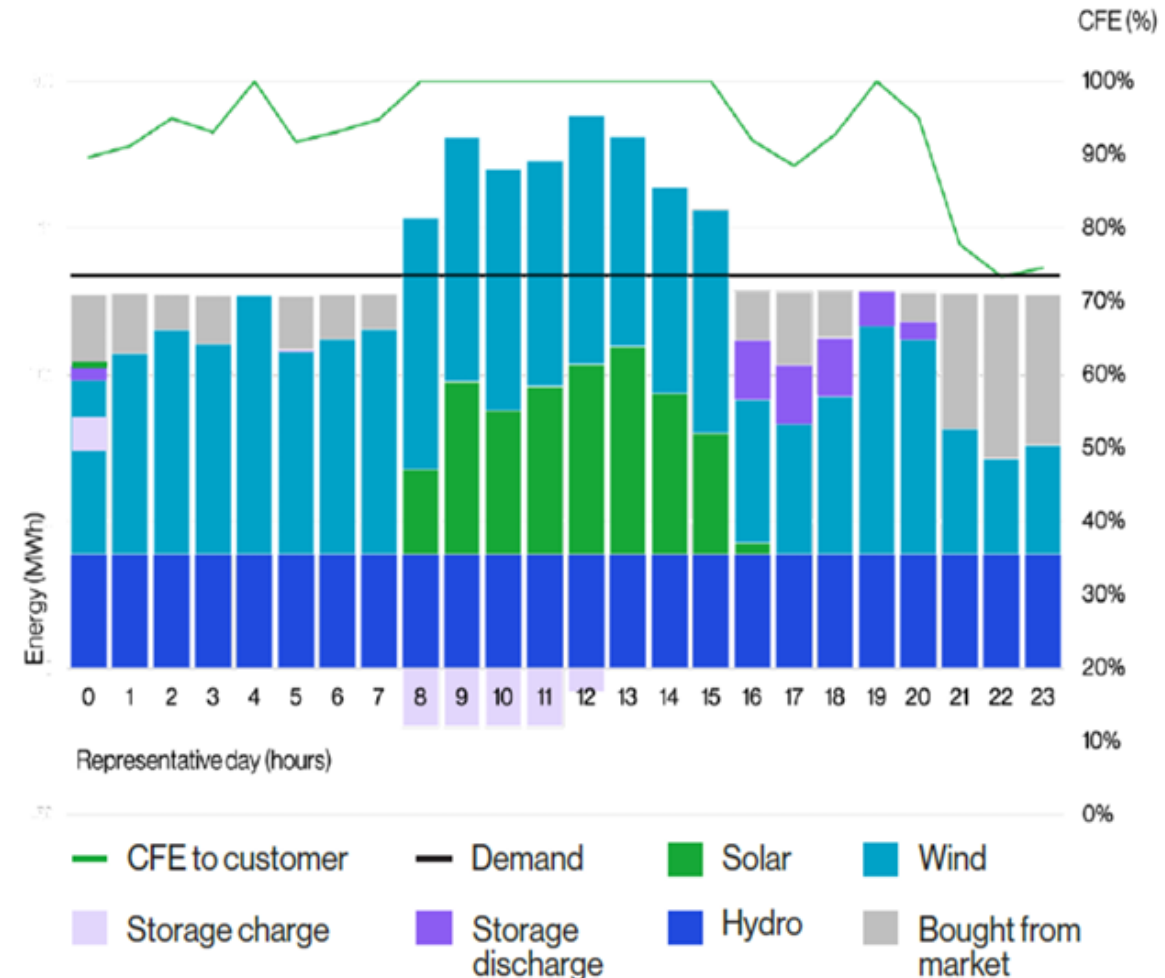
Options for Clean Energy Leadership

	100% Annual Matching (Unbundled RECs)	100% Annual Matching (Electricity contracts)	24/7 Carbon-free Electricity	Carbon-optimized procurement
	Indirectly reduces emissions and supports RE technology	Reduces emissions and directly supports RE	Can eliminate emissions from consumption and transform electricity grids	Maximizes emissions reductions from an electricity portfolio
Helps combat climate change	✓	✓	✓	✓
Accelerates full-scale transformation of electricity grids	X	X	✓	?
Eliminates all carbon emissions associated with the buyer's electricity use	X	X	✓	X
Directly reduces carbon emissions associated with the buyer's electricity use	X	✓	✓	X
Matches <i>annual</i> electricity consumption with clean energy	✓	✓	✓	X
Matches <i>hourly</i> electricity consumption with clean energy	X	X	✓	X
Supports investment in clean electricity	?	✓	✓	✓
Supports investment in clean electricity <i>in the grid region where electricity is consumed</i>	X	✓	✓	?
Hedges price volatility and risk for the buyer	X	?	✓	X
Maximizes emissions reductions per \$ spend	X	X	X	?
Maximized overall emissions reductions be MWh generated	X	X	X	✓

Why 24/7 CFE?

- Greater emissions reductions than annual matching if target is high enough
- Phases out gas faster, creates demand for technologies like LDES and “clean firm” generation
- Spurs innovation and cost reductions in technologies critical to the next phase of decarbonization
- Signals to market and investors that clean firm resources are more valuable than variable resources, helping address heavy upfront capital costs
- Hedges price volatility and risk
- But, it comes at a cost premium

Source: Xu, Manocha, Patankar et. al (2021), Peninsula Clean Energy “Our Path to 24/7 Renewable Energy by 2025”



Source: [AES Case Study](#)



Measuring Progress on 24/7 CFE

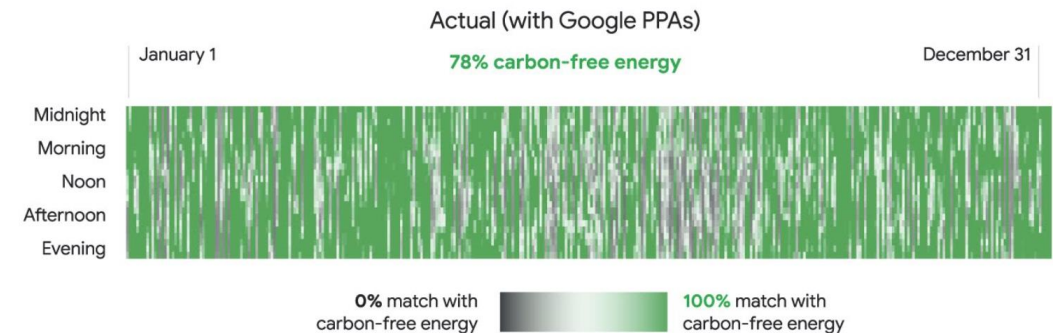
- **CFE Score**

- Measures how well each hour of electricity consumption on a regional grid matches with CFE from that grid
- Can be used to summarize any duration of time (hour, day, year)
- Load-weighted average representing the share of electricity demand in a specific location met with carbon free energy

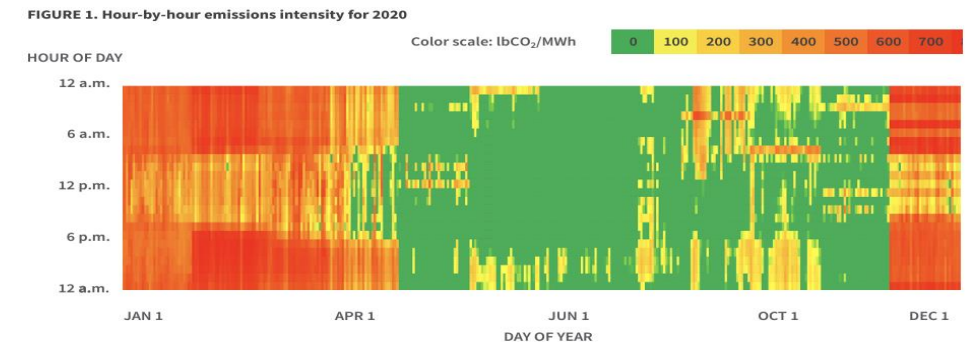
- **Emissions Intensity**

- Peninsula Clean Energy

Google Carbon Heat Map 2019

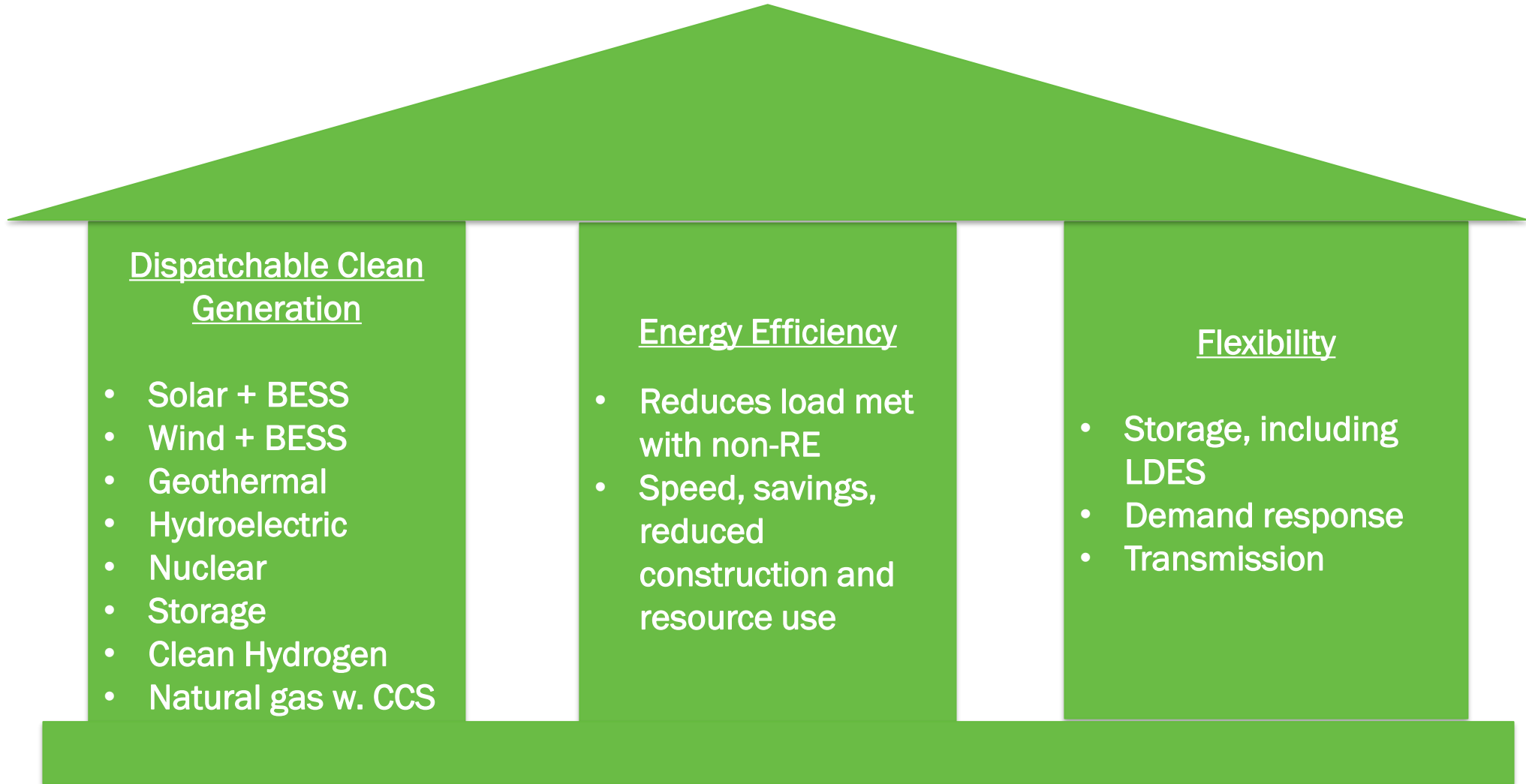


Peninsula Clean Energy Hourly Emissions Intensity 2020



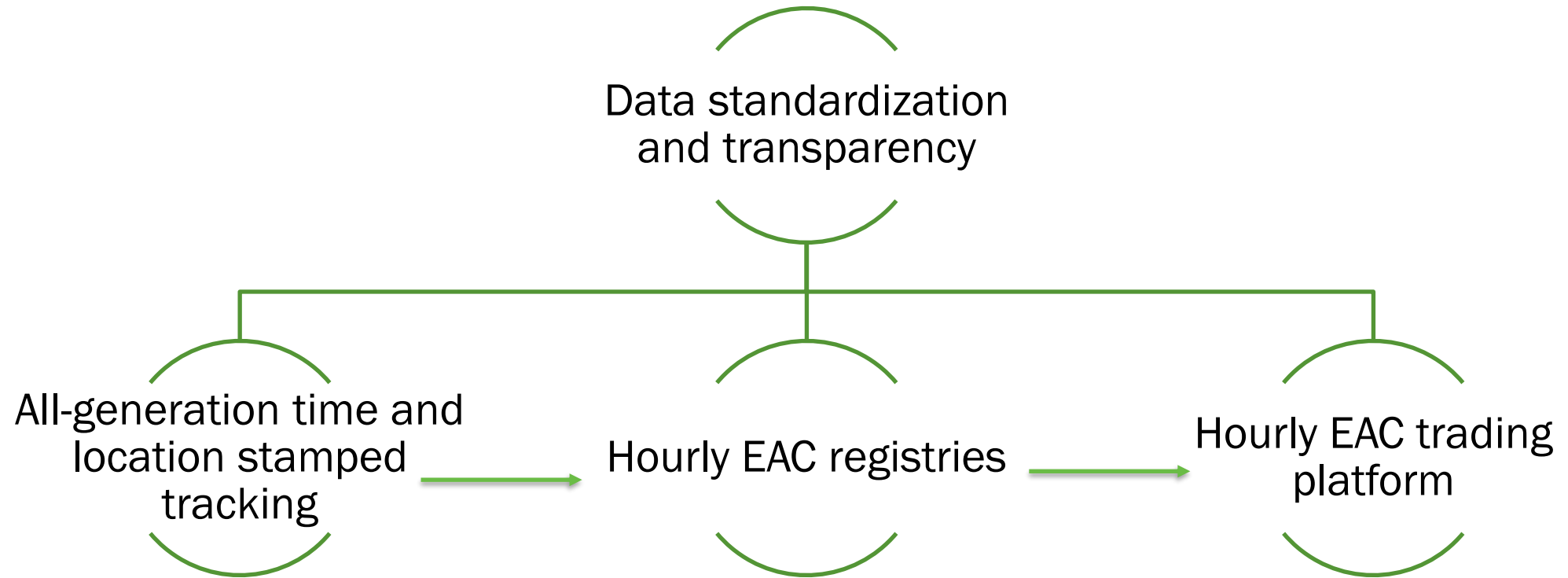
CURRENT STATUS AND COMMITMENTS

What will it take to achieve a 24/7 CFE grid?



Source: ACEEE “Energy Efficiency in a High Renewable Energy Future” (2023)

What enabling market infrastructure is needed?



Status of Enabling Infrastructure: Tracking Systems

Tracking System	Geographic coverage	Resources tracked	Hourly functionality currently available?	Current plans to implement or expand hourly tracking?	Estimated timeline for implementation if system decides to pursue hourly tracking
ERCOT	Single state	RE only	No	Yes	No timeline given
MIRECS	Single state	RE only	No	No	1-1.5 years
M-RETS	Multi state	RE and Alternative Energy only	Yes (limited functionality)	Yes	Already tracking
NAR	Multi state	RE only	Yes (pilot only)	No (no further plans; still in pilot)	Less than 1 year
NC-RETS	Single state	RE only	No	No	Unknown / No timeline given
NEPOOL-GIS	Multi state	All generation	No	Yes (under review)	1 year
NYGATS	Single state	All generation	No	No	1-2 years
PJM-GATS	Multi state	All generation	Yes (limited functionality)	Yes	Already tracking
WREGIS	Multi state	RE only	No	Yes	3-5 years*

*Timeline could be closer to 3 years if (1) there is full state agency buy-in, (2) clear instructions are received from federal or state agencies, and (3) funding for stakeholder participation is made available.

Source: CRS as of May 2023, updated from ISO-NE "Hourly EACs" 5/8/24

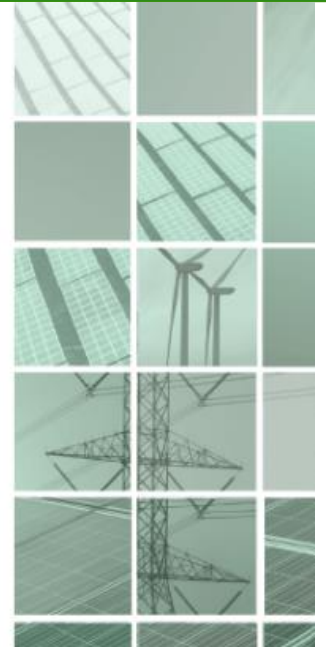
Status of Enabling Infrastructure: Trading Platform

- **Granular Certificate Trading Alliance (GC Trading Alliance)**
- **Integrated trading and management platform launching in 2024**

LEVELTEN ENERGY ANNOUNCES

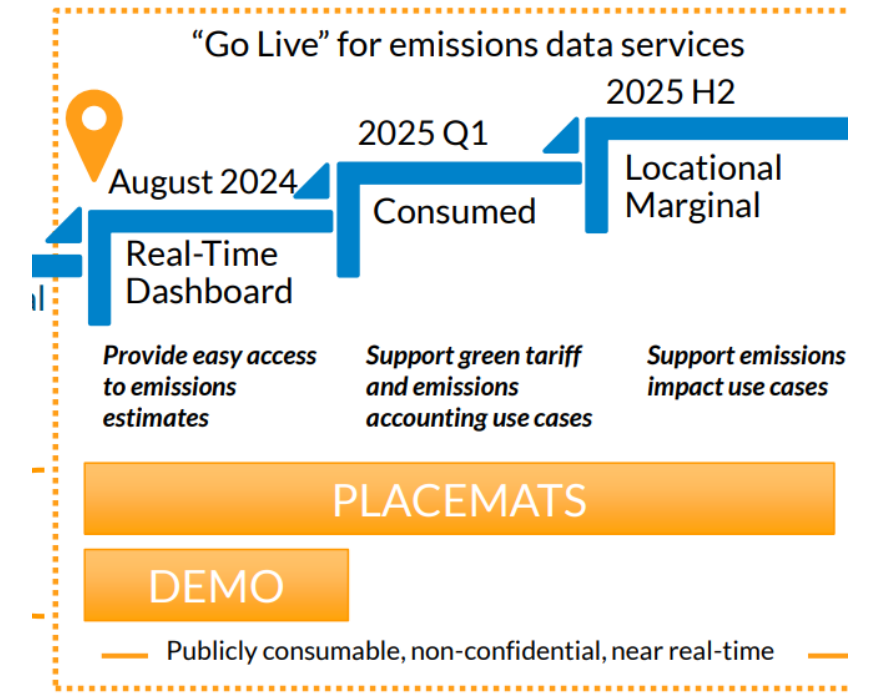
The Granular Certificate Trading Alliance

Making carbon-free energy available at every hour



Status of Enabling Infrastructure: All-Generation Tracking

- All-generation time and location stamped tracking, or “granular certificates”
- RTOs can lead
 - MISO Real-Time Emissions dashboard just launched
- Utilities are working with solutions providers to provide data transparency to customers



Southern Company Collaborating With Singularity on Grid Carbon Reporting

Jul 2, 2024 3:00 PM ET

Current 24/7 CFE Commitments

Private Companies

- Google
 - 100% by 2030
- Microsoft
 - 100% by 2030
- Nucor

Public Sector

- U.S. Government
 - 50% by 2030
- Local governments in New York, California, and Iowa

Utilities

- Peninsula Clean Energy
 - 100% by 2025

USG Commitment: E.O. 14057 December 2021

- Agencies are required to achieve:
 - 100% carbon pollution-free electricity on a net annual basis by 2030, including 50 percent 24/7 carbon pollution-free electricity
- UN 24/7 Carbon-Free Energy Compact (joined December 2023)
 - Voluntary commitment with over 140 participants to match every hour of electricity consumption, on every energy grid, with carbon-free sources of electricity production.
- **CEQ Guidance**
 - Definition of “50 percent 24/7 carbon pollution-free electricity” forthcoming

SE



DECEMBER 08, 2021

Executive Order on Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability

 BRIEFING ROOM  PRESIDENTIAL ACTIONS



Implementing Instructions for
Executive Order 14057
Catalyzing Clean Energy Industries and Jobs
Through Federal Sustainability

Proposed 45V Guidance

Proposed Hydrogen Tax Credit guidance requires EACs to be hourly matched within DOE transmissions needs study regions by 2028

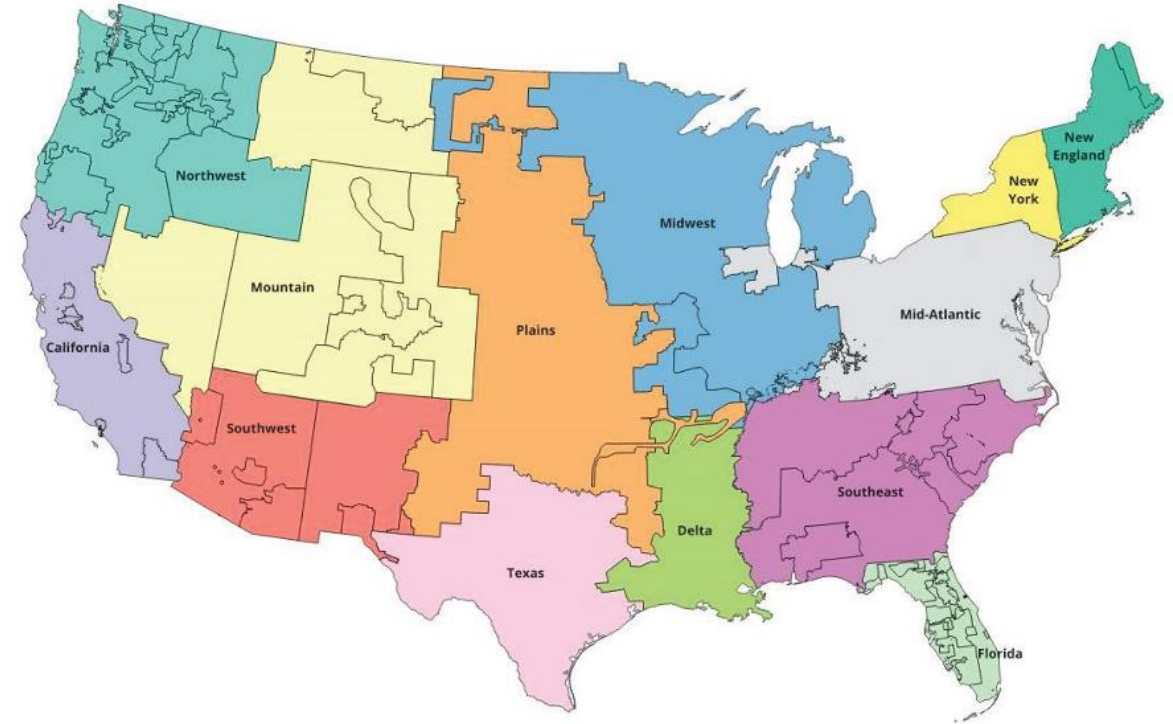


Figure 2. 45V Regions Based on Needs Study

EMERGING STRATEGIES

Biden-Harris Administration Announces US Government's First Initiative with a Utility to Work Toward 24/7 Carbon Pollution-Free Electricity

November 15, 2022

- Education and stakeholder engagement
- Pilot deployments in key applications
- Utility partnerships to advance 24/7 CFE goals

24/7 Carbon Pollution-Free Electricity

Federal Energy Management Program

Federal Energy Management Program » 24/7 Carbon Pollution-Free Electricity

E.O. 14057 commits the federal government to operating on 100% carbon pollution-free electricity (CFE) on a net annual basis by 2030, including 50% 24 hours per day/7 days per week (24/7)—or “hourly matched”—CFE. Below is information on the difference between net annual and hourly matching, why it matters, and what agencies can do to work toward 24/7 CFE.

What Is Carbon Pollution-Free Electricity?

Per the Council on Environmental Quality (CEQ), carbon pollution-free electricity is

NEWS | 29 SEPTEMBER 2023

U.S. Air Force, U.S. Army, the Defense Innovation Unit, and Industry Advance DoD Installation Energy Resilience with Geothermal Energy Solutions

Private Sector

- **RFI in PJM for “advanced technologies”**
 - FOAK technology with TRL level of 6 or above, not yet widely commercialized
 - Greater than 50 MW; for storage discharge duration of at least 8 hours required and >12 hours preferred
 - Pathway to scale to 100 GW+ of total deployments globally by 2040
 - Preferably operational by 2030 or earlier
 - RFI closed and in commercial discussions
- **Google, NV Energy, Fervo “Clean Transition Tariff”**

Microsoft, Google, Nucor partner on initiative to spur emerging 24/7 clean power technologies

The Advanced Clean Electricity initiative aims for widespread commercial deployment of advanced nuclear, next-generation geothermal and long-duration storage by the early 2030s.

Published March 21, 2024

NV Energy seeks new tariff to supply Google with 24/7 power from Fervo geothermal plant

The “Clean Transition Tariff” is intended to spur the deployment of more dispatchable clean energy resources, Google leaders say.

Published June 21, 2024

QUESTIONS?

Sujata.Rajpurohit@hq.doe.gov

APPENDIX



FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

August 21 – August 22, 2024

Department of the Air Force Approach to Electrification

Mr. Douglas K. Tucker

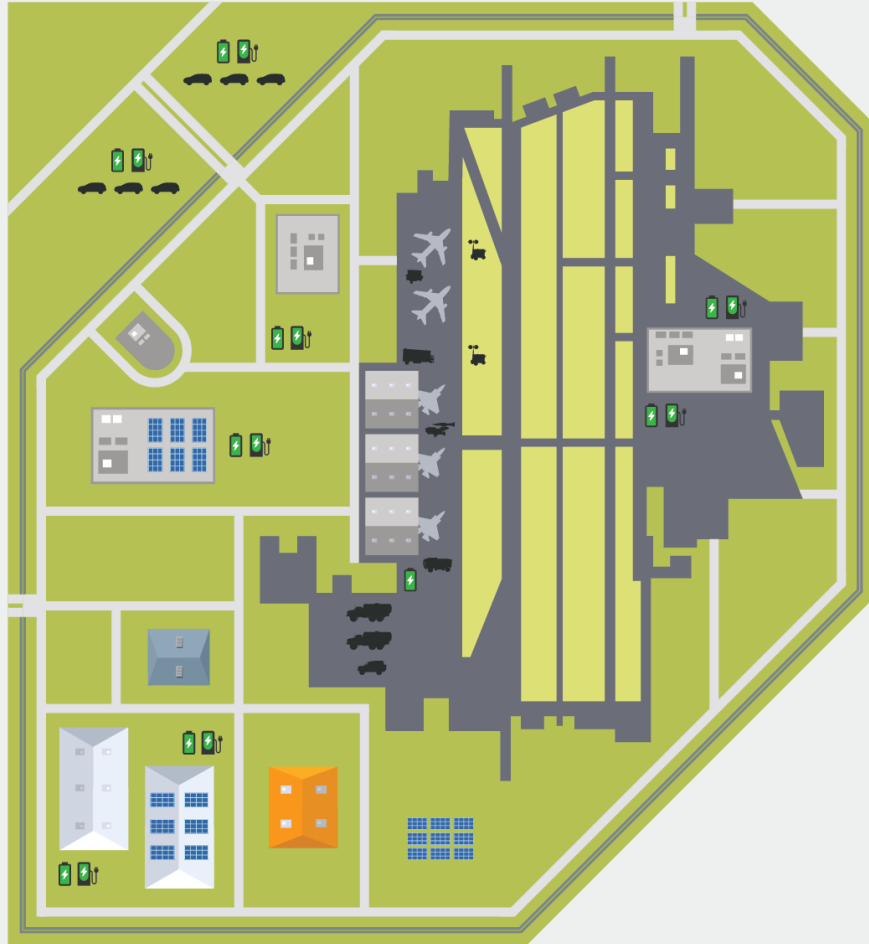
Director, Installation Energy, Policy and Programs

Office of the Deputy Assistant Secretary of the Air Force
(Infrastructure, Energy, and Environment)





Department of the Air Force (DAF) Electrification Approach



MISSION RESILIENCE

Infrastructure and acquisition needs to be well timed to maintain and improve vehicles' mission performance. Host tenants needs should be communicated clearly from the beginning.



ENERGY RESILIENCE

Electrification efforts support mid- and long-term goals to improve energy use and reduce emissions. Planning takes into consideration on-base distribution generation and storage.



COMMUNITY RESILIENCE

Successful fleet electrification is supported by partnerships to provide electrification infrastructure and energy generation, transmission outside the fence line.



CYBER RESILIENCE

Will determine how we integrate telematics and data management into electrification.



CLIMATE RESILIENCE

Transition to ZEV reduces the DAF's climate footprint through reduction of tailpipe emissions.



Policy Drivers



1. **FY22 National Defense Authorization Act:** Requires 10% of major military installations to achieve energy net-zero and waste or water net-zero by FY35
2. **Federal Building Performance Standard:** Targets zero scope 1 emissions from on-site fossil fuel use through building electrification in at least 30% of applicable facilities by FY30

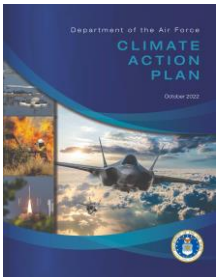


3. **DoD Electrification of Standard Building Operations Memorandum:** Requires services to maximize the use of all-electric technologies where market-ready technologies exist



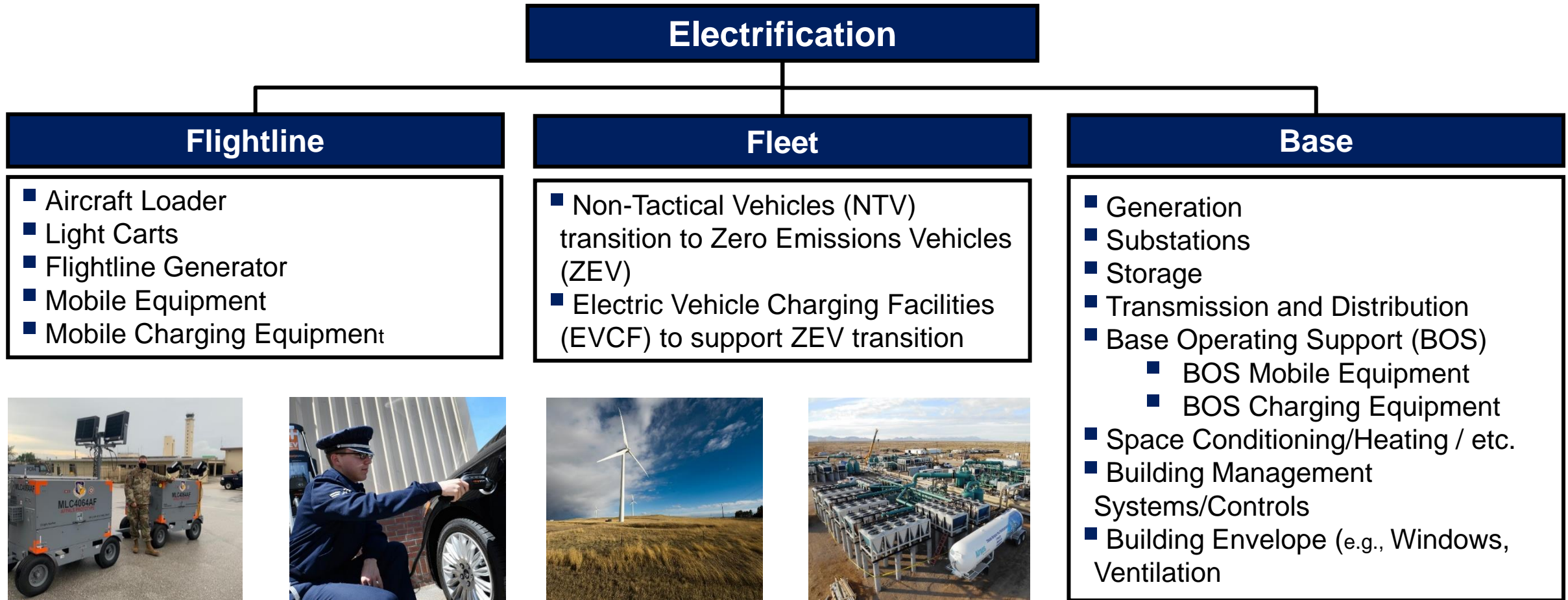
4. **DAF Climate Action Plan:**

- Net-zero emissions building portfolio by Fiscal Year (FY) 2046, including a 50% emissions reduction from 2008 levels by FY33
- 100% carbon pollution-free electricity (CFE) on a net annual basis by 2030, including 50% 24/7 CFE
- 100% non-tactical zero-emission vehicle acquisitions by FY35





Enterprise Electrification Initiatives





Flightline Equipment Electrification Pilots

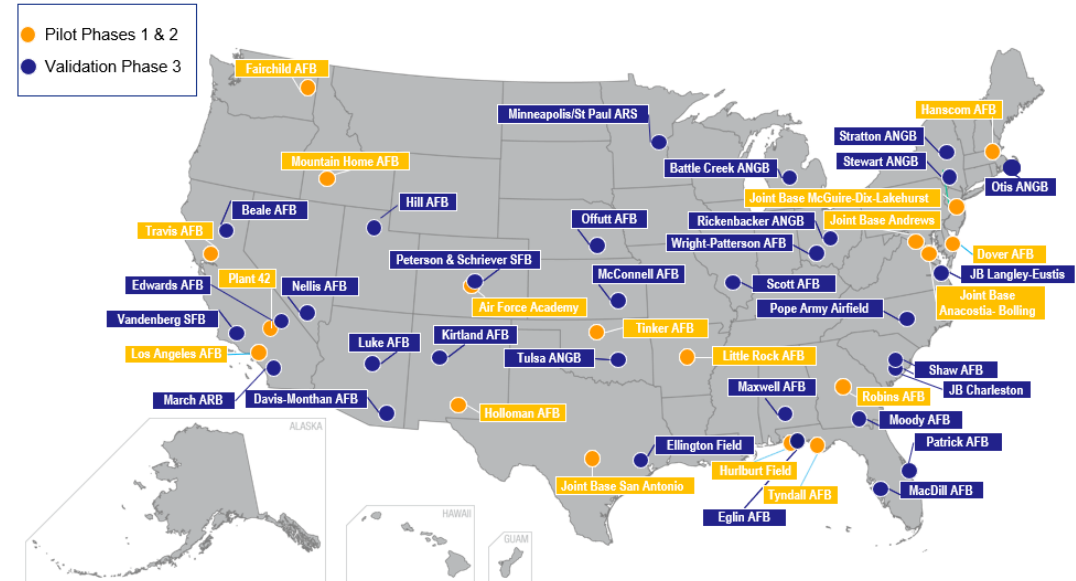
- Intended to demonstrate the efficiency and effectiveness of various electric and hybrid technologies for aircraft maintenance
- Example Technologies
 - Hybrid Flightline Generator, Light Carts, Hybrid Halverson Aircraft Loader
- Key Benefits
 - Reduced fuel consumption and associated emissions
 - Reduced flightline noise and improved Airmen communication
 - Reduced generator maintenance and manpower hours
 - Cost effective charging from engines and grids





DAF NTV Fleet Electrification Program

- Accelerating the integration of ZEVs into government-owned and leased fleets
- DAF is in various stages of charging solution development at 50 installations
 - Preferred ownership is contractor owned/contracted operated (COCO)
- DAF Fleet Electrification Program Framework will outline process for installations to plan and execute charging infrastructure projects to meet the ZEV program targets (Summer 2024)



COCO Charging-as-a-Service Model

- Sustainment services
- Scalable deployment
- Vendor financed projects w/out appropriated funds (Service Agreement w/ software and Operations & Maintenance)
- Point-of-sale provides payment capability for government and privately owned vehicles



Net Zero Construction Project Highlights

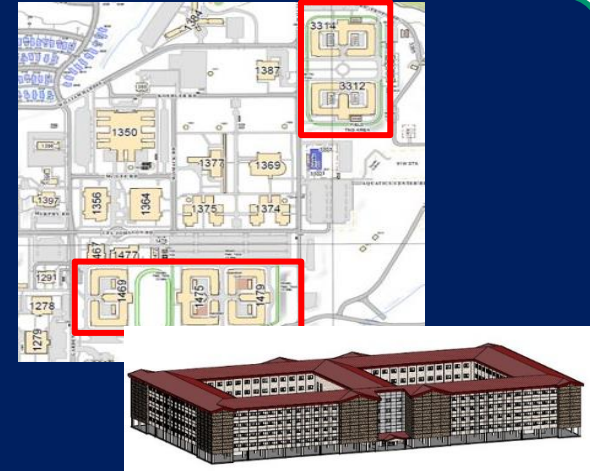
Net-Zero Construction Pilot Project

- Child Development Center (CDC) at Hanscom AFB, MA (FY24, \$37M)
- 37K sq ft CDC for 264 kids (6 weeks – 5 years)
- Eliminate existing/projected wait list (currently 208 days vs DoD standard 90 days)



Net-Zero Construction Pilot Project

- Medical Education & Training Campus (METC) Dorm at Joint Base San Antonio (FY25, \$469M)
- 600 room/1200 bed dorm
- Replaces 1 of 5 failing tri-service dorms



Sustainable Materials Pilot



- Consolidated Comm Center at Patrick SFB (FY24, \$97M)
- Includes reinforced concrete as primary structural material
- Concrete specs modified to target 30-40% lower Global Warming Potential compared to conventional concrete baselines
- Child Development Center at Mt Home AFB, ID (FY25, \$40M)
- Project will incorporate mass timber as a primary building material
- Potential benefits include lower carbon footprint vs steel/concrete, faster construction, improved aesthetic/Quality of Life

Growth Offset Policy Demolition

- Tripled demo funds from ~\$30M to ~\$135M/year across FYDP
- Estimated reduction in square footage: ~3.6M
- Estimated PRV Elimination: ~\$2.1B

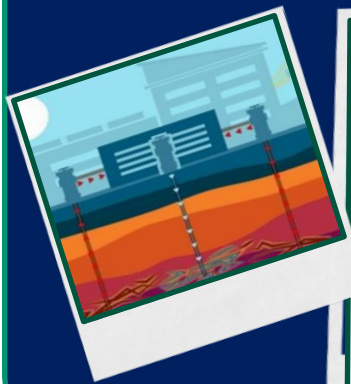




Exploration of Alternative Energy

Geothermal

- DAF initiated geothermal prototypes to explore the technology's feasibility across the enterprise:
 - Mountain Home AFB (Zanskar)
 - Ellington AFB (Sage)
- If successful, this work will result in follow-on contracts for the construction, ownership, operation, and maintenance of geothermal facilities to provide resilient, baseload power
- DAF will also explore opportunities for networked geothermal (shallow depth, ground-source heat pumps)



Minot AFB Case Study:

Replaced central heating plant supporting 90+ facilities with 400 tons of ground source heat pumps for large facilities and facility-specific high-efficiency boilers for the remaining facilities.



Advanced Nuclear

- Spearheading the 1st DoD commercial advanced nuclear micro- reactor at Eielson AFB
- Partnering with Defense Logistics Agency Energy Office to execute a 30-year power purchase agreement via 10 U.S.C. 2922a
- Commercial vendor will license, own, operate, and decommission the reactor
- Pilot will meet requirements of FY19 National Defense Authorization Act, EO 13972, and DAF Arctic Strategy





FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

August 21 – August 22, 2024

Fervo Energy

Enhanced Geothermal Systems

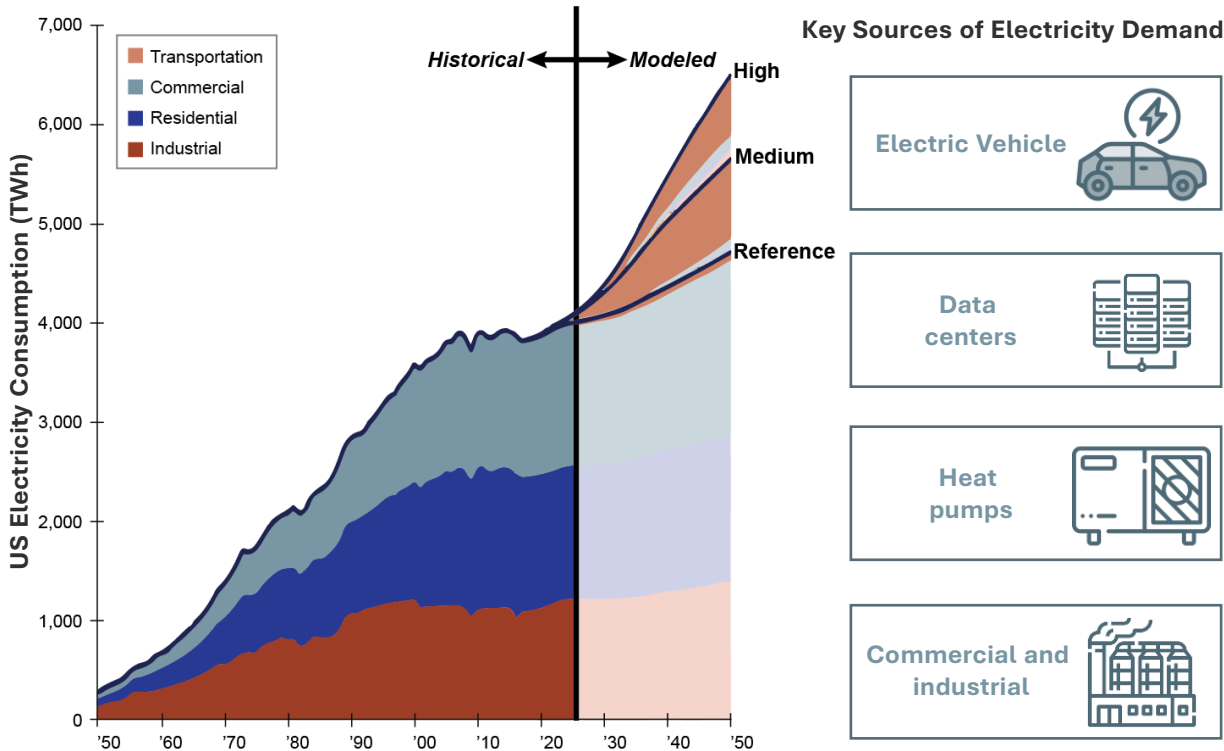
Alex Smith, Fervo



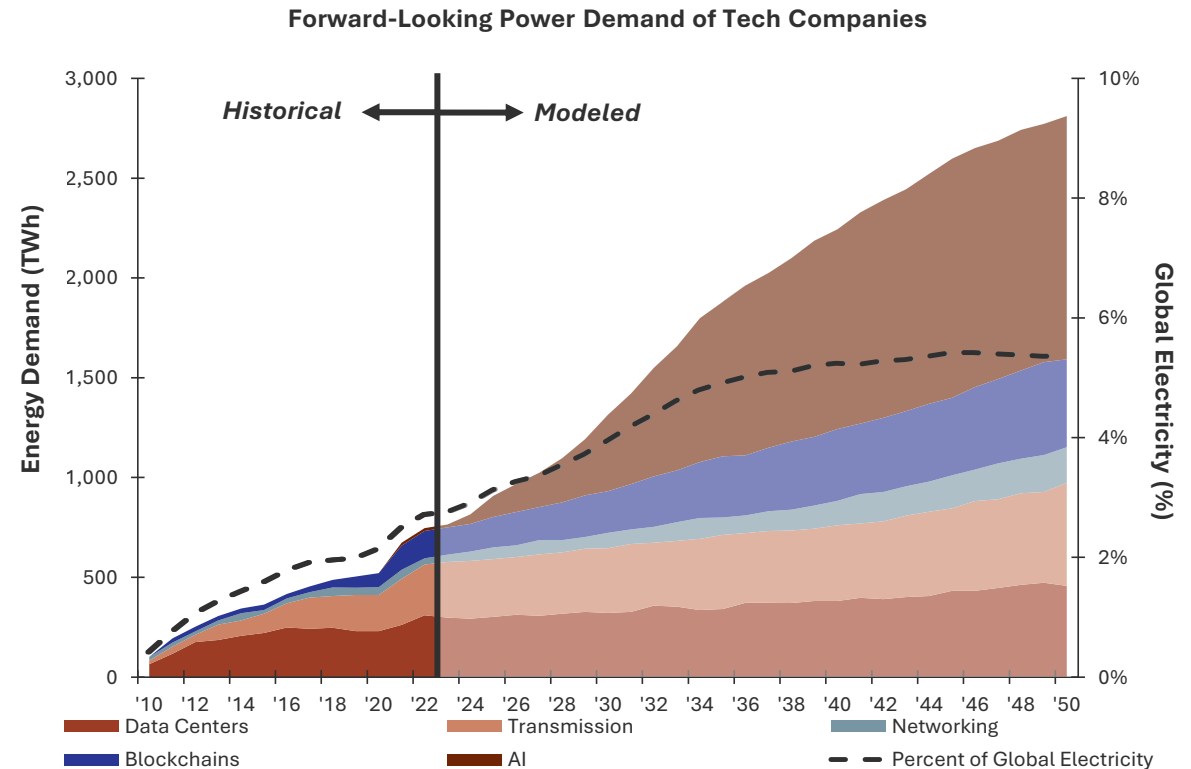
Energy demand is on the rise



Electrification to Significantly Increase Overall Demand for Electricity¹



Tech Companies Expected to Have Surging Electricity Demand²

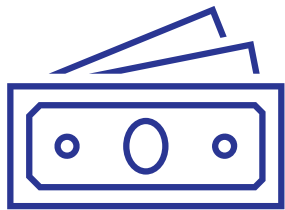


¹ U.S. Department of Energy's National Renewable Energy Laboratory (NREL) ² Department of Energy, IEA.

Demand provides opportunity for new forms of energy



Intermittent Power Insufficient to Reach Full Decarbonization¹



Affordable

As energy price volatility increases, offtakers are focused on the affordability of different resources



Reliable

Severe weather has caused power buyers to prioritize reliable, secure sources of energy



Clean

Shifting public opinion on climate change has compelled offtakers to privilege carbon-free energy

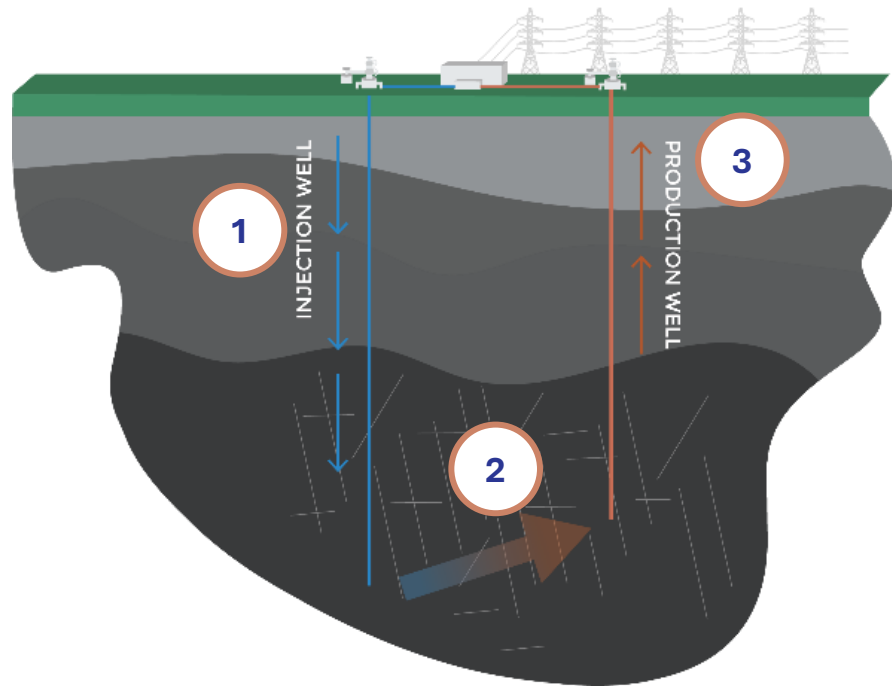
24/7 Clean Power Needed to Ensure Reliability



Traditional geothermal energy is part of the solution



Traditional geothermal development has been limited to a small set of geographies with specific subsurface conditions, leading to a small resource pool.

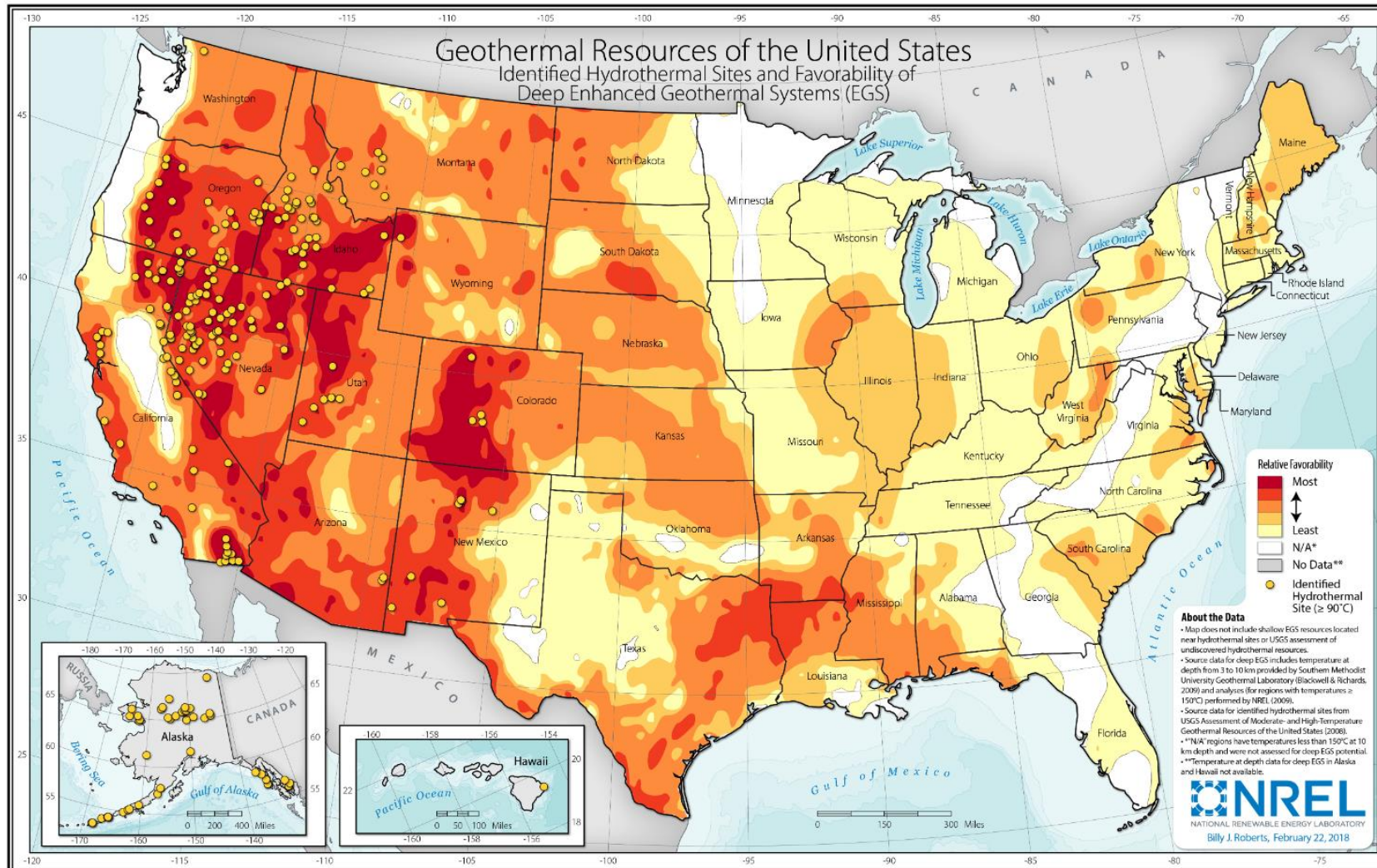


How it works:

- 1 Cold Water is pumped underground
- 2 The water is heated by the Earth's temperature as it flows through the subsurface and returns to the surface via production wells
- 3 Steam from the heated generates carbon-free electricity

To date, one out of every three geothermal wells has been a “dry hole” because it cannot support commercially viable flow rates.

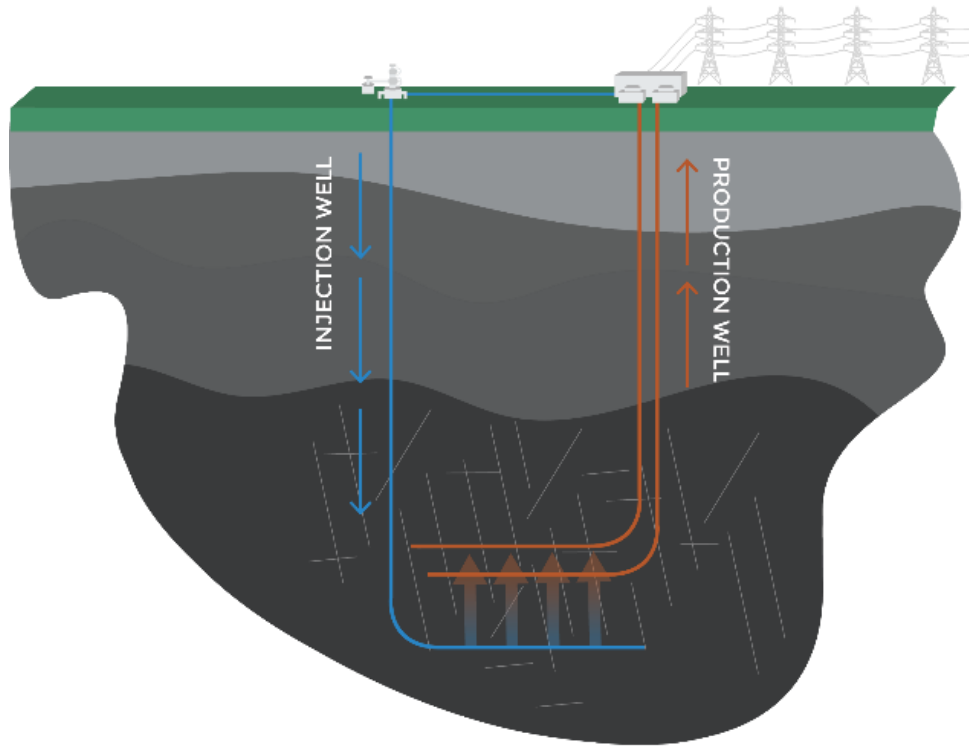
But there is the resource potential for so much more



Next-generation technology accesses this potential



Fervo's approach to geothermal energy development relies on many of the same technologies that enabled the North American shale revolution, including:



- **Horizontal drilling**, which increases the contact area with the geothermal reservoir
- **Multistage completions** with extreme limited entry and proppant, which increases flow rates and heat transfer efficiency
- **Distributed fiber optics**, which enhances monitoring, characterization, and downhole flow control

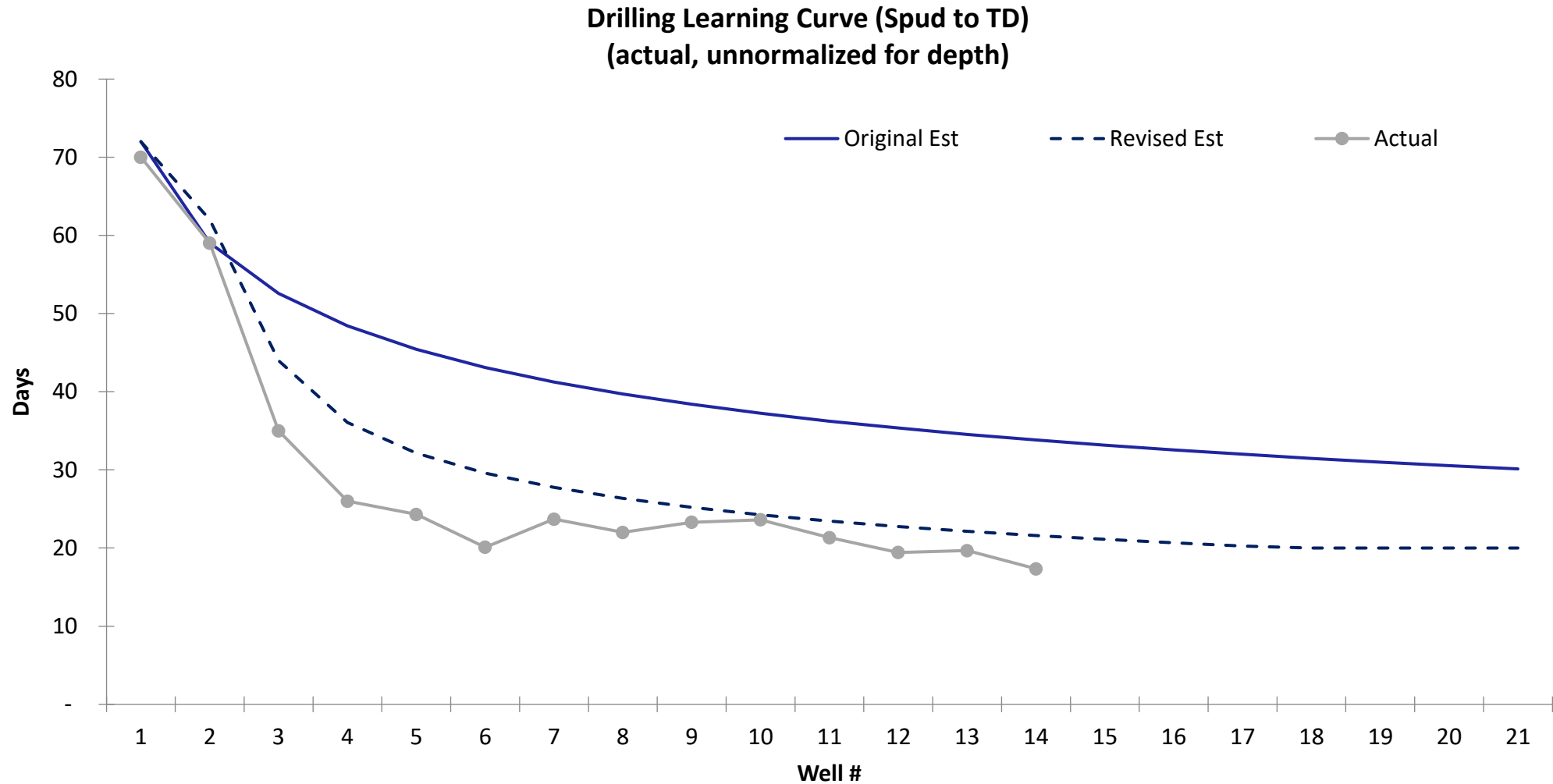
Demonstrated success with big plans ahead



	Cape Phase 1	Cape Phase II	Corsac Phase I
Nameplate Capacity	90 MW	283 MW	115 MW
Online Date	2026	2028	2030

“Geothermal innovations like those pioneered by Fervo will play a critical role in extending Utah’s energy leadership for generations to come.”
 – Gov. Spencer Cox

Success shows cost reduction potential



Next-generation geothermal is poised for significant growth



Geothermal power will grow **40X by 2050**, the final piece of the puzzle for a **24/7 carbon-free** grid

100

3 GW

Geothermal power currently in operation throughout the US

120 GW

By 2050

>500 GW

Available with existing drilling technology

50

0

2020

2030

2040

2050

Questions?

Federal Utility Partnership Working Group
August 21–22, 2024 Houston, TX



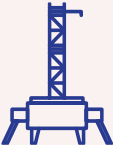
Geothermal is already cost-competitive with other forms of firm power




Levelized Cost of Energy Comparison—Unsubsidized Analysis




Lazard's Levelized Cost of Energy Analysis, 15.0



LCOE of next-generation geothermal undercuts that of nuclear, coal, gas peaking, and gas combined cycle



Technological innovation and learning curves will enable the geothermal industry to continue to cut costs



DOE's Enhanced Geothermal Shot can provide additional momentum for cost reduction

Evaluating Geothermal Heat Pumps in REopt[®]

Presentation at FUPWG 2024

Matthew Lowlavar, FEMP



Agenda

- REopt Overview
- Geothermal Heat Pumps (GHP) in REopt
- Upcoming:
 - Air-Source Heat Pumps (ASHP) in REopt
 - Geothermal District Energy Systems in URBANopt
- Summary and Resources

REopt Overview

Will Distributed Energy Resources (DERs) Work for Your Site?



**Renewable
Energy
Resource**



**Technology Costs
and Incentives**



**Site Goals
(Economics,
Resilience, Clean
Energy)**



**Utility Cost
and
Consumption**

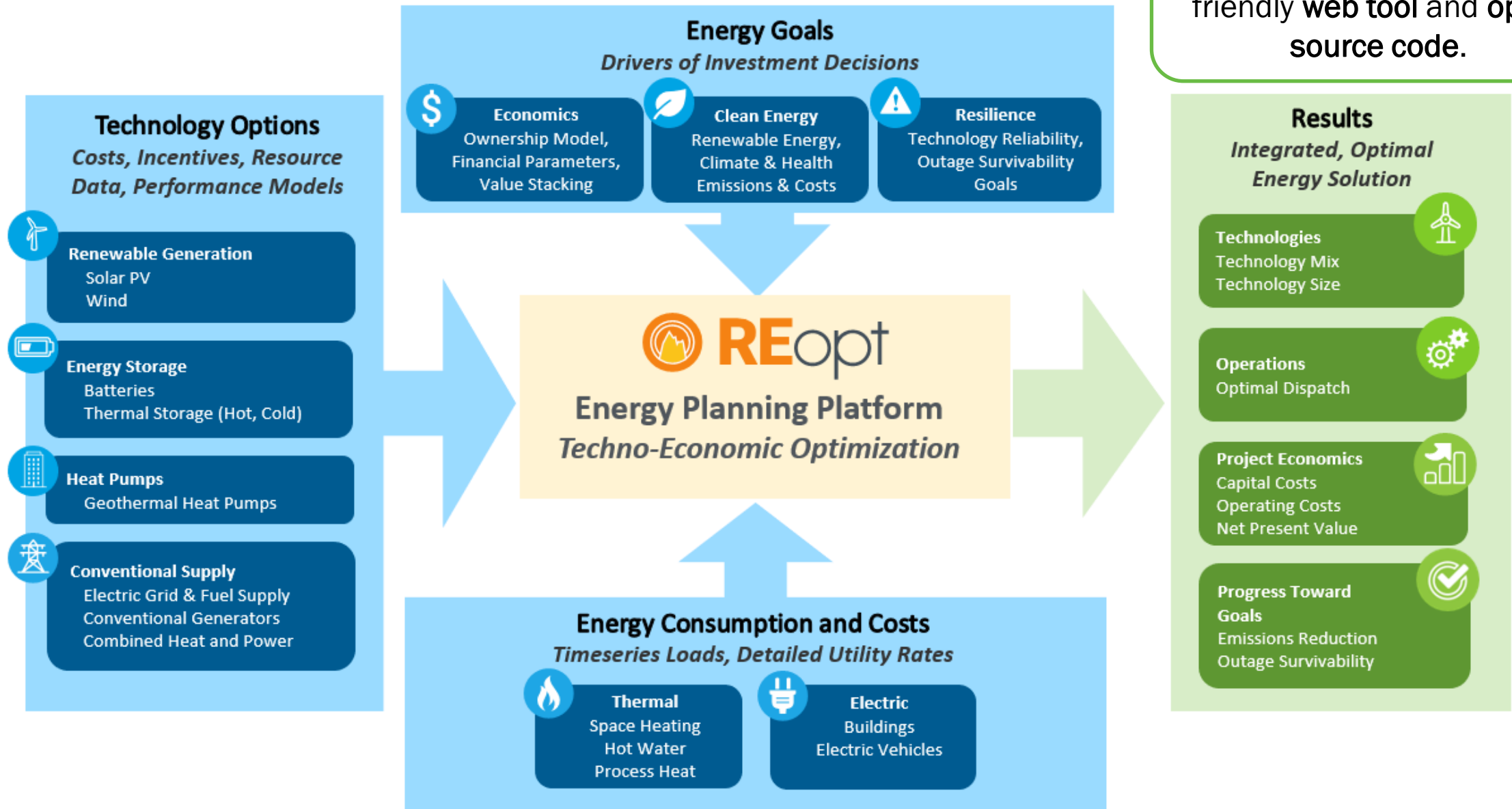


**Financial
Parameters**

Many factors affect how DERs may provide cost savings, resilience, and clean energy to your site. REopt allows these factors to be evaluated concurrently.

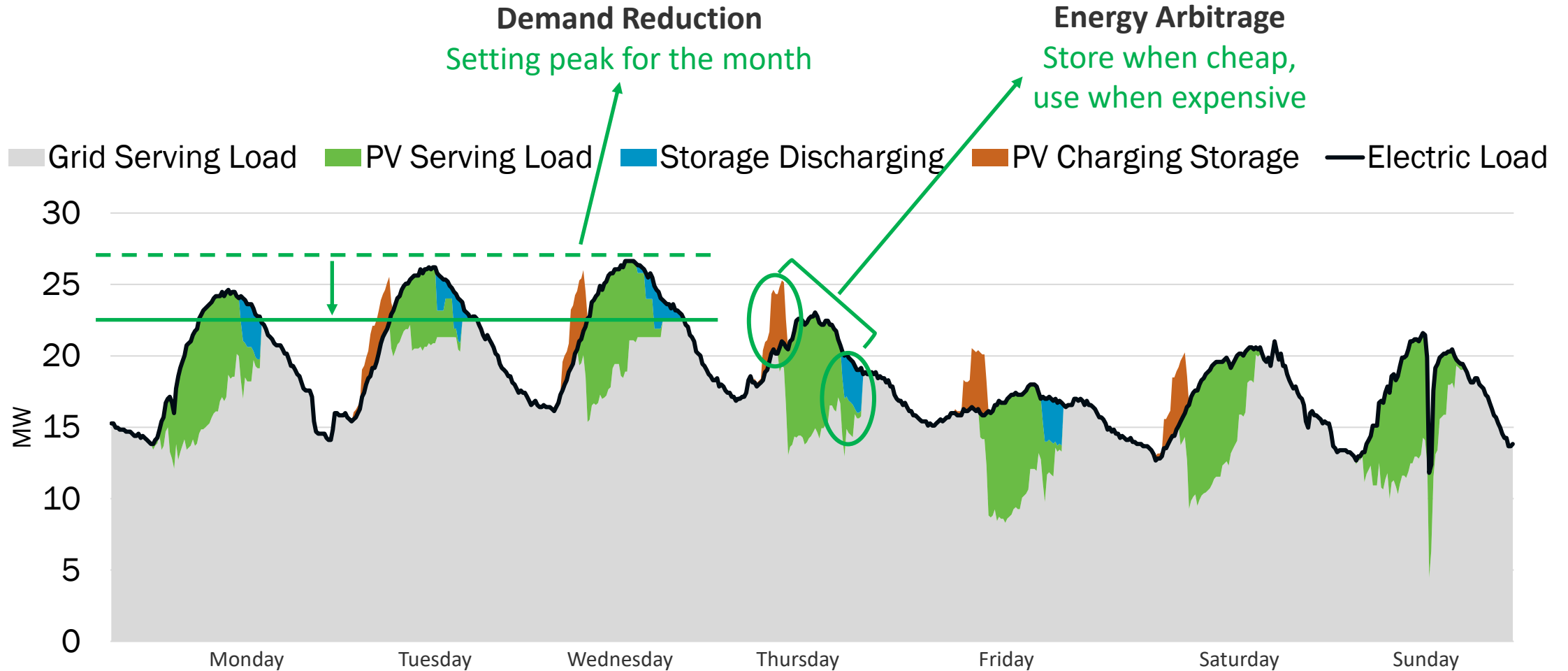
REopt Energy Planning Platform

REopt is accessible via a free, publicly available, user-friendly **web tool** and **open-source code**.



How Does REopt Work?

REopt considers the trade-off between ownership costs and savings across multiple value streams to recommend optimal size and dispatch.



Example of optimal dispatch of photovoltaics (PV) and a battery energy storage system (BESS)

REopt Web Tool User Interface

- **REopt web tool** provides free, publicly available, user-friendly capabilities from NREL's comprehensive **open-source REopt model**
 - Only requires 3-4 user inputs, but offers hundreds of customizable inputs with default values
- Optimizes **PV, wind, combined heat and power (CHP), GHP, battery energy storage, and thermal energy storage** system sizes and dispatch strategies to **minimize life cycle cost of energy**
- Concurrently evaluate DERs for **cost-savings, decarbonization, and resilience goals:**
 - **Clean energy goals** allow users to consider renewable energy targets, emissions reductions targets, and emissions costs in optimization
 - **Resilience mode** optimizes DER systems, along with backup generators, to sustain critical load during grid outages
- Access the REopt web tool at reopt.nrel.gov/tool.

Step 1: Select Single Site or Portfolio Analysis

Single Site 🏠

Portfolio Analysis 🏠 🏠

Step 2: Choose Your Energy Goals

Cost Savings 💰

Resilience 🛡️

Clean Energy 🌍

Step 3: Select Your Technologies

PV ☀️

Battery 🔋

Grid ⚡

Wind 🌪️

CHP 🏭

Prime Generator ⚡

Chilled Water Storage ❄️

Geothermal Heat Pump 🌍

Step 4: Enter Your Site Data

📍 Site and Utility (required)

* Site location 📍

Enter a location

* Required field

🌐 Use sample site

* Electricity rate 📊

⌵

Use custom electricity rate 📊

🔧 Optional inputs

🔄 Reset to default values

📊 Load Profiles (required)

+

💰 Financial

+

🔥 Renewable Energy & Emissions

+

⚙️ PV

+

🔋 Battery

+

REopt Web Tool – Key Outputs

Your recommended solar installation size

3,885 kW
PV size

Measured in kilowatts (kW) of direct current, this recommended size minimizes the life cycle cost of energy at your site.

Your recommended battery power and capacity

276 kW **598 kWh**
battery power battery capacity

This system size minimizes the life cycle cost of energy at your site. The battery power and capacity are optimized for economic performance.

Your potential life cycle savings (20 years)

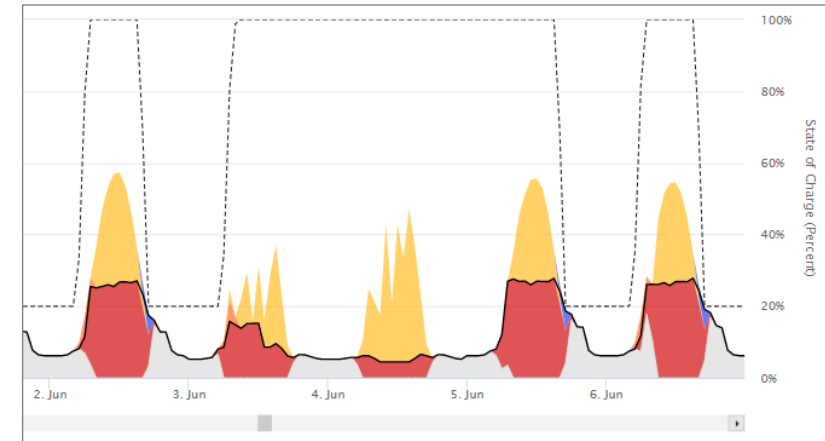
This is the net present value of the savings (or costs if negative) realized by the project based on the difference between the total life cycle costs of doing business as usual compared to the optimal case.

\$1,972,493

System Size and NPV

	Business As Usual	Financial	Difference
Renewable Energy			
Annual Renewable Electricity (% of electricity consumption)	0%	58%	58%
Climate & Health Emissions Costs			
Cost of Climate Emissions throughout Analysis Period	\$651,584	\$273,948	-\$377,636
Cost of Health Emissions throughout Analysis Period	\$92,811	\$39,485	-\$53,326
Climate Emissions, CO ₂			
Total Year 1 Emissions (t CO₂)	757	318	-439

Climate and Health Emissions Impacts



Hourly Dispatch

	Business As Usual	Financial	Difference
System Size, Energy Production, and System Cost			
PV Size	0 kW	113 kW	113 kW
Annualized PV Energy Production	0 kWh	132,000 kWh	132,000 kWh
Battery Power	0 kW	0 kW	0 kW
Battery Capacity	0 kWh	0 kWh	0 kWh
Net CAPEX + Replacement + O&M	\$0	\$133,318	\$133,318
Energy Supplied From Grid in Year 1	132,000 kWh	65,384 kWh	66,616 kWh
Year 1 Utility Cost – Before Tax			
Utility Energy Cost	\$18,112	-\$404	\$18,515
Utility Demand Cost	\$0	\$0	\$0
Utility Fixed Cost	\$0	\$0	\$0
Utility Minimum Cost Adder	\$0	\$0	\$0

Detailed Financial Outputs

Overview of REopt GHP Model

REopt GHP Background

- GHP technology was added to REopt with funding from U.S. Department of Energy's FEMP and Geothermal Technologies Office
- Initially released December 2021
- REopt leverages a GHP model developed by a third party

Step 1: Select Single Site or Portfolio Analysis ?

Single Site 🏠

Portfolio Analysis 🏠 🏠

Step 2: Choose Your Energy Goals

Cost Savings \$

Resilience 🛡️

Clean Energy 🌍

Step 3: Select Your Technologies

PV ☀️

Battery 🔋

Grid ⚡

Wind 🌬️

CHP 🏭

Prime Generator ⚡

Chilled Water Storage ❄️

Geothermal Heat Pump 🌍

Benefits of GHP in REopt

- **Allows high fidelity screening of GHP**
 - Detailed heat exchanger model for estimation of heat exchanger sizing, capital costs, and heat pump and heat exchanger performance
- **Allows integrated exploration of GHP and distributed energy resources as competing options or synergistic technologies**
- **Defaults provided on ground properties, heat pump performance, costs, etc.**
- **REopt is not a design tool; consultation with technical experts and application engineers is needed before investing**

Geothermal Heat Pump

Require GHP purchase in the solution	Yes
Heat pump configuration	Distributed water-to-air heat pumps (WAHP)
GHX configuration	Non-hybrid
Total installed cost for heat pump (\$/ton)	\$1,075
Total installed cost for building hydronic loop (\$/ft ²)	\$1.70
Total installed cost for GHX (\$/ft)	\$14.00
GHP incremental O&M cost increase over existing HVAC system (\$/ft ² -year)	-\$0.51
Space heating efficiency thermal factor (%)	
Cooling efficiency thermal factor (%)	

[Advanced inputs](#) [Reset to default values](#)

Evaluating GHP in REopt

- Users can choose whether to “force” GHP into REopt’s solution or whether to only include GHP if cost effective
- Default values available for technology cost and performance assumptions
 - Some default values are populated based on site/load assumptions from other input sections
- **GHP is different from other REopt technologies because:**
 - The hourly dispatch (operation) is not determined by REopt;
 - GHP is dispatched in each hour based on the user's entered heating and cooling loads

Geothermal Heat Pump

Require GHP purchase in the solution ? Yes

Heat pump configuration ? Distributed water-to-air heat pumps (WAHP)

GHX configuration ? Non-hybrid

Total installed cost for heat pump (\$/ton) ? \$1,075

Total installed cost for building hydronic loop (\$/ft²) ? \$1.70

Total installed cost for GHX (\$/ft) ? \$14.00

GHP incremental O&M cost increase over existing HVAC system (\$/ft²-year) ? -\$0.51

Space heating efficiency thermal factor (%) ?

Cooling efficiency thermal factor (%) ?

+ Advanced inputs

Reset to default values

REopt GHP Configurations

- **Heat pump configuration options:**
 - Distributed water-to-air heat pumps (WAHP). Sometimes called water-source heat pumps.
 - Central plant water-to-water heat pumps (WWHP)
- **Heat exchanger (GHX) model:**
 - Closed loop, vertical bores most common in commercial applications.
 - In REopt, we simulate GHX for the entire analysis period (as a default) to size GHX to ensure the ground doesn't get too warm or too cold over the useful life
 - **Optional Hybrid GHX:** Supplement heat sink/source with boiler or cooling unit. Can be used with WWHP and distributed WAHP.

Geothermal Heat Pump

Require GHP purchase in the solution ? No

Heat pump configuration ?
Distributed water-to-air heat pumps (WAHP)
Distributed water-to-air heat pumps (WAHP)
Central plant water-to-water heat pumps (WWHP)

GHX configuration ?

Total installed cost for heat pump (\$/ton) ? \$1,075

Geothermal Heat Pump

Require GHP purchase in the solution ? No

Heat pump configuration ?
Distributed water-to-air heat pumps (WAHP)

GHX configuration ?
Non-hybrid
Hybrid
Non-hybrid

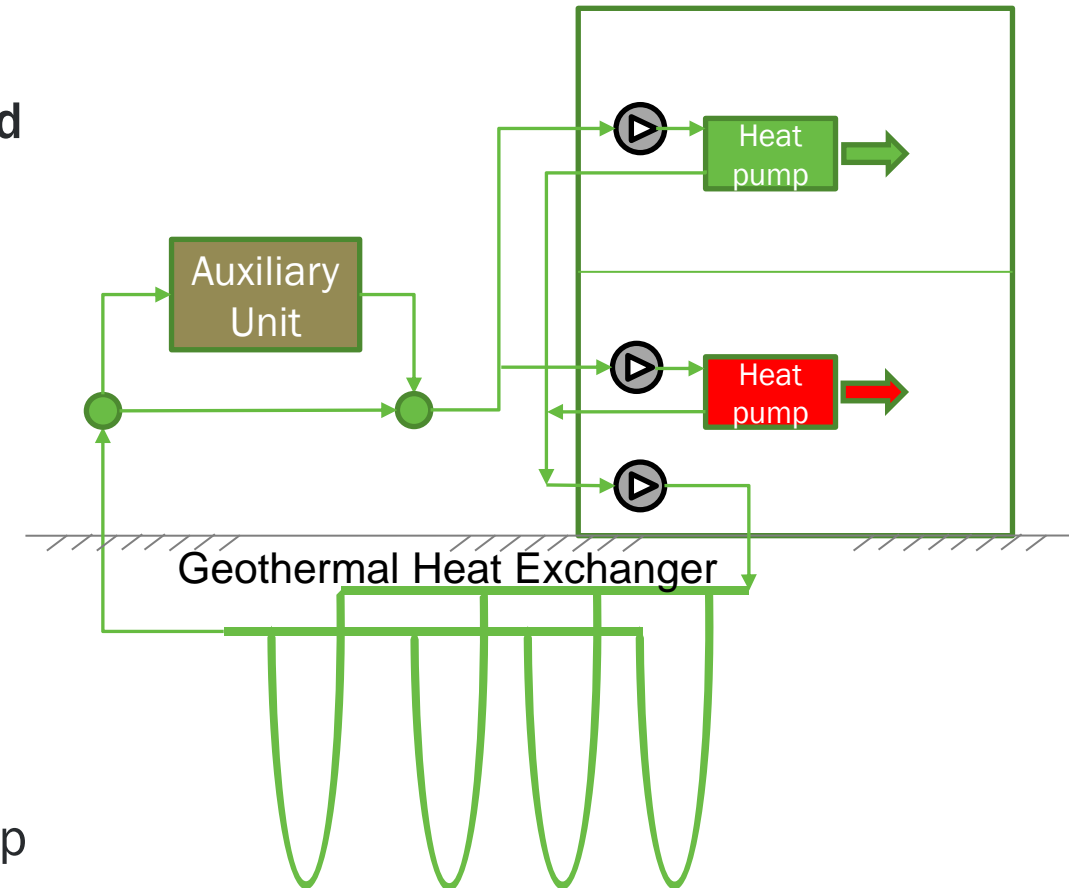
Total installed cost for heat pump (\$/ton) ?

REopt Heat Pump Configuration Options

	Distributed water-to-air heat pumps, WAHP	Central plant water-to-water heat pumps, WWHP
Form of delivered energy	<ul style="list-style-type: none"> Conditioned air 	<ul style="list-style-type: none"> Heated or chilled water
Configuration	<ul style="list-style-type: none"> Multiple distributed throughout facility, e.g., one per zone Are 'dual-mode', i.e., they can either heat or cool depending on the zone's needs Note: Modeled in REopt as a lumped performance, i.e., we don't model each zone and heat pump individually 	<ul style="list-style-type: none"> Centrally located units One dedicated heat pump for heating and one for cooling
Renovation considerations	<ul style="list-style-type: none"> Requires a full renovation of HVAC, including the installation of the heat pumps and a building interior water loop to connect the GHX and heat pumps 	<ul style="list-style-type: none"> Ideally, requires renovations only in the mechanical plant
Electricity consumption impacts	<ul style="list-style-type: none"> Electricity consumption of the heat pumps is determined by the temperature of the water from the GHX 	<ul style="list-style-type: none"> Electricity consumption of the heat pumps is determined by the temperature of the water from the GHX and the setpoint temperatures of the heating and cooling loops serving the zones

REopt Hybrid Heat Exchange Option

- Oftentimes, the GHX drives total costs
- In facilities with balanced heating and cooling loads to and from the ground, in general, a smaller GHX is needed
- In facilities with uneven heating and cooling, the ground temperature can change year over year, which requires increasing the size of the GHX
- To reduce the size of the GHX, and therefore the cost of the GHP retrofit, hybrid GHX can be considered
- Hybrid GHX adds an auxiliary heat exchange unit downstream of the ground loop
- Auxiliary unit is either:
 - A boiler to add heat to the GHX water loop
 - A cooling tower to remove heat from the GHX water loop

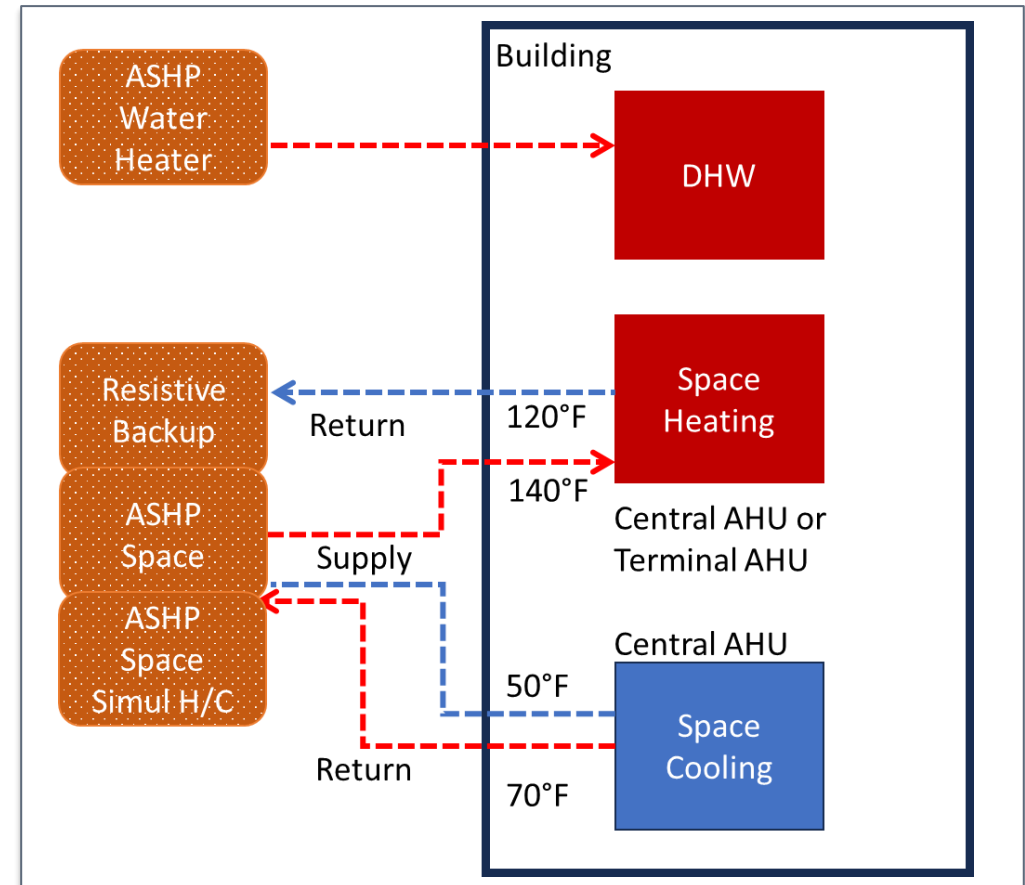


Upcoming Capabilities

Upcoming Capabilities

Upcoming (Fall 2024): Air-Source Heat Pumps in REopt

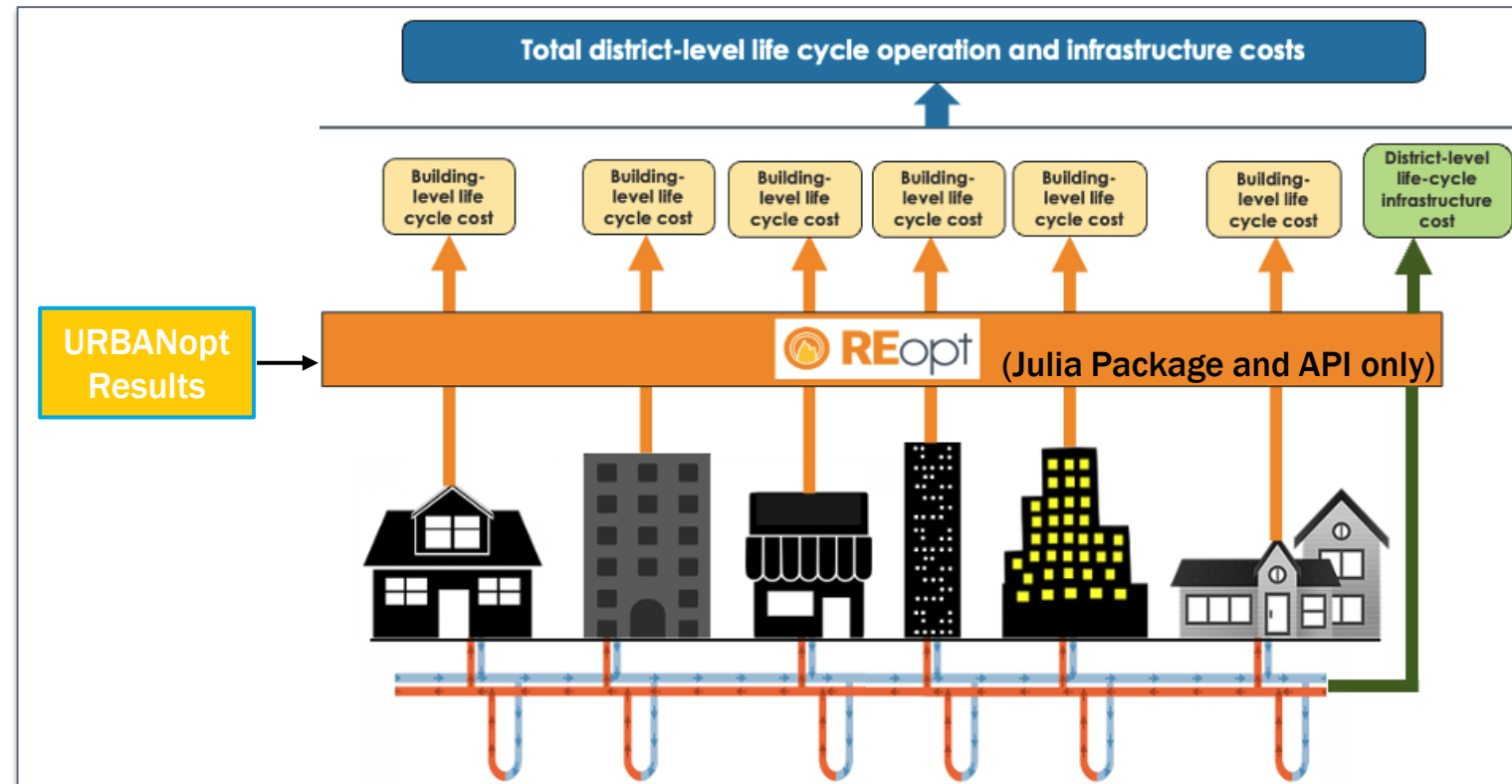
- Adding air-source heat pump (ASHP) models to REopt for:
 - Space heating and optional cooling
 - Domestic hot water (DHW)
- Additionally, we are disaggregating heating loads in REopt to allow for multiple technologies to collaborate towards various site energy requirements
 - Will also allow for evaluating process heat loads in the future
- Six different configurations for ASHP will be modeled to meet different site needs



Example ASHP configuration in which space heating, space cooling, and domestic hot water needs are met by an ASHP with resistive heating backup. *This is one of six configurations to be added to REopt.*

Also: Geothermal District Energy Systems in URBANopt

- URBANopt ([nrel.gov/buildings/urbanopt.html](https://www.nrel.gov/buildings/urbanopt.html)) is another NREL techno-economic analysis tool that allows users to evaluate energy options at the district level (e.g., 10s-100s of buildings), whereas REopt focuses on building-level impacts.
- REopt-URBANopt collaboration underway **geothermal district energy systems** to allow users to evaluate from both building-level (REopt) and district-level (URBANopt) perspectives.
- Note this capability is currently only scoped to be accessible programmatically (not via the web tool).



Summary & Resources

Summary and Resources

Summary

- **GHP in REopt:**
 - REopt’s GHP module allows high fidelity screening of the technical and economic potential of GHP retrofits
 - However, screening results are driven by a number of inputs; diligence is needed to ensure inputs are accurate
 - GHP can be used to eliminate fossil fuels as a source of heat, reduce greenhouse gas emissions, and reduce facility utility costs
 - Cost-effective applications most likely:
 - Have balanced heating and cooling loads to the GHX
 - Occur at facilities that are new, undergoing extensive renovations, or have HVAC equipment that is due for replacement
- **ASHP will be added to REopt this fall!**
- **REopt – URBANopt collaboration underway to facilitate analysis of geothermal district energy systems (won’t be added to the web tool yet, but hopefully eventually!)**

Accessing REopt

Interface	Description
REopt Web Tool reopt.nrel.gov	<ul style="list-style-type: none">• Easy-to-use web access• Key standardized capabilities• Results visualization• User accounts
REopt API github.com/NREL/REopt_API/wiki	<ul style="list-style-type: none">• Open-source code• Additional features and capabilities• Programmatic access facilitates large-scale analysis and tool integration• API: Leverage NREL computational resources• Julia package: Faster solve times, users can run locally
REopt Julia Package Home · REopt.jl Documentation (nrel.github.io)	
REopt Analysis Scripts github.com/NREL/REopt-Analysis-Scripts/wiki	<ul style="list-style-type: none">• Scripts (e.g., Jupyter notebooks) to use the API and Julia package

Additional Resources

- **Web tool user guides**—Web tool user manual, quick-start videos and fact sheets, YouTube tutorials and webinars, curriculum materials: reopt.nrel.gov/user-guides.html
- **User forum**—Landing page for questions asked and answered regarding the web tool, API, Julia package, and analysis scripts: github.com/NREL/REopt-Analysis-Scripts/discussions.

Existing and Upcoming FEMP REopt Trainings

		Summary	Access
<i>On-demand:</i>			
“REopt and Federal On-Site Clean Energy” series	1. Introduction to REopt	<ul style="list-style-type: none"> REopt overview Assumptions for federal users 	wbdg.org/continuing-education/femp-courses/fempodw134
	2. Site Data Requirements	<ul style="list-style-type: none"> Load data Utility rates Area available for on-site DERs 	wbdg.org/continuing-education/femp-courses/fempodw135
	3. Meeting Decarbonization and Resilience Goals	<ul style="list-style-type: none"> Clean energy accounting and goals Resilience modeling 	wbdg.org/continuing-education/femp-courses/fempodw136
Geothermal Heat Pumps in REopt		<ul style="list-style-type: none"> REopt’s GHP model 	On-demand link forthcoming
REopt Energy Resilience Performance		<ul style="list-style-type: none"> REopt’s resilience modeling capabilities 	On-demand link forthcoming
REopt Web Tool Portfolio Analysis		<ul style="list-style-type: none"> Portfolio analysis capabilities 	On-demand link forthcoming

Ask for Project Assistance

- Request help with your project today!
- Fill out a quick and easy application through the FEMP portal

Submit a Request
[Here](#)

The screenshot shows the top of the FEMP portal. At the top left is the 'ENERGY.GOV' logo, followed by the 'Office of ENERGY EFFICIENCY & RENEWABLE ENERGY' and the 'Federal Energy Management Program' title. Below this is a breadcrumb trail: 'FEMP Assistance Request Portal » FEMP Technical Assistance for Distributed Energy Projects'. The main heading is 'FEMP Technical Assistance for Distributed Energy Projects'. A paragraph explains that users should fill out three form categories to request technical assistance, and a FEMP project specialist will review the request. A note indicates that certain fields are required. The form itself is partially visible, showing sections for 'Contact Information', 'Project Information', and 'Project Description and Status'. The 'Project Information' section includes fields for 'Project Name *', 'Project Location *', and 'Project Description and Status *'. The 'Project Description and Status *' field has a placeholder text: 'Briefly describe the project you are pursuing and the current status of it.' Below this is a section for 'Project Champion and Team Members'.

Stay in Touch

Ask Questions

Visit FEMP's [Technical Assistance Portal](#) to ask questions ranging from general to project-specific.

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Thank You

Contact Info:

matthew.lowlavar@hq.doe.gov



FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

August 21 – August 22, 2024

Microgrids: How They Support an Installation and Serving Utility

Brian Dosa, PE – Director, Public Works, Fort Cavazos

Kevin M Mann – Manager Privatization, Fort Cavazos

Mike Gutowski, PE – Federal Business Leader, PowerSecure

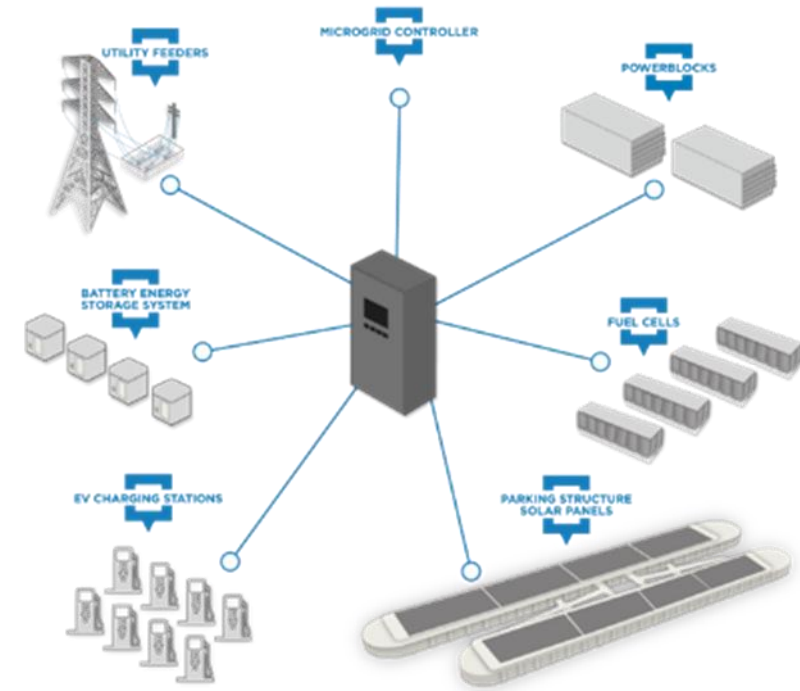


Panel Agenda

- Microgrids 101
 - What is a microgrid
 - Types of microgrid
 - Why develop a microgrid
- How does a microgrid support an Army Installation
 - Fort Cavazos Mission
 - Energy Resilience = Mission Readiness
- Why a utility would use a microgrid
 - System Strengths & Partnership Power
 - Grid Intelligence & Flexibility / Market Readiness

What Is A Microgrid?

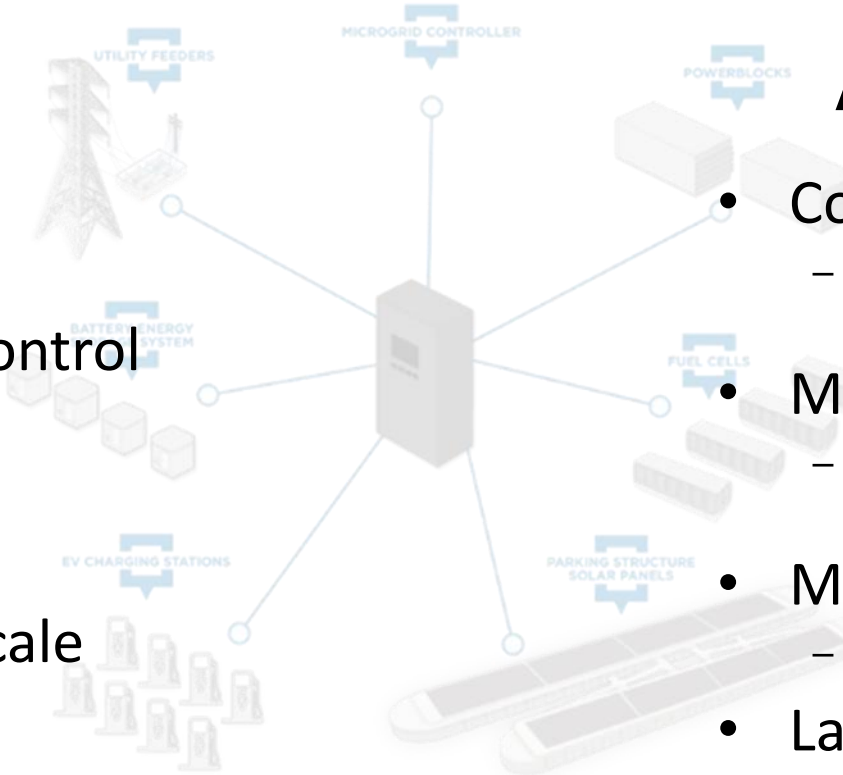
- Interconnected loads and distributed energy resources (DERs) within a well-defined electrical boundary
- The ability to connect or disconnect from the grid, operating in parallel or independently as an islanded system
- Sensitive to the aspect of time – encompassing the duration required to start and operate, as well as how long it can sustain operations



From Individual Resources to Microgrid

Basic Microgrid

- Simple controls
 - Inverters, turning on/off
- Narrow range of control
 - Grid to island
- Fewer DERs
 - Maybe 1 - 2
- Serves a simpler scale
 - Cluster of buildings

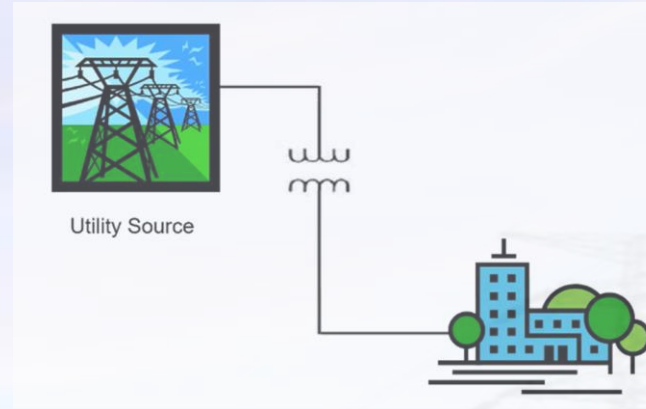


Advanced Microgrid

- Complex controls
 - Chooses between scenarios and modes such as load optimization and islanding
- More complex islanding
 - Control of power disruption and order of loads brought online
- Multiple DERs
 - Usually 3 or more
- Larger scale of service
 - Campuses, installations, bases

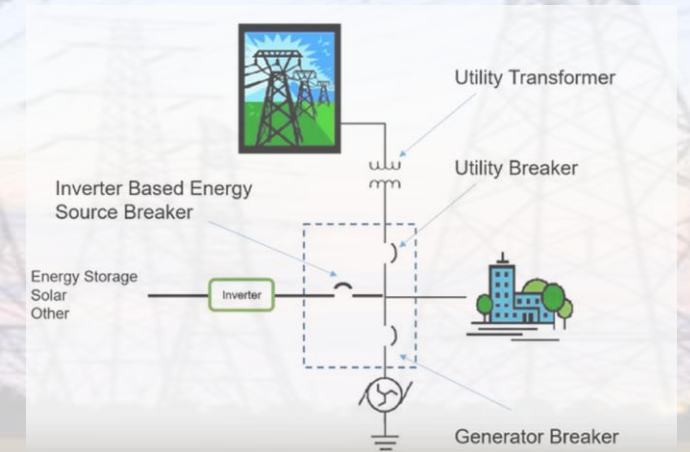
Why Develop a Microgrid?

- **Power Security**
 - Power quality
 - Grid instability
- **Power Diversification**
 - Generation options
 - Cost effectiveness
- **Increased Renewable Energy**
 - Carbon footprint
 - Essential portions of an advanced microgrid
- **Emission reduction**
 - Permitting issues and run time limits
 - Spinning reserve



Conceptual - Before Microgrid

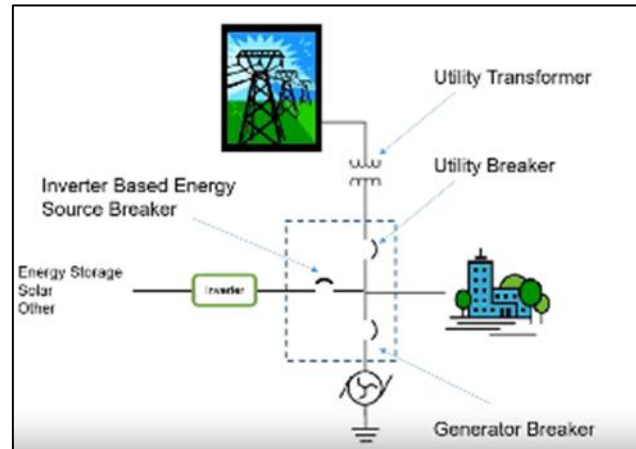
Conceptual – Microgrid Installed



Modes of Operation

- Grid Connected Mode

- Utility grid is present and stable
- Utility main breaker is closed
- All loads are fed by utility grid



- Island Mode

- Utility grid is not supplying power
- Utility main breaker is open
- DER sources are active and feeding loads

- Parallel Mode

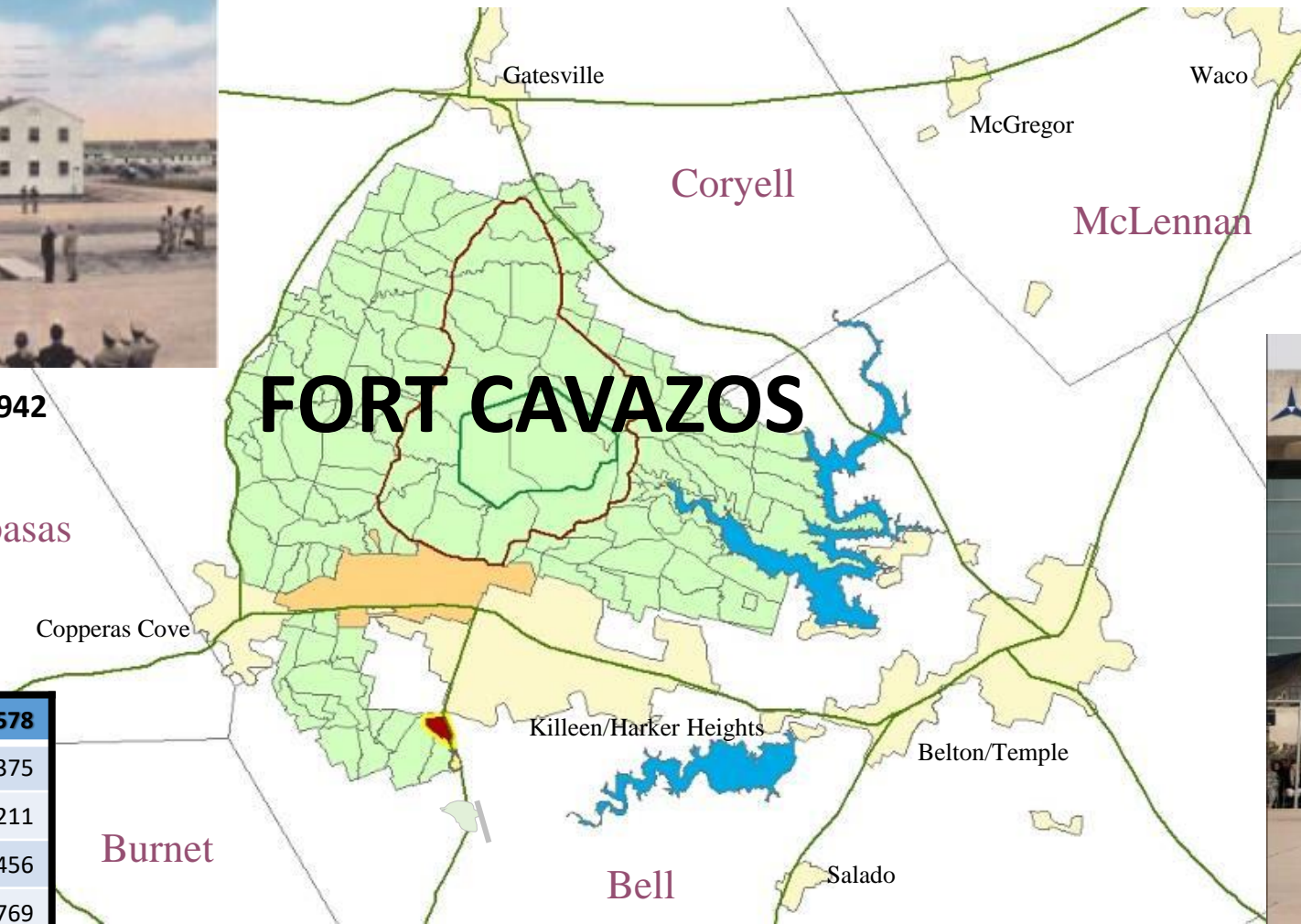
- Utility grid is present and stable
- Utility main breaker is closed
- “Grid forming” DER sources are serving loads with power to supplement or reduce the amount of grid provided power

GREETINGS FROM THE GREAT PLACE

CELEBRATING 82 YEARS OF SERVICE TO OUR NATION



18 September 1942



FORT CAVAZOS



Total Population Served (Actual)	716,578
Soldiers	34,375
On-post Family members	59,211
Off-post Family members	34,456
Gov Civilian Employees	4,769
Service/Contract Employees	6,782
Retirees, Family, Survivors	622,911



Readiness Starts Here

Fort Cavazos supports combat readiness:

- Home to 4 Brigade Combat Teams – most in Army
- Demonstrated ability to support up to 50,000 Soldiers
- An outstanding and highly capable Power Projection Platform and Mobilization Force Generation Installation
- Immediate access to 197,000 acres of Maneuver Training Area



Energy Resiliency at Fort Cavazos

Installation Energy and Water Plan (IEWP) was completed in January 2020.

- **Critical facilities:**
 - Mission (III Corps HQ, 1CD HQ, NEC HQ, RGAAF tower, CRDAMC, etc.)
 - Infrastructure (electric substations, water pump stations, NEC Remote Switching Centers (RSC), etc.)
- **Less than 50% of critical facilities have backup power generation:**
 - 38% mission facilities have backup power generation
 - 62% of Infrastructure facilities have backup power generation



- aka Black Start Exercise (BSE)
- Conducted 15 March 2022
- Facilitated by MIT-LL and USACE

Sustain

- Validated energy resilience and identified gaps in our readiness to respond and recover from long-duration electricity disruption to critical facilities
- MIT-Lincoln Labs augmented by USACE observation and feedback during the exercise proved invaluable
- Fort Cavazos Emergency Operations Center (EOC) is well trained and prepared to respond to Emergency / Consequence Management incidents.
- Existing backup generation performed well, including water/wastewater systems.
- Dominion demonstrated the ability to quickly restore power without incident or unintended consequences.

Improve

- Fort Cavazos requires additional backup power and/or microgrids to increase resiliency by reducing vulnerability of key infrastructure to external threats.
- Additional DPW power system mechanics required to maintain backup generators; regular PMCS is critical to keep them ready.
- Facility Managers are essential, must understand their responsibilities and maintain awareness of their facilities to maintain a common operating picture.
- Better understanding of exact coverage in facilities with partial backup power.
- Most Communication Rooms (CRAC units) do not have backup power and would be at risk in warm weather.

Take-aways

- Approximately half of Fort Cavazos' critical facilities have full or partial back-up generation.
- Future ERRE/BSE will benefit Fort Cavazos and help improve resiliency; will focus on targeted areas vs. entire post.



Robert Gray Army Airfield

- One of five U.S. Army Power Projection airfields
- Joint use with Killeen Regional Airport
- 10,000' x 200' dual ILS Runway
- Supports military and civil fixed and rotary wing aircraft, and Gray Eagle UAS operations
- Includes the Larkin Deployment Terminal, an on-airfield 900 pax processing facility
- Home of Gray Army Radar Approach Control Facility, which controls airspace within 60NM of Fort Cavazos
- New \$32.7M Fuel System and Storage recently completed



Killeen Regional Airport



Energy System Strengths & Partnership Power

- ✓ Improving Reliability, Resiliency, Efficiency & Sustainability
- ✓ Integrating renewables and distributed energy resources
- ✓ Providing Defense Community customers with new opportunities and options to mitigate risk
- ✓ Strengthening physical and operational security

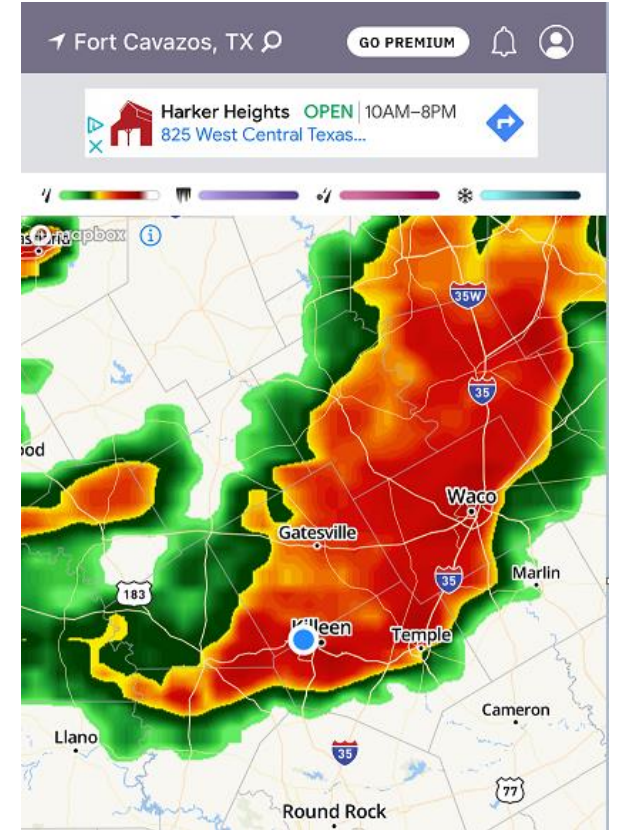


Federal Utility Partnership Working Group
August 21–22, 2024 Houston, TX



Grid Intelligence

- Real Time 24/7/365 Monitoring & Response



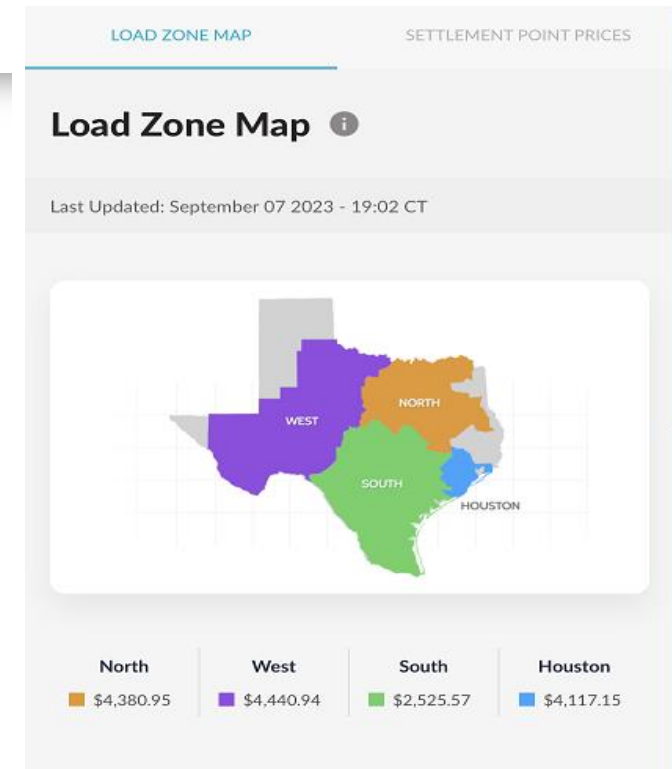
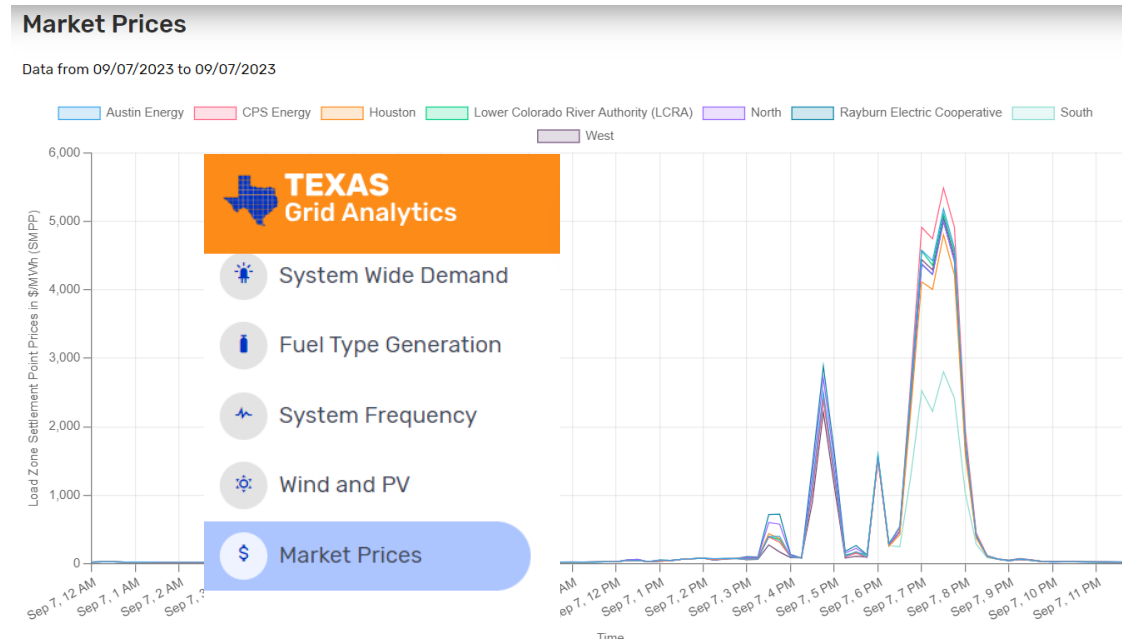
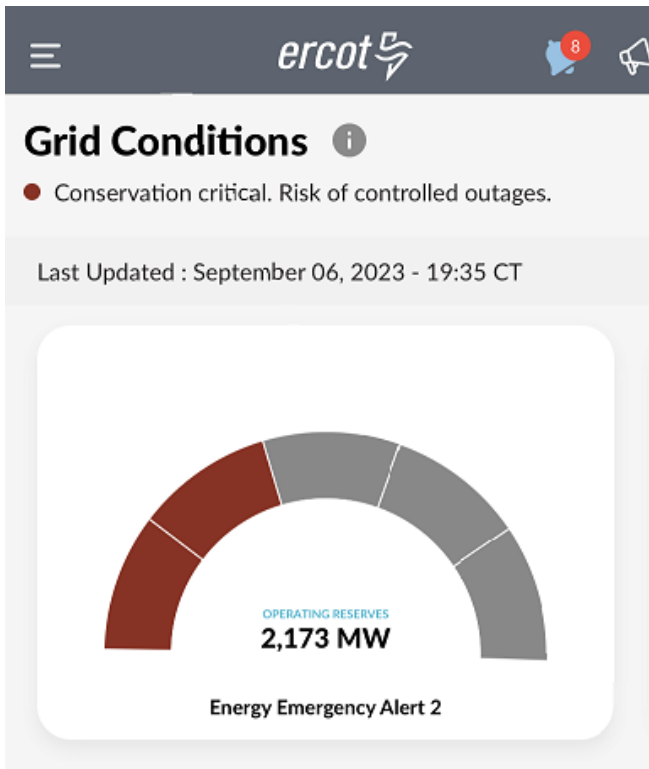
Flexibility

- Ability to move from commodity & generation options quickly



Market Readiness

- Understanding our markets, our opportunities





Thank You for your time!



FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

August 21 – August 22, 2024

Summer 2024 FUPWG Seminar!

Next up: Networking event!

At the Spindletop Reception. 4:45PM – 6:15PM CT. Located in the Hyatt Regency. An Elevator Operator will assist you with getting up to Spindletop.

