U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Welcome and Announcements – FUPWG Day 2

Tracy Niro – DOE FEMP

FEMP Federal Energy Management Program

Welcome to FUPWG Day 2!

- Highlights from Day 1
- Reminder: Slides and speaker bios are posted on the **FEMP FUPWG website**
- Invite your colleagues – registration is still open!
- Questions - Q&A Tool
- CEU Reminders

To Receive IACET-Certified CEUs for 5 Sessions of FUPWG

1. **Attend the training** in full—no exceptions.
   - If multiple people watching same screen during the training, email (stacey.young@thebuildingpeople.com) with who attended, who showed as connected, and for how long each person attended.
   - If participating by phone only, email (stacey.young@thebuildingpeople.com) and include your phone number.
   - There is no need to confirm your attendance if you logged in using Zoom.gov.
2. **Complete an assessment** demonstrating knowledge of course learning objectives within six weeks of the training. A minimum of 80% correct answers is required.
3. **Complete an evaluation** of the training event within six weeks of the training.

For logistical questions related to accessing the FUPWG test or evaluation, email FEMP Training at femp_training@ee.doe.gov.

Accessing Whole Building Design Guide – Tues Sessions

To Access the FUPWG Assessments and Evaluations, Visit:

FUPWG Session 1 – What's New in the Industry (Tuesday, 11:30am – 1pm)

- https://www.wbdg.org/continuing-education/femp-courses/femplw05032022

FUPWG Session 2 – Best Practices and Resources (Tuesday, 1:15 – 3pm)

- https://www.wbdg.org/continuing-education/femp-courses/femplw05032022a

FUPWG Session 3 – UESC Overview Part 1 (Tuesday, 3:05 – 3:55pm)

- https://www.wbdg.org/continuing-education/femp-courses/femplw05032022b

Accessing Whole Building Design Guide – Weds Sessions

To Access the FUPWG Assessments and Evaluations, Visit:

FUPWG Session 4 – New Federal Energy Goals and How We Get There (Wednesday, 11:10am-3pm)

- https://www.wbdg.org/continuing-education/femp-courses/femplw05042022

FUPWG Session 5 – UESC Overview Part 2 (Wednesday, 3:05-3:50pm)

- https://www.wbdg.org/continuing-education/femp-courses/femplw05042022a

VIRTUAL FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

May 3-4, 2022

Electric ECM Opportunities

Shanti Pless and Otto Van Geet

NREL

FEMP

Federal Energy Management Program

Federal Carbon Reduction Policy

Federal policies include:

- EO 13990: Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis
- EO 14008: Tackling the Climate Crisis at Home and Abroad
- EO 14057: Catalyzing America's Clean Energy Economy Through Federal Sustainability
  - Sec. 205. Achieving Net-Zero Emissions Buildings, Campuses, and Installations. (a) Each agency shall achieve net-zero emissions across its portfolio of buildings, campuses, and installations by 2045 and reduce greenhouse gas emissions by 50 percent from buildings, campuses, and installations by 2032 from 2008 levels, prioritizing improvement of energy efficiency and the elimination of onsite fossil fuel use.
  - Other directives include carbon pollution-free electricity (CFE) goals, zero emission vehicles, 65% reduction in scope 1&2 emissions by 2030
  - Implementing instructions from CEQ within 120 days (from December 8, 2021)

Decarbonization Checklist

- Document baseline scope 1 and 2 emissions
- Identify load reduction and efficiency opportunities
- Equipment electrification
- On site carbon free electricity generation & storage
- Consider off-site carbon free electricity purchase options

Establishing Carbon Baseline

Tools available to calculate site emissions baseline include:

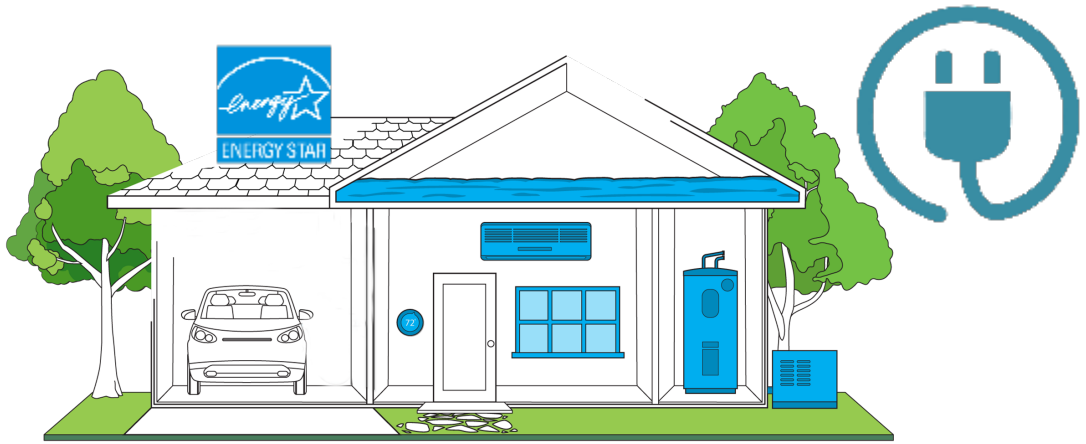
- EPA GHG Equivalencies Calculator (for scope 1)
- EPA eGRID Power Profiler (for regional scope 2)
- EPA Simplified GHG Emissions Calculator (spreadsheet used for annual reporting)

Decarbonization Strategies

Strategy is unique to each site

- Primarily a function of on-site fossil fuel use (Scope 1)
- Influenced by serving utility's current and future generation mix (Scope 2)

Baseline Load



Optimized Load

Step One: Deep energy efficiency and load reduction.

- Lighting, chillers, and load reduction
- When replacing inefficient fossil fuel-based equipment, begin with load reduction, then electrification and demand flexibility
- Avoid new long-lived fossil fuel burning equipment (boiler, etc.) when possible

Step Two: Electrification (electric vehicles, heat pumps).

- Reduces emissions in most locations
- Largest reductions where current/future utility carbon emissions are relatively low

Step Three: On-site carbon free energy generation / storage.

- Largest emissions reduction where current/future utility carbon emissions are relatively high

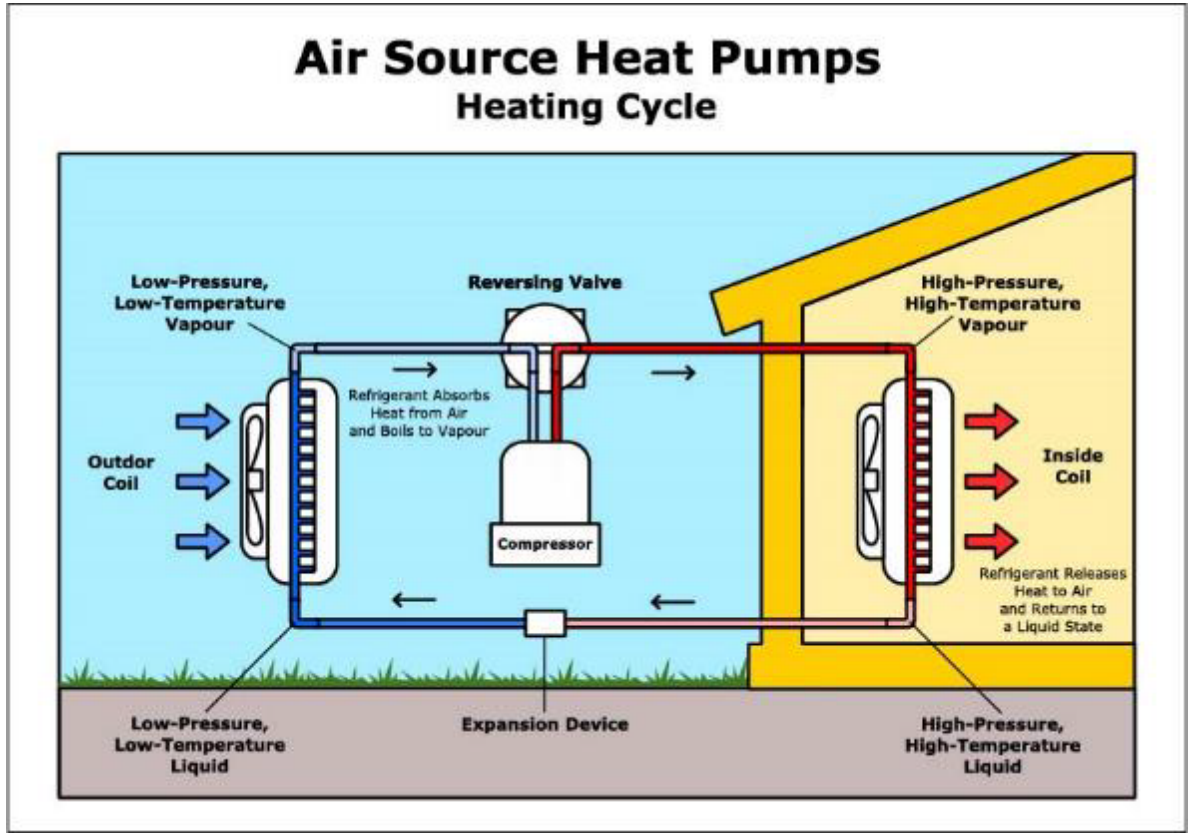
Building Decarbonization Best Practices

- **Estimate energy savings and carbon reductions for each ECM to determine which deliver the largest carbon reductions at the lowest cost**
  - Saving energy reduces carbon emissions
- **Take advantage of budget for planned HVAC equipment replacements to improve efficiency and/or switch to lower carbon options**
- **Reduce loads and evaluate opportunities for downsizing equipment during replacement by comparing current equipment to load trend data**
- **Replace high global warming potential (GWP – CFC, HFC) refrigeration equipment with high efficiency, low GWP refrigeration equipment. Ensure old refrigerants are reclaimed or disposed of properly.**
- **Reduce water consumption to save pumping electricity and heating energy**
- **Install automated building controls**
  - Integrate DER and electric vehicle charging
  - Provide automated demand response and flexibility services

Adapted from: Green Building Advisory Committee, Federal Building Decarbonization Task Group presentation

Electrification – Heat Pumps

- **Air source heat pumps**
  - Ducted and ductless mini–split, AHU, RTU
  - Variable Refrigerant Flow (VRF) –
    - Good for variable load buildings
  - Cold Climate Heat Pumps
    - Reduced performance in cold weather below ~10F-20F
  - Heat pump water heaters
- **Water source heat pumps**
  - Consider sewer water, waste heat recovery
- **Ground source heat pumps (GSHP)**
  - Good for mixed climates
  - Good for very cold or very hot climates
  - Can be open or closed loop (vertical or horizontal loop); can use in bodies of water
- **Avoid electric resistance heat**
  - Will increase carbon emissions with dirty grid
  - Will increase electric demand and cost



DOE Energy Saver: Air Source Heat Pumps

Heat Pump Coefficient of Performance (COP)

Entering Air/Fluid Temperature (°F)	Cooling COP (kWt/kWe)	Heating COP (kWt/kWe)
20	11.0	3.4
30	11.0	3.6
40	11.0	4.2
50	10.5	4.7
60	9.2	5.1
70	7.3	5.7
80	5.8	6.0
90	4.8	6.3
100	3.9	6.3
110	3.3	6.3
120	2.7	6.3

- **Colder entering temp results in better cooling performance**
- **Warmer entering temp results in better heating performance**
- **Cold Climate Heat pumps COP>1 @ OA temps of -20F**

Heat Pump Considerations

- **Existing steam heating systems (steam is difficult to produce with heat pumps)**
  - Convert steam to hot water, hot water produced with HR chiller/heat pumps/condensing boilers
- **O&M and maintenance costs**
  - O&M may increase with heat pumps vs gas fired equipment
- **Heat pump vs. gas equipment performance**
  - Air source heat pump efficiency and capacity reduced at temperature less than ~20°F
  - But still better than electric resistance at –20°F for best-in-class cold climate heat pumps
- **Electric service requirements**
  - Heat pumps increase winter electrical demand, may require electrical service increase
  - Resilience may require larger backup power source
  - **Cost of electric energy, demand (and electrical demand increase)**
  - Electrical energy use and demand will increase in winter with heat pumps
- **More information: Decarbonizing HVAC and Water Heating in Commercial Buildings**

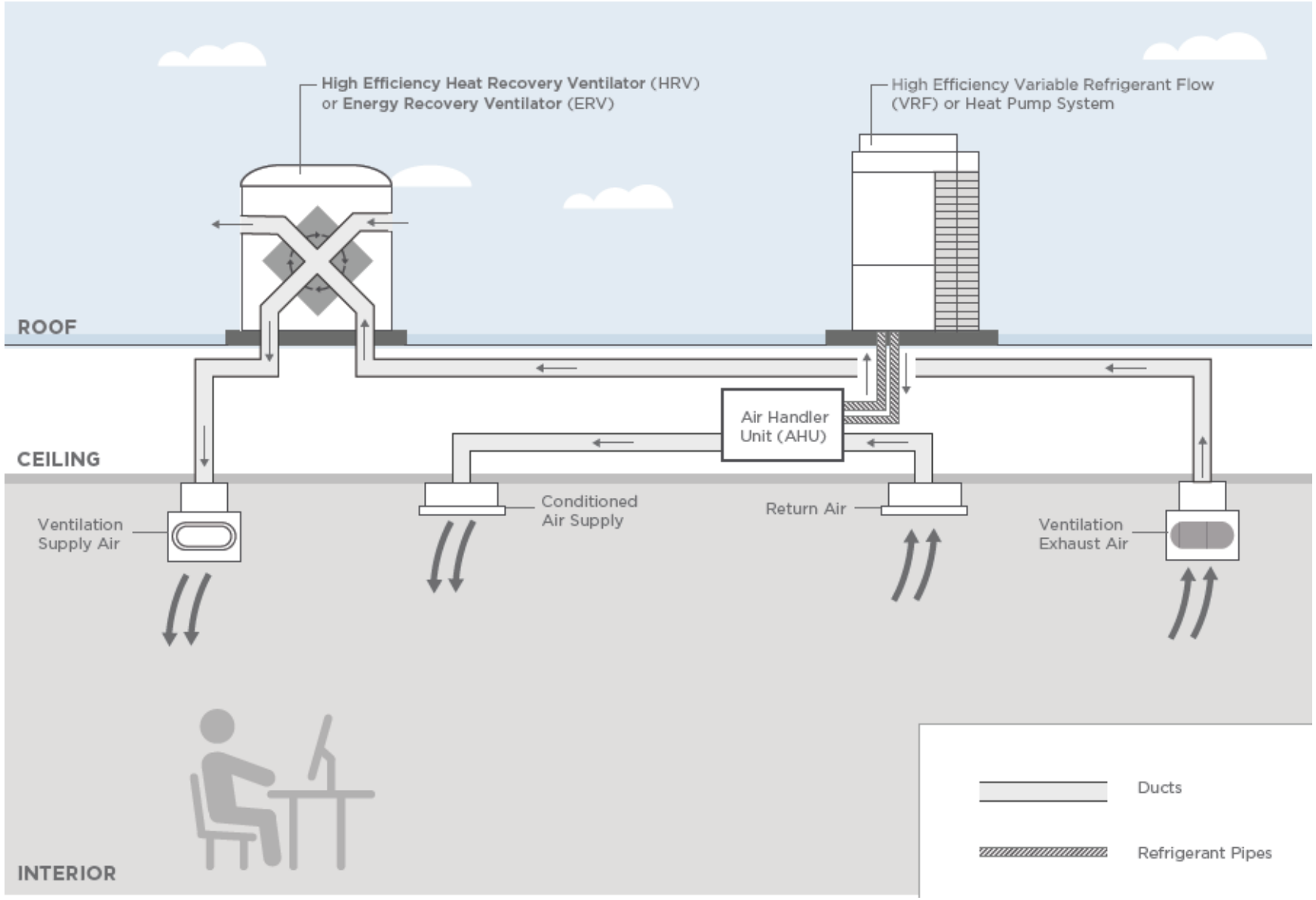
Northwest Energy Efficiency Alliance (NEEA) Pilot

High-Efficiency HVAC Retrofits

DOAS + ERV + VRF

Source: NEEA, "Very High Efficiency Dedicated Outside Air System Pilot Project Report," March 2020

Dedicated Outside Air System (DOAS) – provides only air needed for ventilation
Energy Recovery Ventilator (ERV) – recovers ~80-90% of energy from exhaust air
Variable Refrigerant Flow (VRF) – provides heating or cooling as necessary at part loa



NEEA Pilot: 45-85% HVAC Energy Savings

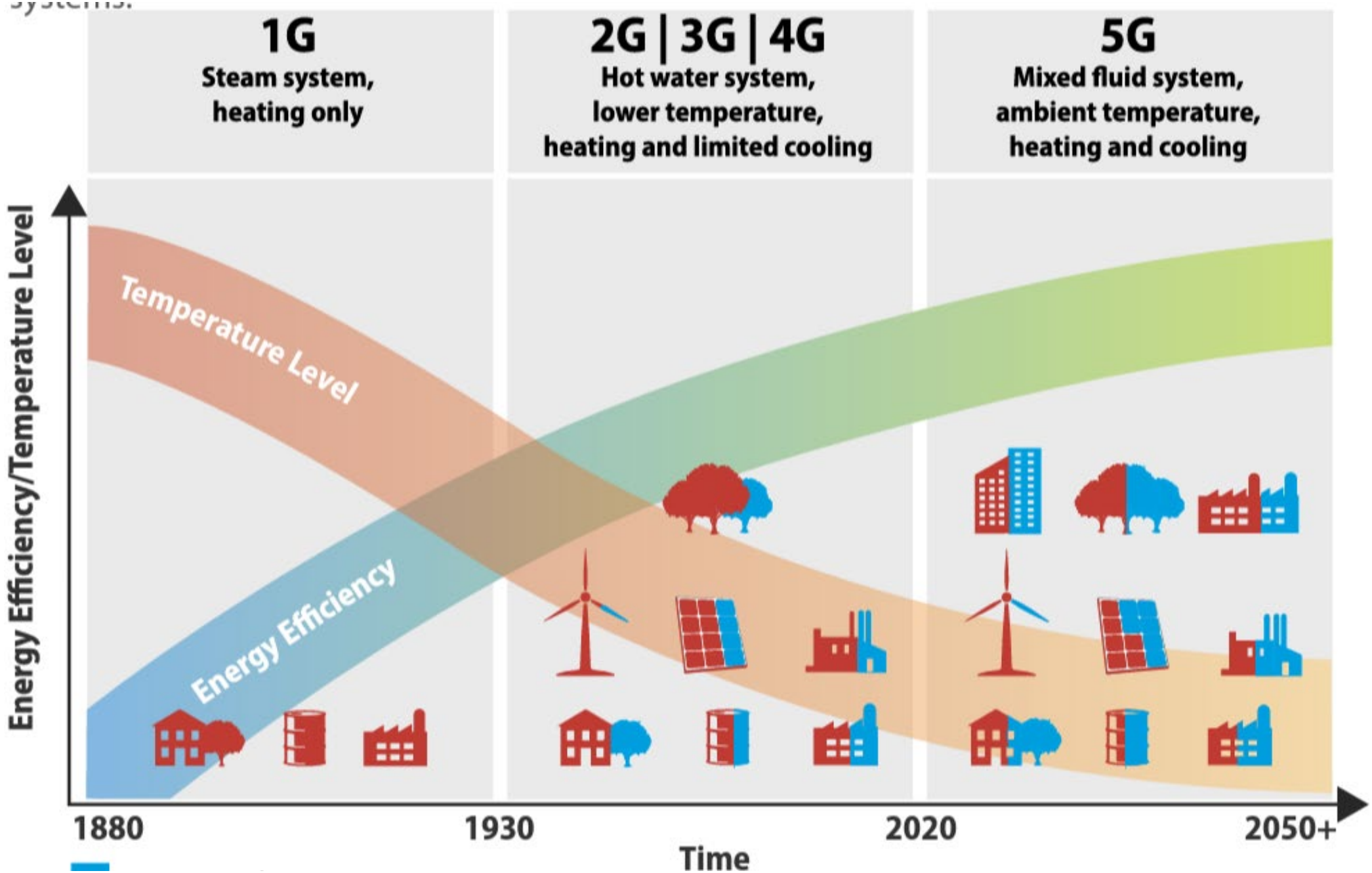
				
Location	**Portland, OR**	**Corvallis, OR**	**Seattle, WA**	**Corvallis, OR**
Building type	Second-story law office space	Single-story government office building	Third-floor office space	Restaurant
Conditioned area (sq. ft.)	11,615	3,770 of 13,200	5,911	1,360
Total project cost (per sq. ft.)	$15.61	$11.47	$16.83	$27.50
Reduction in building energy use	63%	39%*	42%	8%**
Reduction in HVAC energy use	72%	70%*	69%	43%**
Existing HVAC system	9 RTUs (35 tons in total)	2 4-ton RTUs (in the 3,770 sq. ft. retrofitted zones)	14-ton electric resistance RTU	7.5-ton RTU
New HVAC system	16-ton Mitsubishi VRF 4 Ventacity VS1000RT HRVs	4-ton Mitsubishi multi-zone mini-split heat pump 1 Ventacity VS1000RT HRV	14-ton Mitsubishi VRF 1 Ventacity VS1000RT HRV	2-ton Fujitsu single-zone ductless heat pump 3 3-ton Daikin single-zone ductless heat pumps 1 Ventacity VS1000RT HRV

				
Location	**Seattle, WA**	**Darby, MT**	**Libby, MT**	**Portland, OR**
Building type	Airport terminal building	Dormitory	Office building	Restaurant
Conditioned area (sq. ft.)	25,200	11,000 (per dorm)	5,735	1,147
Total project cost (per sq. ft.)	$36.85	$9.64	$21.90	$30.99
Reduction in building energy use	61%	24%	29%	20%
Reduction in HVAC energy use	85%	52%	45%	73%
Existing HVAC system	3 RTUs (95 tons in total)	5 electric forced-air furnaces 1 exhaust fan	1 electric boiler 2 swamp coolers 1 6-ton heat pump RTU 1 server room heat pump	1 3-ton RTU
New HVAC system	4 Mitsubishi VRF systems (32 tons in total) 3 Ventacity VS1000RT HRVs	4 3-ton York split system heat pumps 1 4-ton York split system heat pump 1 Ventacity VS1000RT HRV	2 4.5-ton Mitsubishi heat pump units 1 Ventacity VS1000RT HRV	1 3-ton Daikin multi-zone ductless heat pump 1 Ventacity VS1000RT HRV

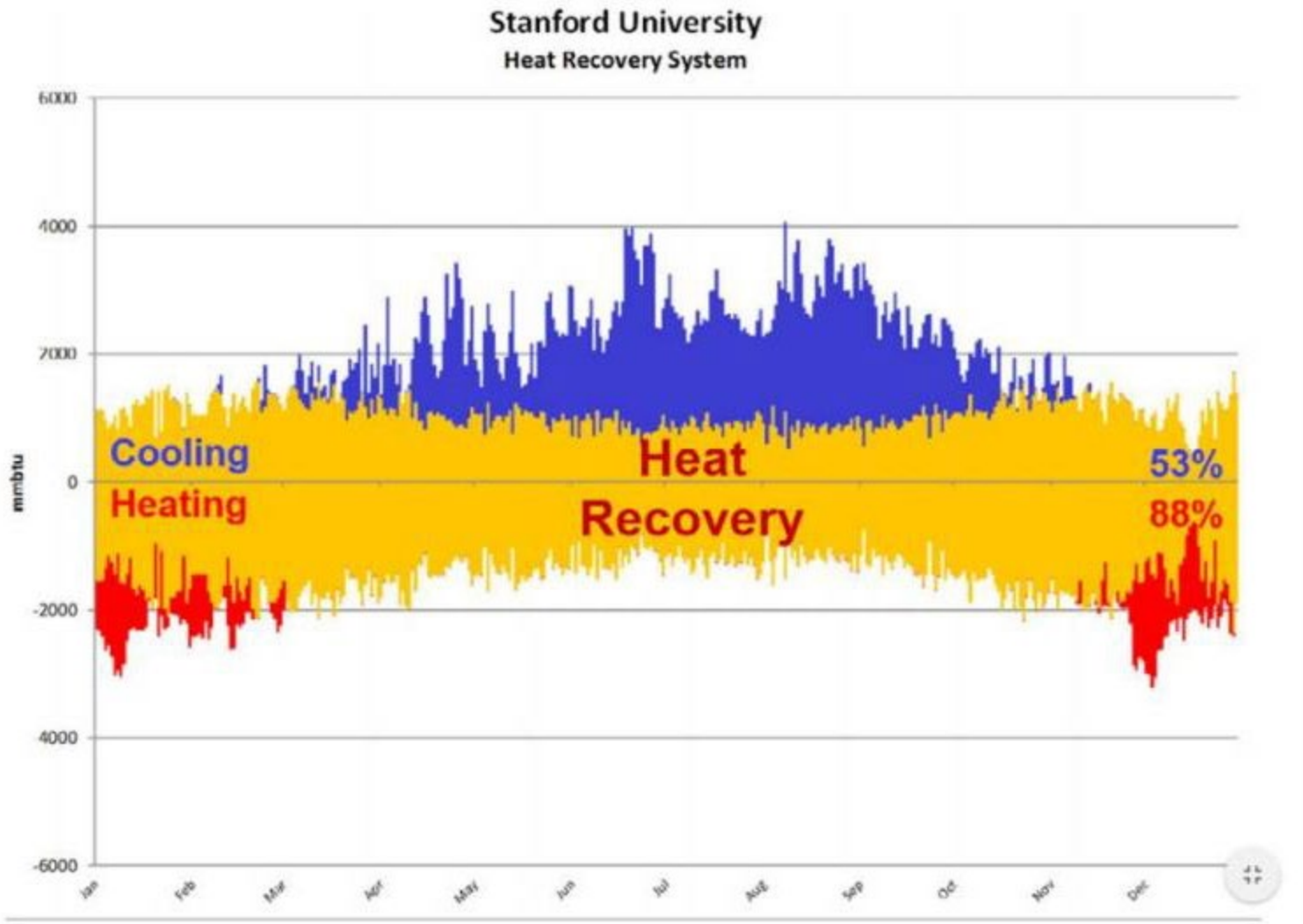
Source: NEEA, "Very High Efficiency Dedicated Outside Air System Pilot Project Report," March 2020

Existing Large Building / District Systems

- Re-commission HVAC systems, fix issues, establish rigorous commissioning/maintenance program
- Develop 10 – 20 year decarbonization/electrification plan
  - Perform envelope analysis with eye to peak loads, likely replace all single pane and/or aluminum frame windows
  - Envelope efficiency can *significantly* buy down cost of central plant equipment
  - Retrofit buildings to use ~120-140F hot water
  - **Retire central steam system (gen 1).** Replace with low temp hot water (<140F) (gen 4) or ambient loop (gen 5).
  - Convert high pressure/temp hot water systems (gen 2/3) to gen 5.
  - Central plant: Heat recovery chillers + ASHPs/GSHPs + thermal storage


1G
Steam system, heating only
2G | 3G | 4G
Hot water system, lower temperature, heating and limited cooling
5G
Mixed fluid system, ambient temperature, heating and cooling
Temperature Level
Energy Efficiency
Energy Efficiency/Temperature Level
1880
1930
2020
2050+
Time

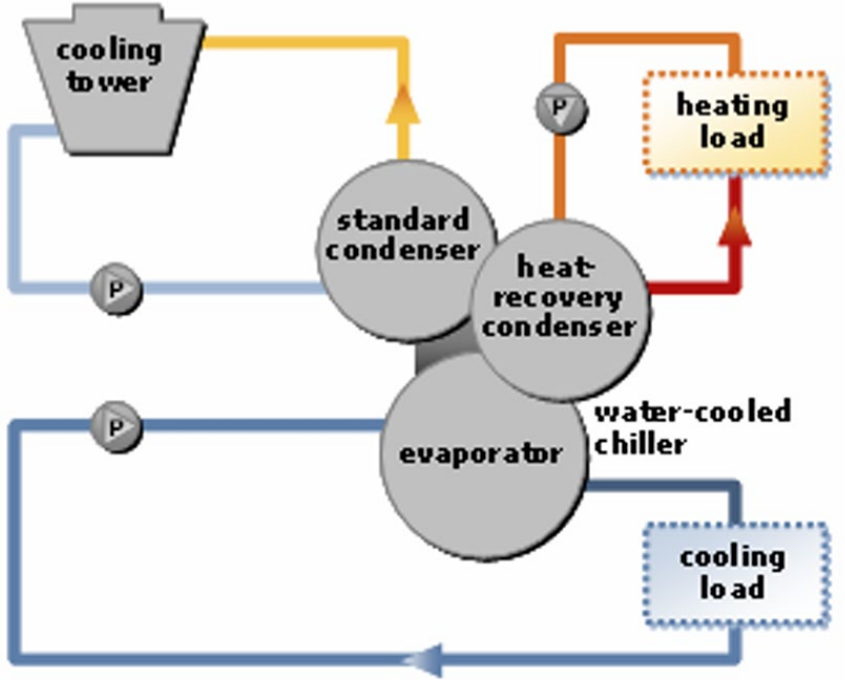
Heat Recovery Chillers – Simultaneous Heating and Cooling



Since 2015, the Stanford Energy System Innovations (SESI) Project has achieved a 68% GHG reduction and 18% water reduction, meeting 88% of campus heating load with heat pumps at lower life-cycle cost than alternatives.

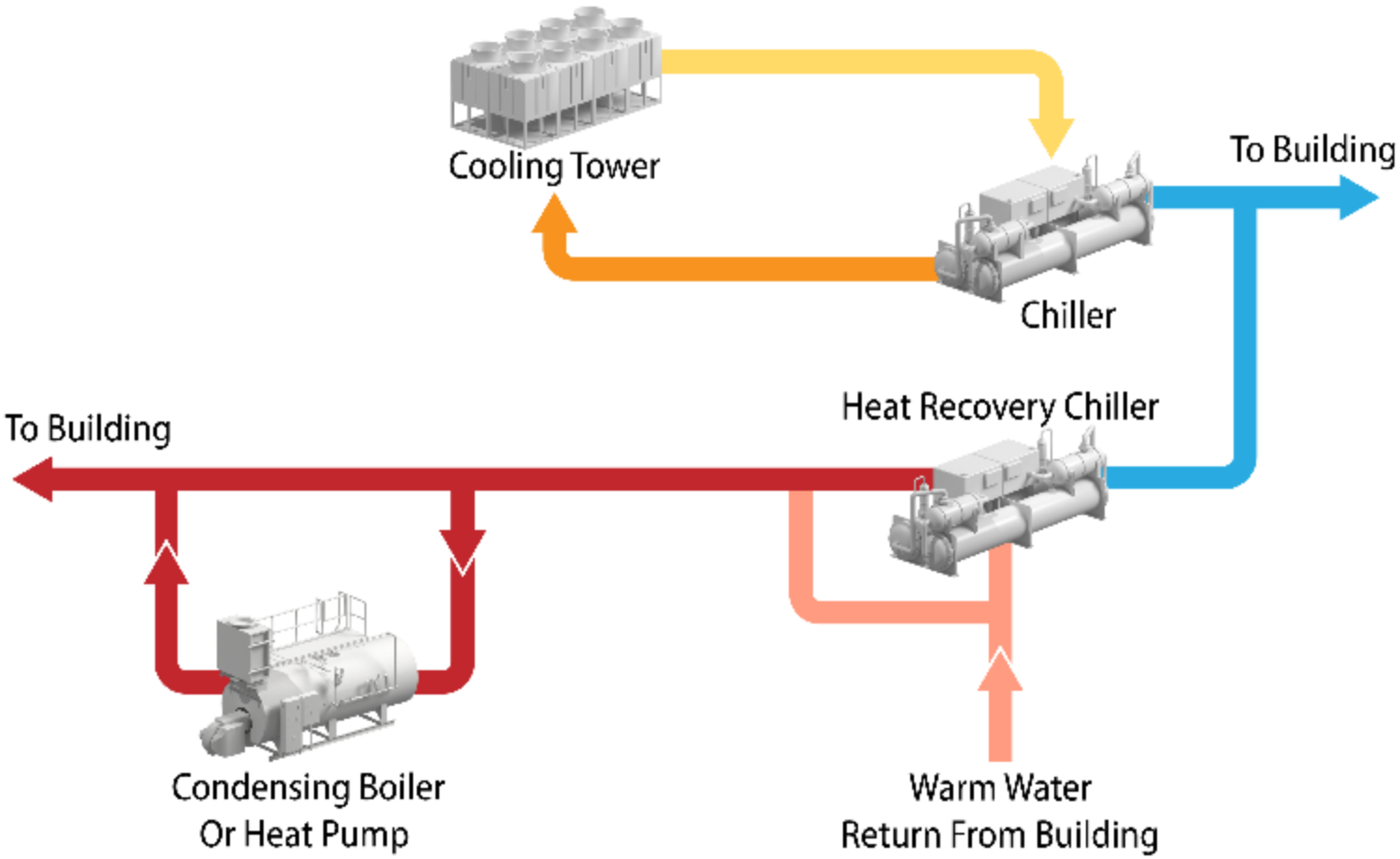
SESI Website
SESI Brochure

Heat Recovery Chillers, Combined with Conventional Chillers/Boilers



[Introduction of Heat Recovery Chiller Control and Water System Design]

Heat Recovery COP 6-8 @113°F HW, 41°F CHW



Cambium Data Set

NREL's Cambium dataset can be used to better understand hourly emission reductions from CFE projects and purchases:

- What type of generation is offset?
- How quickly is your grid expected to decarbonize?
- What is the total estimated emission reduction from your project?
- How do grid emissions vary throughout the day?

User Inputs	
Emission	CO2
Emission stage	Combustion
Start year	2023
Evaluation period (years)	20
Discount rate (real)	0.03
Scenario	Mid-case
Global Warming Potentials	100-year (AR5)
Location	End-use
2050 Fraction	0.00

Levelized Long-run Marginal Emission Rates (Annual)

Units: kg of CO2 per MWh at the point of end-use

AL	AR	AZ	CA
405.3	332.7	244.3	123.3

Workbook Outputs

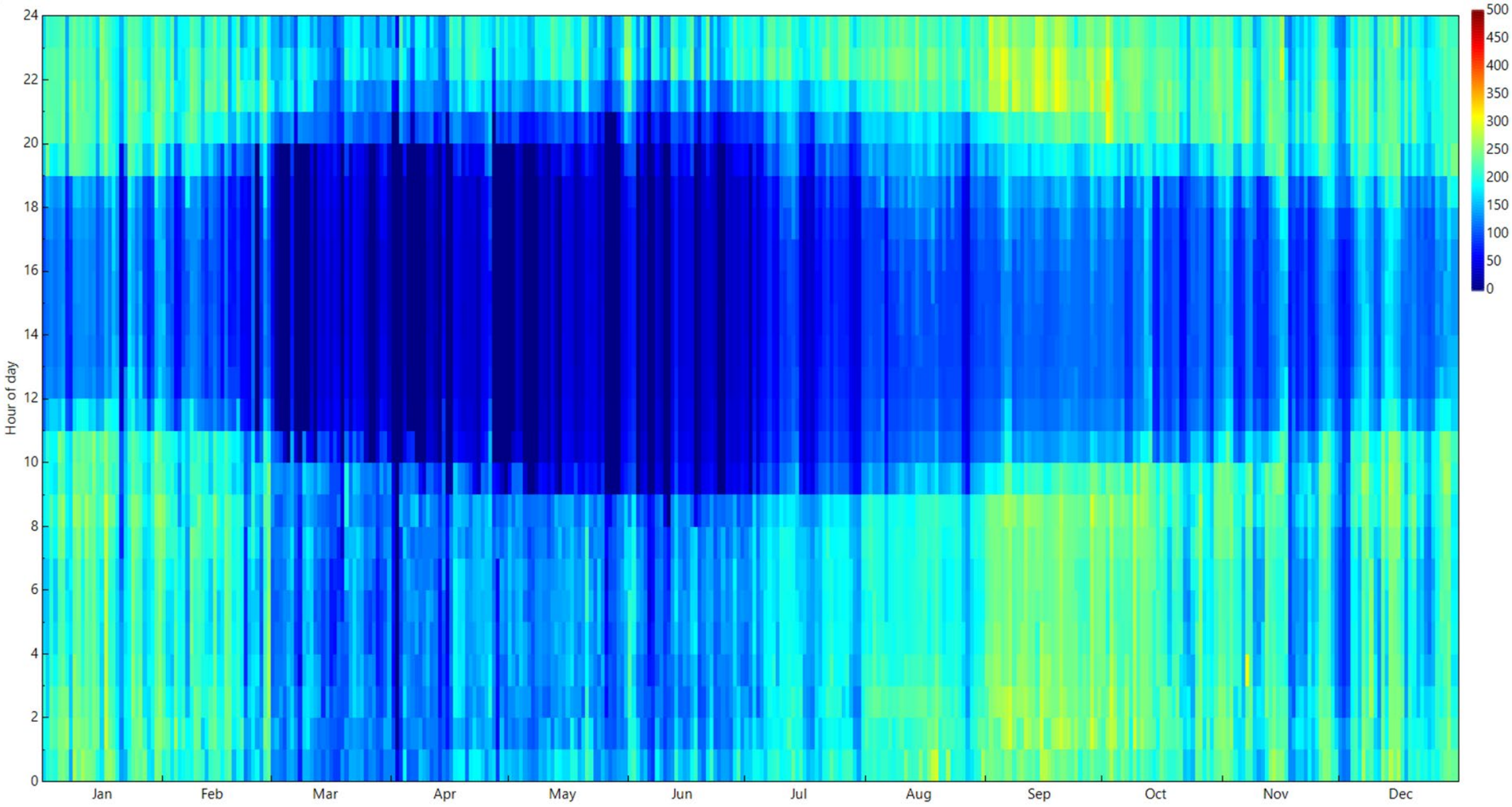
Levelized Long-run Marginal Emission Rates (Time-of-day)

Units: kg of CO2 per MWh at the point of end-use

Hour	AL	AR	AZ	CA
1	487.6	374.1	271.0	151.0
2	489.1	372.8	276.9	157.2
3	487.4	372.5	280.0	161.3
4	486.7	371.3	280.6	158.4
5	484.8	372.7	279.7	155.7
6	445.3	359.6	274.3	135.9
7	381.0	326.9	250.2	115.9
8	325.8	293.9	230.9	102.6
9	301.9	277.2	216.8	97.7
10	296.0	274.8	212.1	98.3
11	294.1	275.1	211.4	98.2
12	295.0	275.4	210.8	99.0
13	296.2	275.6	210.0	99.6
14	301.5	277.7	210.8	100.0
15	313.3	280.2	211.4	101.5
16	349.7	288.7	214.9	106.8
17	412.2	316.1	232.9	121.0
18	464.3	360.2	250.3	128.6
19	487.0	389.9	260.8	132.6
20	478.8	391.5	265.4	130.4
21	475.2	384.0	262.1	128.6
22	488.3	380.7	260.8	135.1
23	494.2	380.2	262.9	137.4
24	489.8	376.3	265.1	145.6

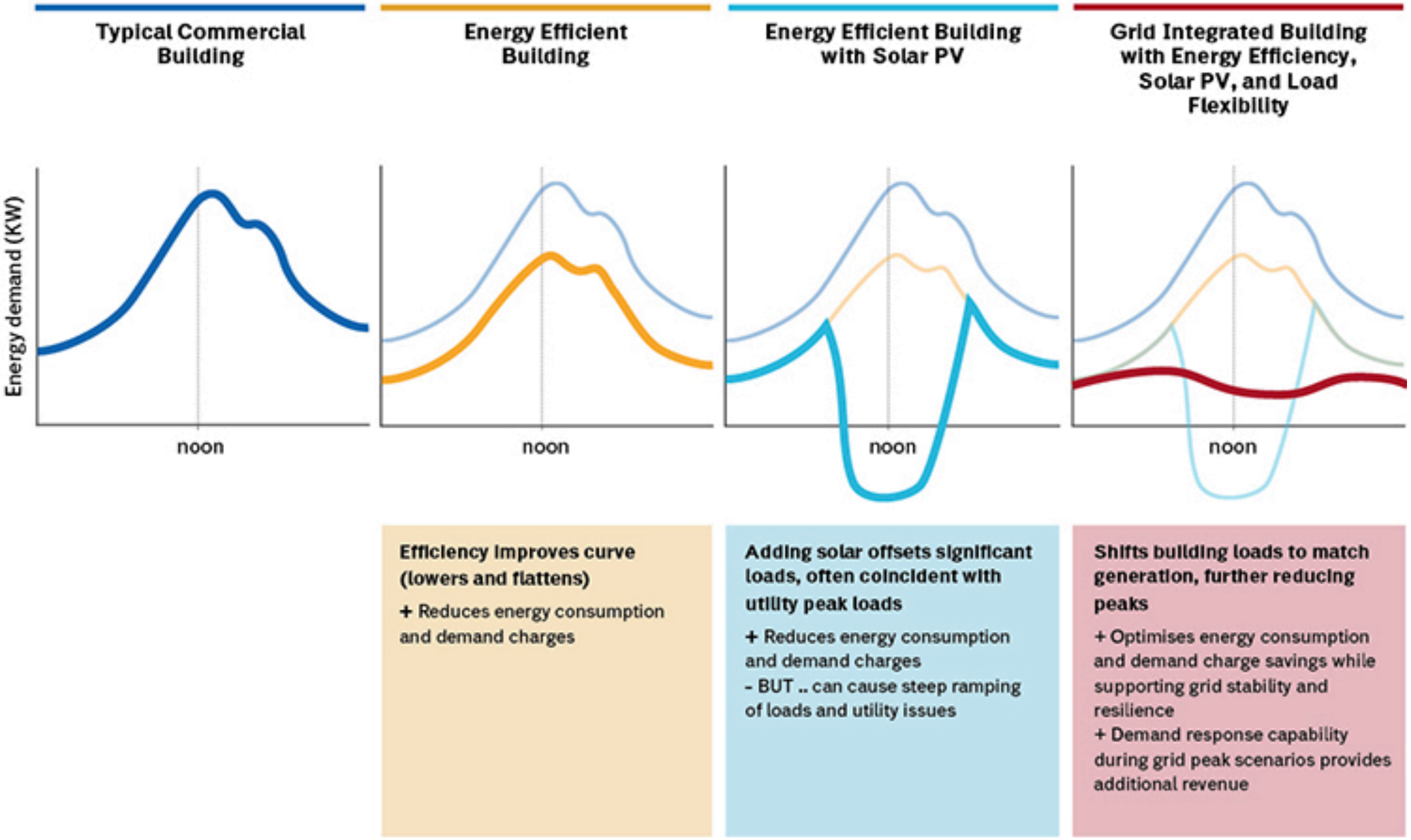
Excerpts from Cambium Long-run Marginal Emission Rates Workbook
Results available for all continental US states and/or grid regions

Northern CA, 2030, Average Hourly Emissions from Cambium (kg of CO2 / MWh)



Grid Interactive Efficient Buildings

Figure 4 | **Building Load Profiles for Typical Buildings, and Grid-Integrated Buildings**



Source: http://www.renewablematter.eu/en/art/997/GridInteractive_Buildings_Good_for_Business_and_the_Environment

Zero Energy Buildings (ZEB) 2.0

- **ZEB 1.0 annual production = annual energy use**

  Key Metric: Energy Use Intensity EUI (annual kBtu/ft^2)

  Challenges: Efficient envelope, lighting, and HVAC, sizing rooftop PV

- **ZEB 2.0 100% renewables, 100% of the time**

  Key Metric: Load Coverage Factor (LCF), % of load covered by renewables each hour

  Challenges: Electrification, hourly grid emissions and renewable data and communication, flexible loads, dispatchable energy storage

The Future of Zero Energy Buildings: Produce, Respond, Regenerate

Preprint

Paul A. Torcellini, Sammy Houssainy, Shanti D. Pless, William Livingood, and Ben Polly

National Renewable Energy Laboratory

Presented at the 2020 ACEEE Summer Study on Energy Efficiency in Buildings
August 17-21, 2020

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

This report is available at no cost from the National Renewable Energy Laboratory (NREL) at www.nrel.gov/publications.

Contract No. DE-AC36-08GO28308

Conference Paper
NREL/CP-5500-77415
September 2020

The LCF metric provides a different viewpoint of achieved success in ZEB 2.0 buildings
Source: NREL's ACEEE 2020 paper on ZEB 2.0

New Buildings (ZEB 2.0)

- Design for the grid in 20 years
- Establish $/MtCO2e to use for capital projects and design decisions
  - *Evaluate $/MtCO2e on an hourly basis*
- Include in Engineer/Architect RFPs:
  - EUI / net EUI target *plus*:
  - Load coverage factor target
  - All electric
  - Peak HVAC loads allowance (~passive house standards)
  - Resiliency and/or storage requirement
  - List and detail flexible loads and allowable deviations
  - Require conceptual design energy analysis, including sensitivities

Questions?

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Shanti Pless, 720-878-5646, Shanti.pless@nrel.gov

VIRTUAL FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

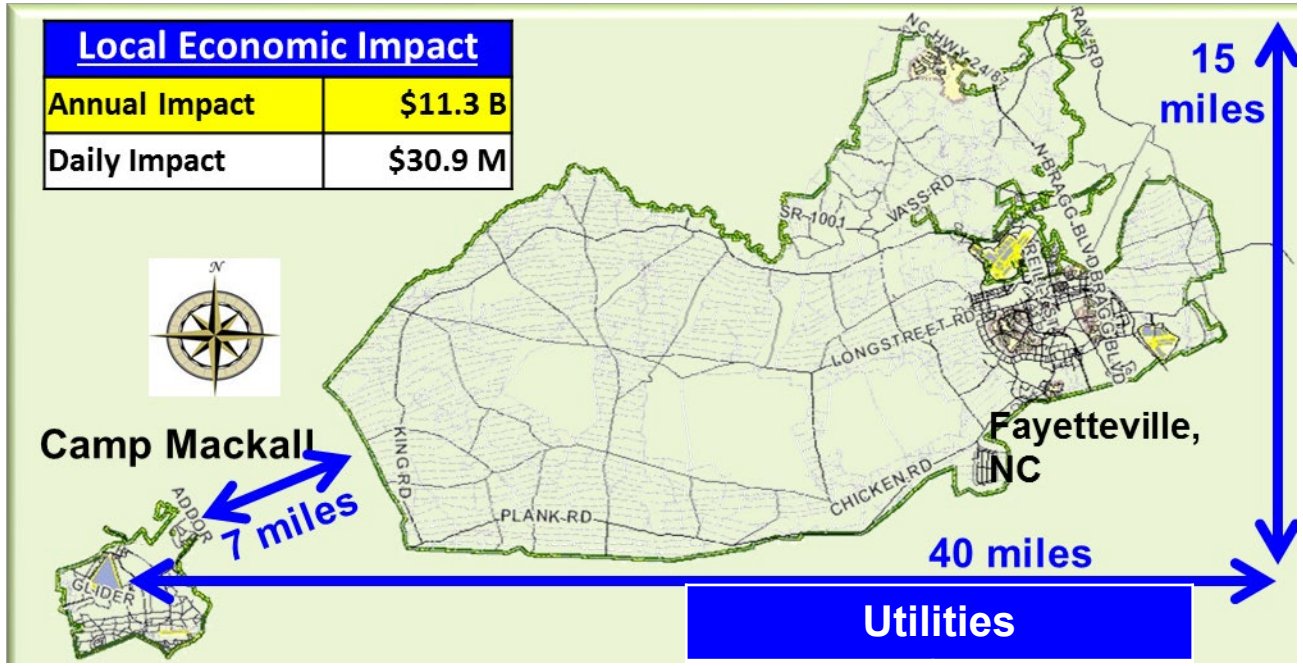
May 3-4, 2022

Fort Bragg Energy Security

Floating Solar

FEMP
Federal Energy Management Program

PREMIER POWER PROJECTION PLATFORM

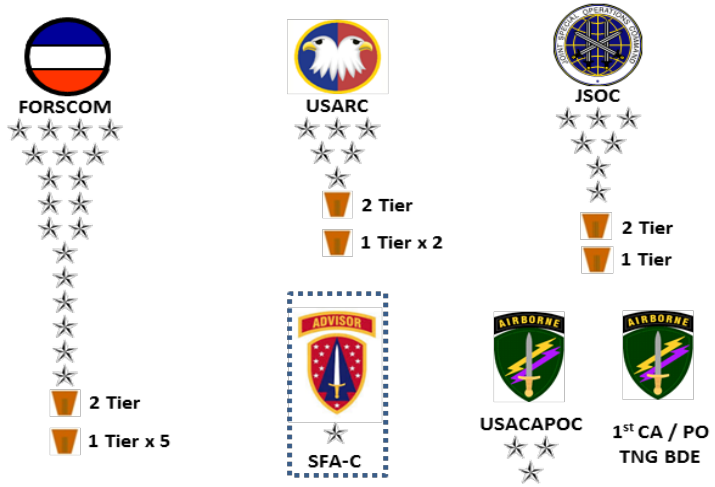


Utilities	
Electricity	$48.9M
Water	$3.1M
Sewer	$2.3M
Natural Gas	$8.8M
Total	$63.1M

Supported Population (FY18 STAT Card)	
Total Military	50,062
DOD Civilians	14,036
Contractors	6,151
Mil Family Members	69,704
Retiree & Families	128,428
TOTAL	268,381

Infrastructure	
Paved Roads (Miles)	1,462
Railroads (Miles)	21
Electric/Water (Miles)	2,071
Facilities (MSF)	53.7

COMMANDS



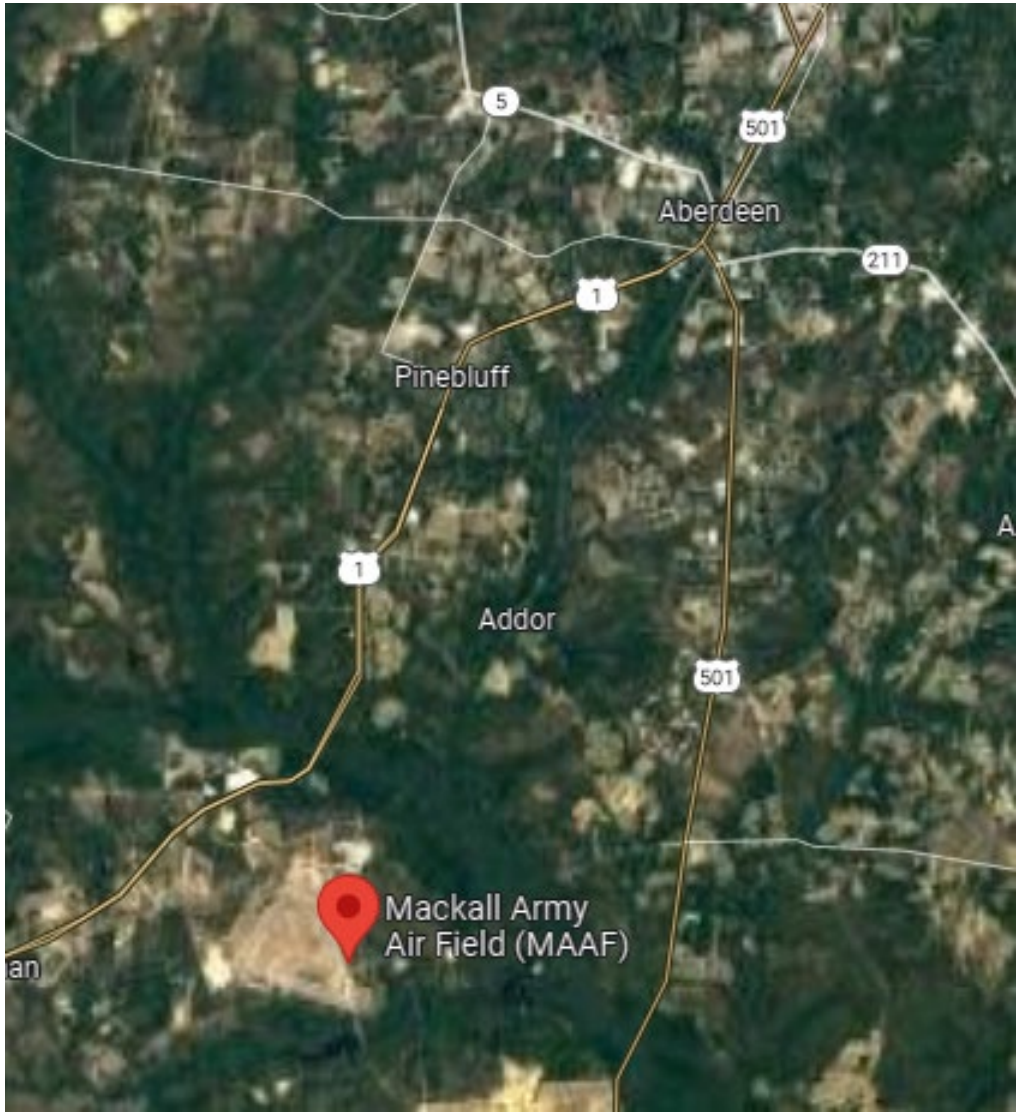
2nd Only to the National Capital Region (Pentagon) In Number of General Officers (38)

1 – 4-Star Command
4 – 3-Star Commands
4 – 2-Star Commands
2 – 1-Star Commands
34 – Brigades

2 Tier – SES (2 Star Equiv)
1 Tier – SES (1 Star Equiv)
Foreign Exchange Officer

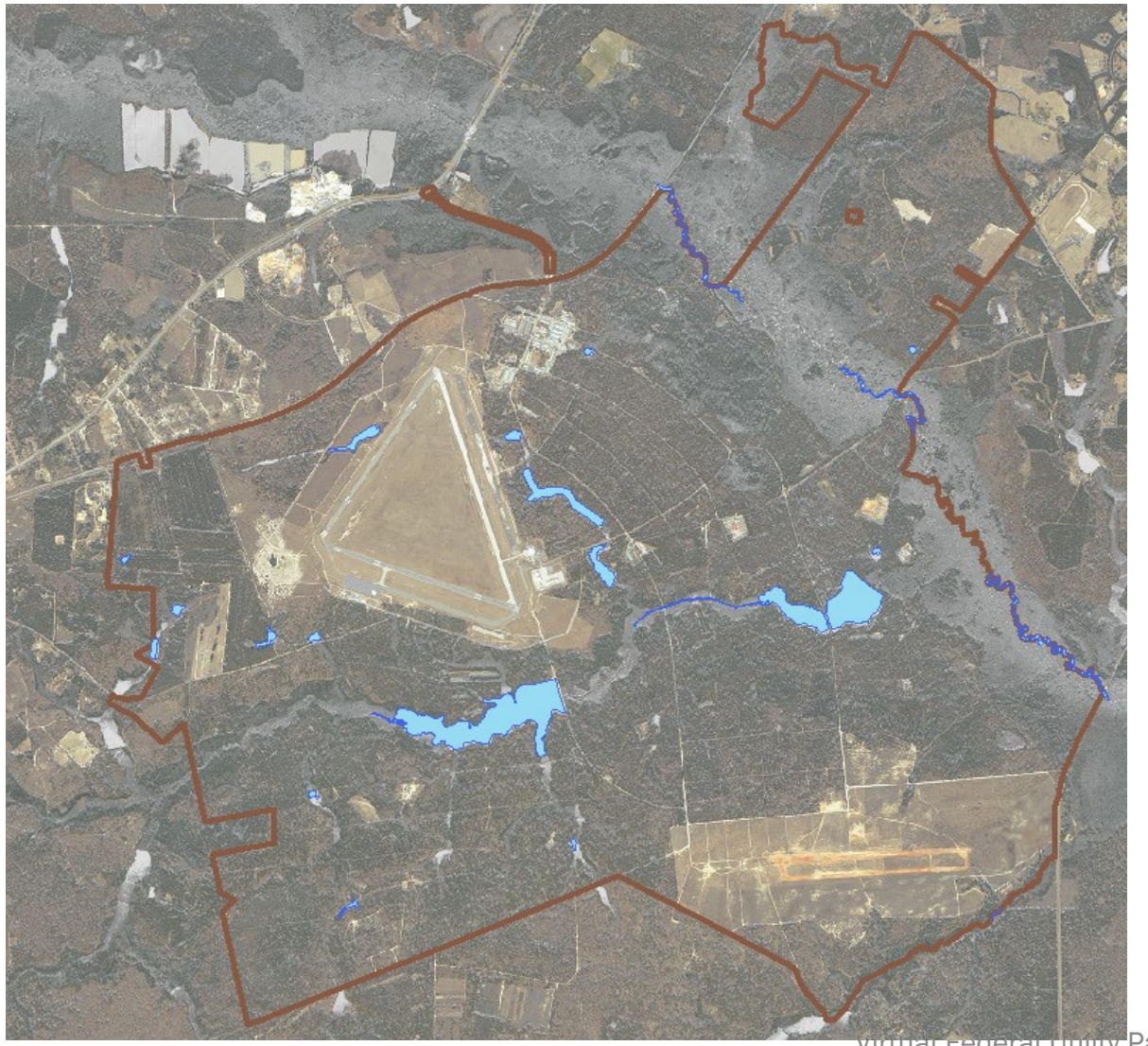
FEMP Federal Energy Management Program

ENERGY SECURITY NEEDED



- Single electrical feed from the town of Aberdeen
- Located at the end of the line
- Frequent power outages

CAMP MACKALL



- Special Forces training site
- Classes scheduled years in advance
- Power disruptions can cause cancellations
- Affects Army attrition

FLOATING SOLAR

- 1.1MW Floating Solar
- Produces 1,527,000 kWh/yr
- 2MWh TESLA Battery
- Completed November 2021
- First floating solar array in DoD
- Largest floating system in the Southeast

UESC Innovation at Fort Bragg

DUKE ENERGY, AMERESCO, AND D3ENERGY

May 2022

UESCs: Basics

Utility Energy Service Contracts are:

- Performance contracts between federal customers and their serving utilities
- Well-established acquisition vehicles authorized and endorsed by multiple regulations and policies
  - 42 U.S.C. § 8256(c), Utility Incentive Programs
  - 42 U.S.C. § 8253, Energy Management Programs
  - 10 U.S.C. § 2913, Energy Savings Contracts and Activities
  - 42 U.S.C. § 2866, Water Conservation at Military Installations
  - Federal Acquisition Regulations Part 41, Acquisition of Utility Services

UESCs must:

- Generate energy savings
- Provide mutual benefits for the customer and utility contractor
- Not exceed 25 years (award to termination)

UESCs can:

- Accommodate many infrastructure and mission needs, static or changing
- Solve complex, multi-faceted problems (more than just energy)
- Use a variety of funding strategies

UESCs *should*:

- Deliver the best value solution
- Leverage and strengthen the existing relationship between customer and utility provider
- Empower enterprise capability for the customer
- Ease acquisition and risks for the customer

UESCs: Purposes

Carbon Independence/NetZero Campus Performance

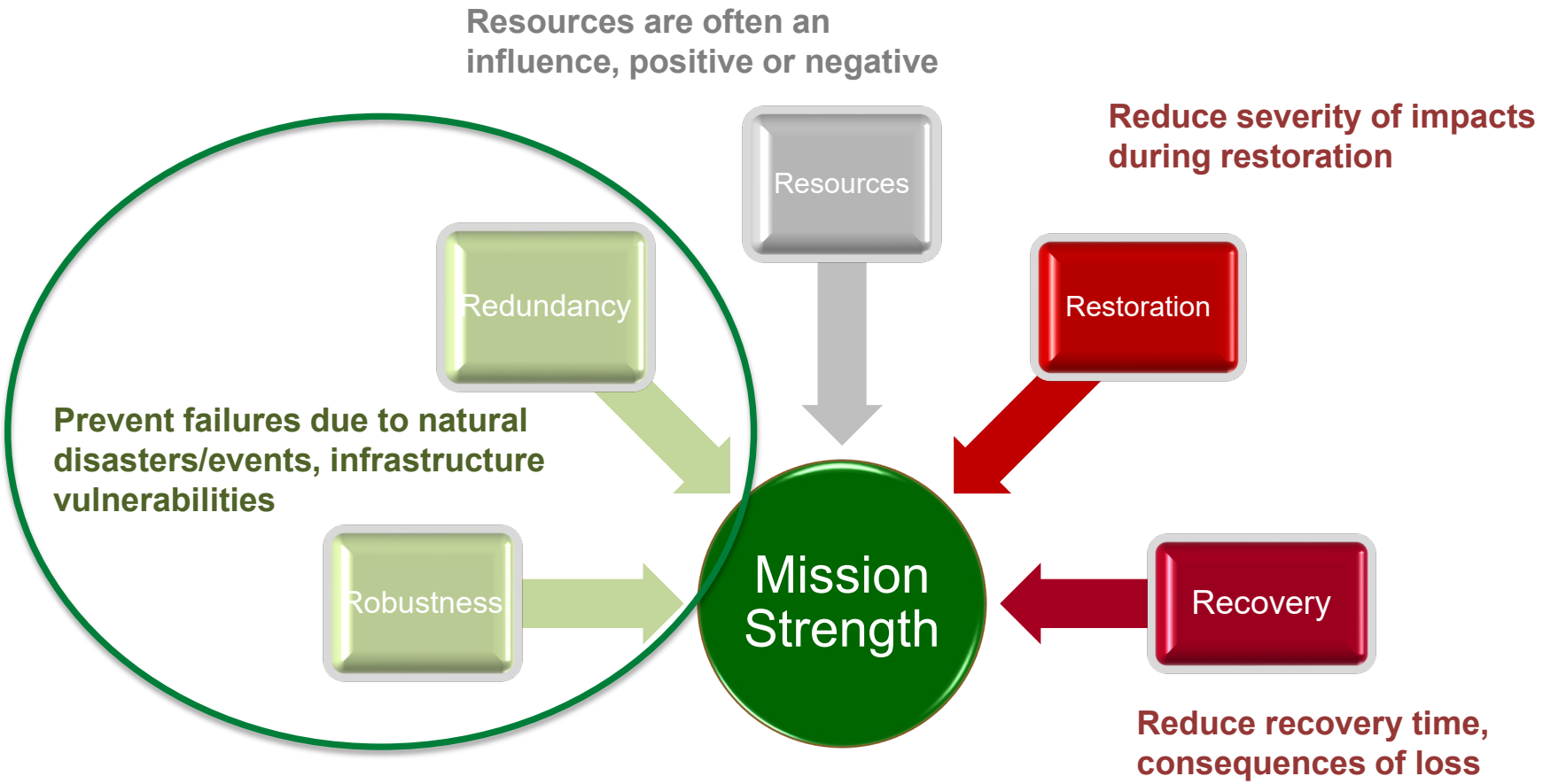
Mission/Operational Risk Reduction/Resilience

Infrastructure Reset, Modernization, Leveraged Investment, Optimization

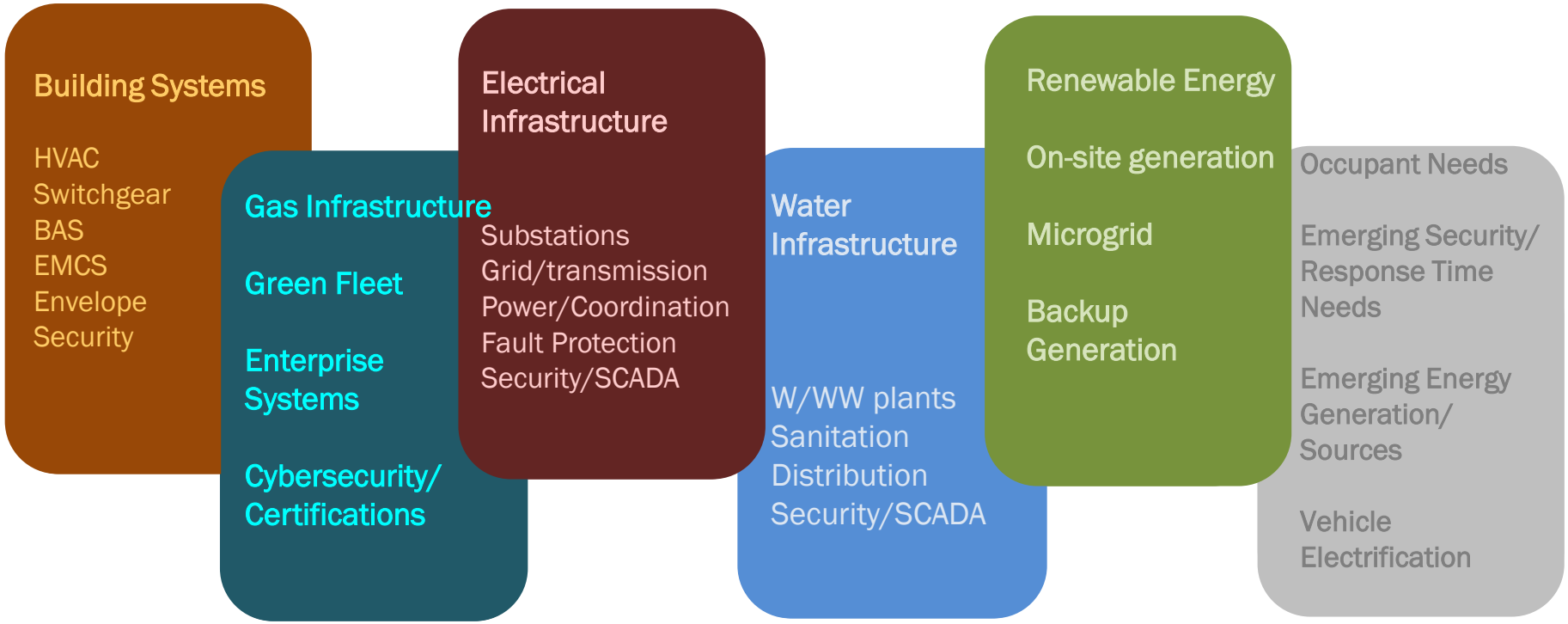
Life Cycle Support, Energy Management

Sum or All of These Goals

UESCs: Addressing Mission Risk



UESC Capabilities



UESCs: Suitability

Stakeholders
- Interest
- Sensitivities/Concerns/Risk Tolerances

Capability
- Direct or sourced expertise
- Contracting effort

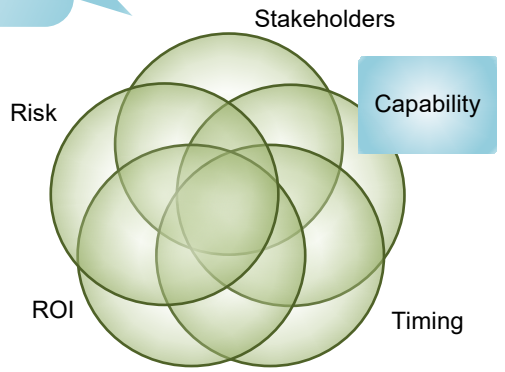
Timing
- Funding sources and mission need
- Delivery Expectations

Effort
- Comparison to other acquisition
- Partnership-leveraged synergy

Risk
- Execution/delivery terms and conditions
- Contractor and government roles and responsibilities

What does the government expect of its contractor?
Single-focus execution?
Bigger partnership?
How big a problem (or how many) to solve?

What are the project priorities?
Resilience?
Risk reduction?
Budget limitations?



*What is the **best value** for the government?*

UESCs: Best Practices

Communication

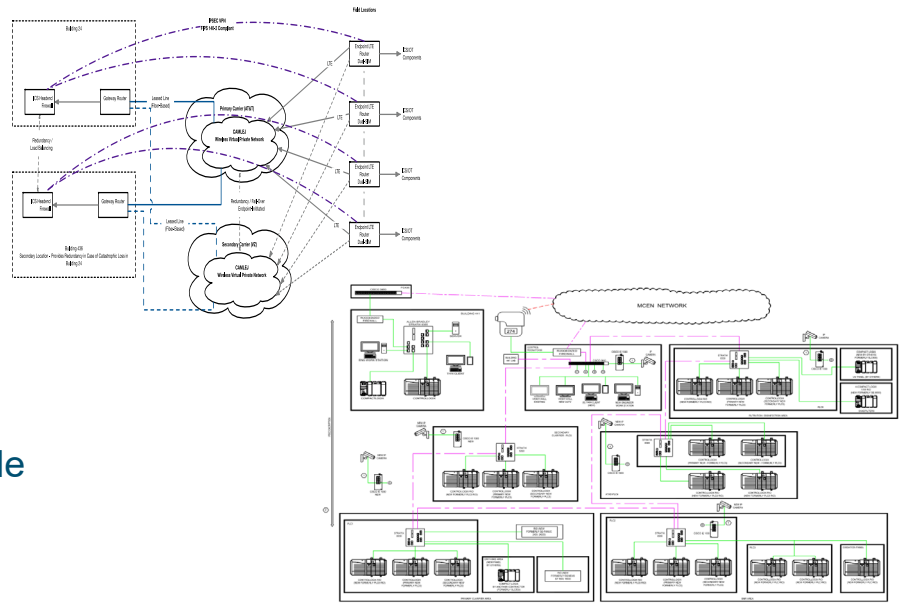
- **Collaboration with stakeholders**
- Thorough understanding of mission
- Frank discussions of energy, mission, operations
- Reverify requirements for capabilities, timing, effort
- Clear roles and responsibilities, risk tolerances
- Know your limitations

Development and Execution

- **Early/Continued engagement on design**
- Clear expectations about design maturity
- Comprehensive cost/price vetting
- Thorough consideration of need v. resources
- Reverify requirements and modify where needed, if possible
- Know your limitations

“Final” Project

- Frank Discussions about risks
- Thoughtful bundling strategy
- Clear expectations for completed work



UESCs: Best Practices - Building Bench Strength

Duke Energy uses multiple strategies to develop and deliver solutions to federal customers.

As a prime contractor, Duke Energy is responsible for ensuring best value, competitive delivery.

"What approach provides the best value to the customer?"

- Self-Performance: When Duke Energy has the internal acumen and resources internally to provide premier, cost-competitive solutions directly to the customer.
- Subcontractor Partnerships: When leveraging a partner(s) provides the premier, cost-competitive solutions.
- A mix of both: When Duke Energy pools its internal resources with world-class partners for optimum delivery.

UESCs: Bench Strength Key to Ft Bragg's Success

Duke Energy and Ameresco

- Partnered for other, similar customers
- Similar philosophies for development, delivery
- Comparable reputations for execution
- Complementary experience with resilience
- Recent success at other military installations
- Knowledge of Army program and requirements
- Expanded market reach

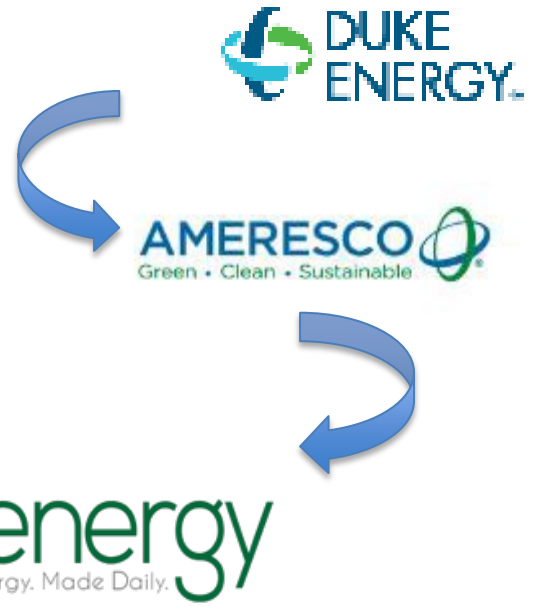
UESCs: That Fateful Conversation

Technical conferences are great!!!!

Strong communication/collaboration empowers agility

— “the conversation”

— Duke Energy and Ameresco takes a hard review of potential (project requirements must still be met)



UESCs can and do adapt mid-development

— UESC performance economically, technically viable

— Impacts of redesign, implementation acceptable

— All subcontractors adhere to stringent standards of time, cost, quality

FUPWG 2022 – FT. BRAGG UESC CASE STUDY

FLOATING PHOTOVOLTAIC SYSTEM WITH BATTERY STORAGE

D3ENERGY
COMPANY OVERVIEW

D3ENERGY is a solar developer who exclusively develops floating photovoltaic systems. We have expertise in all areas of FPV including:

- **Design, Engineering, Installation, & Maintenance**

We are the leading FPV developer, having built the most amount of floating PV systems in the U.S. We have engineered and built projects all over the world, including projects for major entities like Florida Power & Light, Comcast, City of Orlando, Orlando Utilities, Miami-Dade County & the U.S. Army.

D3Energy has an exclusive arrangement with the leading FPV float-manufacturer, Ciel & Terre. Ciel & Terre has been developing large-scale floating solar systems since 2008. Our engineers work closely with their engineers to ensure top-level projects and service.

FLOATING PV SYSTEM

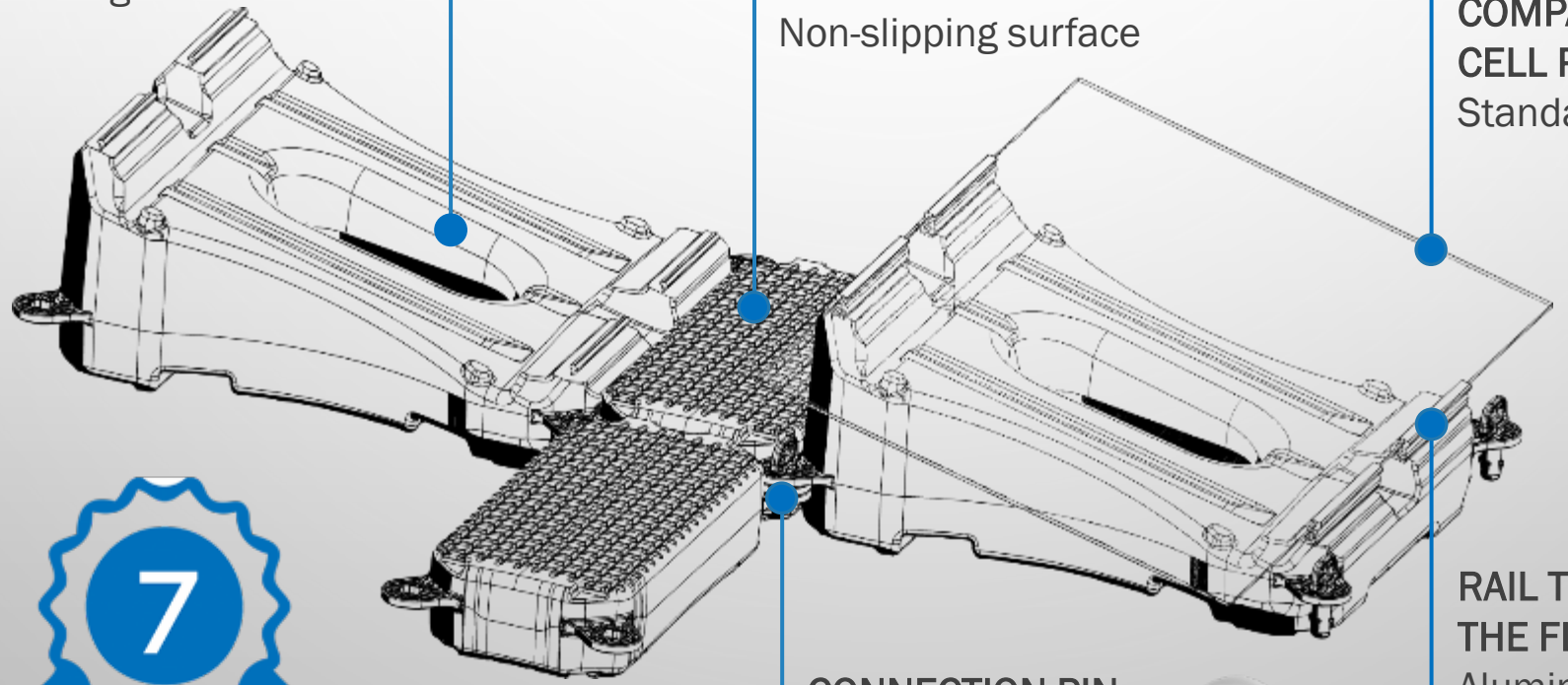
- Floating solar allows standard PV panels to be installed on large bodies of water such as water retention reservoirs, cooling ponds and stormwater ponds.
- A simple and affordable alternative to ground-mount systems with a lifetime of over 25 years – **floating solar opens the possibility of solar where land is unavailable**
- 100% Recyclable
- The Hydrelio® track-record:
  - **1,200+ MWp installed / in construction**
  - **245+ grid-connected projects**
  - **In over 30 countries**

HYDRELIO® – FLOATING PV SYSTEM

MAIN FLOAT SUPPORTING THE PV MODULE
HDPE material
Inclination angle: 12°

SECONDARY FLOAT FOR MAINTENANCE/BUOYANCY
HDPE material
Non-slipping surface

COMPATIBLE WITH 60- & 72-CELL PV MODULES
Standard framed or frameless



CONNECTION PIN
Fiberglass-reinforced PP
NFT 58 000 standard

RAIL TO FIX THE PV MODULE ON THE FLOATS
Aluminium or fiberglass-reinforced PP
Certified ISO 3302-1/1996

inter solar award 2017 WINNER

7 PATENTS REGISTERED

ELECTRICAL

- All electrical wires are encased in reinforced conduits & above the surface of the water
- All PV panels are wired in series and terminate at the combiner boxes
- A marine-grade conduit is used to connect the array to the inverters on shore
- In the event of a short, circuits on that row would be tripped and the current eliminated before a system wide short, or shock could occur.

No hazard exists where the pond water may be electrified

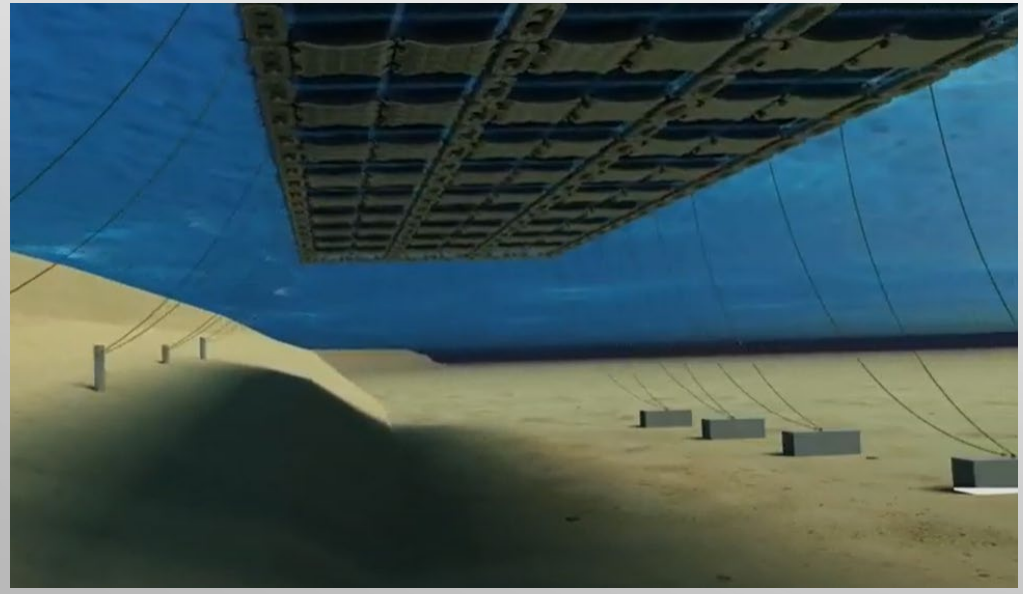
INSTALLATION

- U.S. made – 3 manufacturing plants in the U.S.
- Arrays are fully assembled on shore.
- Once the array is configured, it is either fed or towed into the water.
- Segments are positioned and are then attached to cables/anchors which fix its location in-place.

ANCHORING SYSTEM

Methods of Anchoring

- Shore-mount & Bottom-mount
- Typical anchor types:
  - Percussion, helical, deadweight
- Other components of the anchoring system include steel cables, chains, ropes, & ballasted floats



Wind Resistance / Water Level Changes

- Tested by ONERA (the French aerospace lab), Hydrelio® can withstand up to Cat. 5 hurricane force winds
- Systems can withstand varying water level changes
- Hydrelio® is even suitable for a dry-retention pond

ENVIRONMENTAL

Ecological report by **WRA Environmental Consultants** for California concluded:

- Minimal adverse effects to wildlife species
- Minimal ground & vegetation disturbance during installation
- The floats, made from HDPE plastic do not leach chemicals into the environment
- Maintenance requires no detergents or chemicals
- Gaps in the floats were intentionally created to allow animals to come up within the array
- Drinking water compliance tested by the English Water Quality Center

ADDITIONAL ADVANTAGES OF FLOATING PV

- Reduces evaporation
- Reduces sunlight penetration, precluding growth of algae and subsequent reducing treatment costs
- Saves valuable land

COST ANALYSIS – BENEFITS

- Cost-competitive with a ground-PV system, less than a roof-top system

- Greater efficiency output for floating PV due to cooling effect of the water

- Lower annual O&M

- Ancillary cost savings – (evaporation costs, algae treatments, etc.)
- Eliminates the cost of land or land prep

FORT BRAGG
PROJECT HIGHLIGHTS

- Largest floating PV system in the SE U.S. – 1.1MWp
- First floating PV system on a military base

By the numbers:

- 10,000+ sq. ft. island combined of over 7,500 floats
- 2,700 solar panels
- 43 earth-anchors
- Paired with a 2MWh Tesla battery for base-resiliency and energy storage

JAPAN

Okegawa	1,180	kWp	2013
Kawagoe	696	kWp	
Maeno Ike	848	kWp	2014
Yasugi	1,098	kWp	
Kato-shi	2,870	kWp	
Sakasama Ike	2,313	kWp	
Sawa Ike	1,008	kWp	
Fuku Ike	1,076	kWp	
Hirai Ike	1,125	kWp	2015
Hanamidai	1,153	kWp	
Funatsu Osawa	1,485	kWp	
Umenoki	7,550	kWp	
Kawarayama Ike	1,428	kWp	
Toriga Ike	630	kWp	
Sakurashita Ike	809	kWp	
Juman Ike	490	kWp	
Sohara Ike	2,398	kWp	
Naga Ike Nishi	1,078	kWp	
Kasaoka	973	kWp	
Kobe Oike	1,212	kWp	
Gono Ike	1,203	kWp	
Yakino Ike	1,714	kWp	2016
Hira Ike	1,260	kWp	
Tsuga Ike	2,449	kWp	
Hirono Shin Ike	1,751	kWp	
Isawa Ike	631	kWp	
Naga Ike Higashi	2,156	kWp	
Sayama Ootori Ike	2,502	kWp	
Sayama Nigori Ike	280	kWp	
Sakurakami Ike	1,992	kWp	
Hikona	660	kWp	
Kyuhin	1,188	kWp	
Kire Ike	691	kWp	
Gojiga Ike	572	kWp	
Noma Ike	2,435	kWp	
Tachiai Oku Ike	835	kWp	
Besso Ike	1,426	kWp	
Yukimine Kami Ike	1,568	kWp	2017
Shimoyama Ike	1,966	kWp	
Ootsuda Ike	973	kWp	
Daikai Ike	300	kWp	
Hirono Nigo Ike	1,261	kWp	
Sara Ike	1,176	kWp	
Hachigo Ike	2,402	kWp	
Komaga	2,297	kWp	
Tano Ike	2,548	kWp	2018
Osawa	2,449	kWp	
Bessho Sara Ike	540	kWp	
Yamakura dam	13,744	kWp	
Naka Ota Ike	2,435	kWp	
Iwano Ike	2,596	kWp	
Watashi Ike	2,170	kWp	
Yokota Cho Shiba/Kami	1,591	kWp	
Yokota Cho Shimo	853	kWp	
Otori Babe Iike	2,495	kWp	
Uwa Ike	637	kWp	
Ishitani Ike	660	kWp	
Higashi Ota Ike	2,435	kWp	2018
Ichinomiya Ike	2,242	kWp	
Togawa Ike	2,358	kWp	
Abe Ike	9,087	kWp	
Shimodori Ike	1,210	kWp	
Narasu Ike	2,802	kWp	
Higai Shin Ike	497	kWp	
Musashicho Furu Ike	807	kWp	
Musashicho Shin Ike	503	kWp	
Oda Ike	2,903	kWp	
Sasakuacho UE	594	kWp	
Sakasama Shita	665	kWp	
Sawahara	2,449	kWp	
Nakano Ike	1,204	kWp	
Katakami Oike	2,602	kWp	
Hyoshiga Ike	2,703	kWp	
Sakaya Tame Ike	633	kWp	
Yokawacho Kami Ike	621	kWp	2019
Kitsune Ike	2,861	kWp	
Hikuni Ike	1,308	kWp	
Jodo Ike	2507	kWP	
Kaneibara Ike	864	kWp	
Hirono Ichigo Ike	1,634	kWp	
Innan Kita Ike	1,830	kWp	
Hanaoka Ike	2,289	kWp	
Kiya Ike	1,417	kWp	
Higainichou Ike	1,229	kWp	
Aoki Ike	1,574	kWp	
Ozaka Ike	2,660	kWp	
Kaya Manuma Ike	2,602	kWp	
Tsuji Ike	906	kWp	2020
Kimagase Ike	899	kWp	
Daido Ike	1,158	kWp	
Kotori Babe Ike	2,686	kWp	
Hotokedo Ike	838	kWp	
Yoshi Ike	1,768	kWp	
Hanaoka Ike	2,289	kWp	
Kiya Ike	1,417	kWp	
Higainichou Ike	1,229	kWp	
Aoki Ike	1,574	kWp	
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Daido Ike	1,158	kWp	2020
Kotori Babe Ike	2,686	kWp	
Hotokedo Ike	838	kWp	
Yoshi Ike	1,768	kWp	
Hikita Ike	2,122	kWp	
Oniga Shiro	768	kWp	
Yakage Shin Ike	1623	kWp	
Gotanda	729	kWp	2021

AMERICAS

UCF Orlando (FL, USA)	5	kWp	2016
Kunde Winery (CA, USA)	10	kWp	
Orlando Utilities (FL, USA)	32	kWp	2017
Miraflores (PA)	24	kWp	
Goiás Farm - GO (BR)	305	kWp	
Peñol Guatape (CO)	99	kWp	2018
Kelseyville (CA, USA)	252	kWp	
SC Pond (CA, USA)	607	kWp	
Walden Pond (CO, USA)	74	kWp	
Las Tortolas (CL)	84	kWp	2019
Sobradinho - BA (BR)	1,005	kWp	
OR Tech (OR, USA)	5	kWp	
Sayreville WTP (NJ, USA)	4,403	kWp	
Santa Lucia (CA, USA)	53	kWp	
Windsor Rd Pond (CA, USA)	1,786	kWp	
Miami Airport (FL, USA)	157	kWp	2020
Gardenia (OUC)	32	kWp	
City of Altamonte Spring	962	kWp	
GOAA Orlando airport	216	kWp	
Universal Studio	250	kWp	
Healdsburg Pond	4,780	kWp	2021
Sievert Lake	984	kWp	

ASIA & OCEANIA

Yothathikan pilot (TH)	5	kWp	2014
O-Chang #1 (KR)	495	kWp	
Sungai Labu (MY)	108	kWp	2015
Kas Green Energy (ID)	5	kWp	
Tengeh (SG)	3 x 100	kWp	2016
Ulu Sepri (MY)	270	kWp	
Pirongji (KR)	706	kWp	
Shek Pik (HK)	99	kWp	
Goyeon #1 (KR)	934	kWp	
Chuckdongjae (KR)	90	kWp	2017
Heze City (CN)	600	kWp	
Pei County (CN)	9,982	kWp	
Plover Cove (HK)	100	kWp	
Tian Chang (CN)	1,000	kWp	
Lismore (AU)	100	kWp	
Anhui GCL (CN)	32,686	kWp	
GCL Jining (CN)	6,776	kWp	
Agongdian (TW)	9,994	kWp	
Sugu #1 (TW)	4,023	kWp	
Beishipi (TW)	1,998	kWp	2018
Manun (KR)	2,007	kWp	
Gongam #2 (KR)	934	kWp	
Myeongun (KR)	2,007	kWp	
Myeongwan (KR)	955	kWp	
Gasan (KR)	2,007	kWp	
Anhui CECEP (CN)	70,005	kWp	
CMIC (KH)	2,835	kWp	
SCCC Open Pit (TH)	498	kWp	
O-Chang #2 (KR)	2,506	kWp	
Cial Golf Course (IN)	452	kWp	2019
Wisewood (TH)	1,261	kWp	
Yonggyae (KR)	2,007	kWp	
Bachyun (KR)	954	kWp	
Kewpie (TH)	702	kWp	
Mahavajiralongkorn Hosp. (TH)	31	kWp	
Don Sai (TH)	1,988	kWp	
Gateway City (TH)	117	kWp	2020
Saha Group Industrial Park (TH)	478	kWp	
Rosedale (NZ)	1039	kWp	
Raw Water Pond (IN)	5,403	kWp	
Thoothukudi (IN)	14,800	kWp	2021

EMEA

Piolenc (FR)	15	kWp	2011
Sheeplands (EN)	200	kWp	2014
Nofar (IL)	22	kWp	
Bör (SE)	13	kWp	
Ben Acre (EN)	3 x 100	kWp	2015
Polybell (EN)	471	kWp	
Reeders (EN)	50	kWp	
Godley (EN)	2,991	kWp	
Queen Elizabeth II (EN)	6,338	kWp	2016
Alto Rabagao (PT)	218	kWp	
Maxima Bridge (NL)	57	kWp	
Pontecorvo (IT)	343	kWp	
Cegonha (PT)	11	kWp	
Kairouan pilot (TN)	5	kWp	2017
Hesbaye Frost (BE)	998	kWp	
Engie Zaandam (NL)	26	kWp	
Engie Burgum (NL)	39	kWp	
Oosterhof Holfman (NL)	27	kWp	
Azalealaan (NL)	1,845	kWp	2018
Ashdot (IL)	269	kWp	
Slufter (NL)	51	kWp	
Marlenique Farm (ZA)	59	kWp	
Maiwald (DE)	749	kWp	
O'Mega 1 (FR)	17,015	kWp	2019
Cuba Este (PT)	998	kWp	
Kfar Hamaccabi (IL)	522	kWp	
Salzwedel (DE)	750	kWp	
Veldhunten (NL)	1,191	kWp	
Groillons (FR)	2,974	kWp	2020
Leimersheim (DE)	1,498	kWp	
Madone (FR)	250	kWp	
Terhills (BE)	1,006	kWp	
Differdange (LU)	3043	kWp	2021
Agro Hispamer (ES)	968	kWp	

TAIWAN

Taoyuan (TW)	481	kWp	2017
Caogangwei (TW)	500	kWp	
Sugu #2 (TW)	1,133	kWp	
Changhua Farm (TW)	1,996	kWp	2018
Sugu #1 (TW)	4,023	kWp	
Agongdian (TW)	9,994	kWp	
Beishipi (TW)	1,998	kWp	2019
Shanjiding (TW)	842	kWp	
Gongguan (TW)	4,268	kWp	
Changbin (TW)	88,038	kWp	2020
Jiali (TW)	1,261	kWp	
Dianbaoxi D (TW)	4,102	kWp	
Xiqian (TW)	21,571	kWp	2021
4th Water Way (TW)	10,266	kWp	
Wanxing (TW)	22,752	kWp	

THANK YOU FOR YOUR ATTENTION !

Stetson@D3Energy.com

U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

New Federal Energy Goals and Requirements: How Do They Impact Your Energy Projects?

Skye Schell, Procurement and Distributed Generation Services, FEMP

FUPWG May 4, 2022

FEMP Federal Energy Management Program

New Federal Goals and Requirements

Agency Energy Projects will enable progress toward several Administration and Congressional priorities focused on Energy and Water Efficiency, Decarbonization, Investment, Jobs and American Manufacturing.

Bipartisan Infrastructure Law	Executive Order 14057	Energy Act of 2020
• Key piece in President Biden's Build Back Better agenda • Includes more than $62 billion for DOE to deliver a more equitable clean energy future • Expanding access to energy efficiency and building on technologies of tomorrow	• Government-wide targets for long-term and mid-term GHG reductions • 100% net zero buildings, zero-emission fleets, 24/7 carbon pollution-free electricity • Net zero federal government operations by 2050 or sooner	• Agencies to use performance contracting to address at least 50% of ECMs identified • Agencies to implement all cost-effective ECMs identified within 2 years • FEMP to establish a Federal Smart Building Program

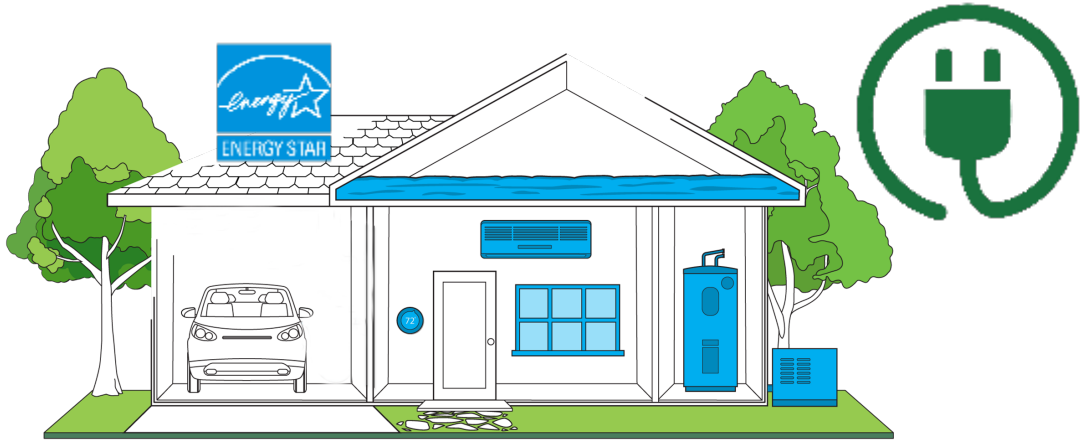
Note: Descriptions are illustrative and not comprehensive

Decarbonization Strategies

Strategy is unique to each site

- Primarily a function of on-site fossil fuel use (Scope 1)
- Influenced by serving utility's current and future generation mix (Scope 2)

Baseline Load



Optimized Load

Step One: Deep energy efficiency and load reduction.

- Lighting, boilers, chillers, and load reduction
- When replacing inefficient fossil fuel-based equipment, begin with load reduction, then electrification and demand flexibility
- Avoid new long-lived fossil fuel burning equipment (boiler, etc.) when possible

Step Two: Electrification (electric vehicles, heat pumps).

- Reduces emissions in most locations
- Largest reductions where current/future utility carbon emissions are relatively low

Step Three: On-site carbon free energy generation / storage.

- Largest emissions reduction where current/future utility carbon emissions are relatively high

Performance Contracting for Decarbonization

Performance contracts offer proven tools for decarbonization

- **Technical Tools**
  - Energy efficiency audits (preliminary assessment/investment grade audit)
  - Energy conservation measures (ECMs) to reduce loads, including deep energy retrofits and renewable energy
  - Electrification by switching from natural gas/other fossil fuels to electricity
  - Load shifting & demand response ECMs to better match load to CFE generation
  - ESPC Energy Sales Agreements (ESAs) for larger on-site renewable generation
  - M&V/performance assurance to ensure savings and emission reductions persist
- **Financial Tools**
  - 3rd party financing for cost effective projects
  - Ability to bundle ECMs and accept one-time payments such as federal or state grants or other funds, one-time savings, and incentives (expanded under Energy Act of 2020)

Building Decarbonization Best Practices

- **Estimate energy savings and carbon reductions for each ECM to determine which deliver the largest carbon reductions at the lowest cost**
  - Saving energy reduces carbon emissions
- **Take advantage of budget for planned HVAC equipment replacements to improve efficiency and/or switch to lower carbon options, like Ground Source Heat Pumps.**
- **Reduce loads and evaluate opportunities for downsizing equipment during replacement by comparing current equipment to load trend data**

Adapted from: Green Building Advisory Committee, Federal Building Decarbonization Task Group presentation

Building Decarbonization Best Practices, cont'd

- **Replace high global warming potential (GWP) refrigeration equipment with high efficiency, low GWP refrigeration equipment. Ensure old refrigerants are reclaimed or disposed of properly.**
- **Reduce water consumption to save pumping electricity and heating energy**
- **Install automated building controls**
  - Integrate DER and electric vehicle charging
  - Provide automated demand response and flexibility services

Adapted from: Green Building Advisory Committee, Federal Building Decarbonization Task Group presentation

Paying for Decarbonization in Performance Contracts

Allowable savings

- **Energy and water cost savings**
  - Efficiency improvements, reduced usage, demand reduction, load management, load shifting, fuel switching, on-site generation, water/wastewater efficiency
- **Energy- and water-*related* cost savings**
  - Reduced O&M costs – contracts, materials
- **Avoided costs**
  - Avoided/obviated equipment replacement

Capital contributions or cost offsets

- **Appropriations**
- **Grants – AFFECT, state, etc.**
- **Rebates/other incentives**
- **REC sales/swaps**

Phase 1: Acquisition Planning

Initial acquisition team meeting with decarbonization focus

- **Establishing project objectives goes beyond typical performance contracting approach**
- **Key considerations:**
  - Determine site needs and how decarbonization opportunities will be prioritized
  - Potential appropriations or funding opportunities to pursue
  - ECMs/technologies with greatest decarbonization potential may not result in greatest energy or cost savings
- **Stakeholder engagement**
  - Understand agency goals and project approval criteria
  - Ensure team is aware of and supports carbon reduction goals, opportunities, and challenges
  - Discuss current and long-term grid power sources with utility

Phase 1: Acquisition Planning

Establish project objectives and requirements

- **Develop site carbon reduction goals/project intent**
  - Determine baseline energy consumption and scope 1&2 GHG emissions
  - Establish site energy needs, including efficiency and decarbonization
  - Discuss technology options to reduce energy consumption, electrify as appropriate and minimize scope 1 GHG emissions
    - Consider deep energy retrofits, renewable energy, water/wastewater conservation
- **Identify opportunities**
  - New construction, major renovation, equipment replacement plans and budgets

Screening for Opportunities

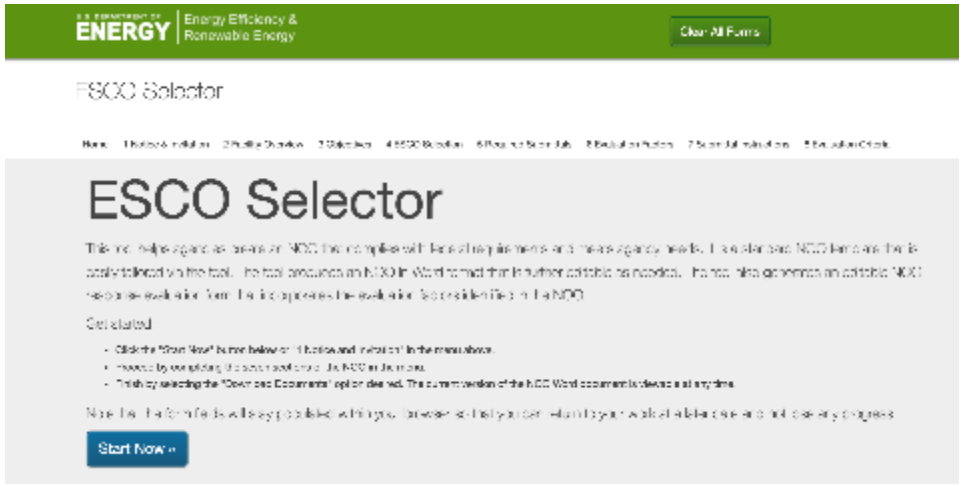
Tools are available to help inform decision-making

- Renewable Energy Integration & Optimization (REopt):
  - Screens renewables, energy storage, CHP, heat pumps (heat recovery chillers to be added)
  - Estimates carbon and other GHG emissions accounting for both grid electricity and on-site fuel consumption
  - Allows screening by clean energy goals (Ex: % RE target, emissions reduction, social cost of GHGs)
- Facility Energy Decision System (FEDs):
  - Primarily to identify energy efficiency opportunities
  - Models energy and cost performance of baseline conditions
  - Evaluates ECMs, optimizes for life-cycle cost, and calculates emissions reduction potential

Phase 2: Utility and ESCO Selection

Notice of Opportunity (ESPC); Letter of Interest/Sources Sought Notice (UESC)

- **Informs utilities/ESCOs of agency project intent and selection criteria**
  - Basic facility information
  - Utility usage and cost by fuel type
  - Existing heating/cooling equipment
  - High priority ECMs
  - Desire for on-site RE, and available space
- **Include importance of low/no carbon energy, electric equipment**
- **Contractor selection criteria should include experience in (any/all may apply):**
  - Site electrification
  - Electric heating technologies
  - Distributed energy
  - Measuring/calculating GHG reduction
- **Start with FEMP's ESCO Selector Tool**



Phase 3: Project Development

- **ESCO/utility ECM workshops should take place early in project development. Each workshop focuses on a specific ECM and includes:**
  - ECM feasibility, cost, savings, O&M requirements, carbon/GHG emissions reduction
  - Contractor should evaluate low carbon/GHG emissions alternatives to typical ECMs
  - Key agency team members should attend workshops to understand trade-offs of including or removing an ECM and low carbon/GHG alternatives
  - Agency staff familiar with project site can help identify site-specific conditions that could prevent an ECM from being successful

- **If necessary, agency staff can use ECM workshops to reiterate prioritizing reduced carbon/GHG emissions**
  - Document all issues, resolutions, decisions

Phase 5: Performance Period

- **Monitor/report ECM performance**
  - Can be supported by annual M&V/performance assurance activities
  - May complement agency annual GHG reporting
- **Remain informed of utility plans for future electric generation source mix to determine additional opportunities over time**

Fort Carson Battery Energy Storage (ESPC-funded)

Summary

- **Federal government policy is promoting decarbonization, electrification (including Fleets), CFE, and use of performance contracting to meet goals.**

- **Performance Contracting can significantly reduce emissions**
  - Start with energy and water efficiency, load reduction
  - Electrify where possible, considering utility grid carbon emissions
  - Include on-site clean DE + storage

- **Focus on Decarbonization in all stages of your project, from goal setting, through audits, project financing supplements, and final project determination.**

- **Look for FEMP training, tools, grants, and technical assistance as you develop your workforce and projects to meet the new Federal goals.**

Thank you!

VIRTUAL FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

May 3-4, 2022

We are currently on break, returning at 1:00pm ET.

FEMP
Federal Energy Management Program

VIRTUAL FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

May 3-4, 2022

U.S. Dept. of Defense Updates

Krista Stehn, Moderator

Office of the Secretary of Defense

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VIRTUAL FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

May 3-4, 2022

DoD Priorities, Policies and Updates

Mr. Michael F. McGhee, SES, PE
Executive Director for Climate Resilience
Office of the Deputy Assistant Secretary of Defense for
Environment and Energy Resilience (ODASD(E&ER))

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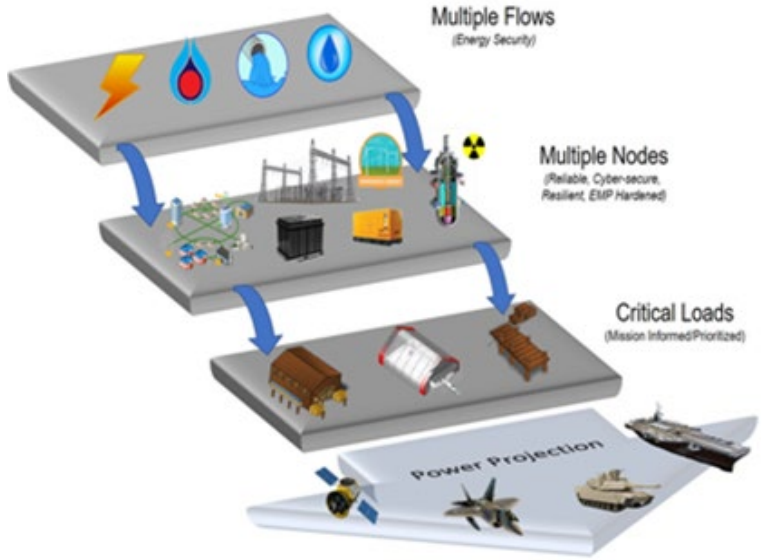
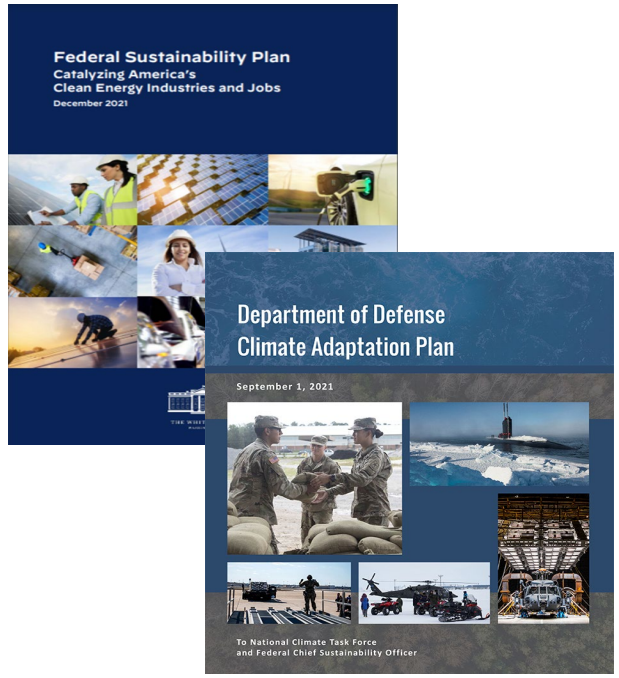
There is little the Department does to defend the American People that is not affected by Climate Change.
-Lloyd J. Austin III, Secretary of Defense
Climate Change is THE context for all future National Security Planning.
-Deputy Secretary of Defense Kathleen H. Hicks

Climate Change – Statutory/Policy Snapshot

- **Statutes**
  - 10 USC 2911 and 2920 [Energy Resilience]
  - Energy Act of 2020
- **Administration Policy/Guidance**
  - National Security Strategy
  - E.O. 14008 - *Tackling the Climate Crisis at Home and Abroad*
  - E.O. 14057 - *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability*
  - Federal Sustainability Plan
- **Department of Defense Policy, Plans, Guidance**
  - National Defense Strategy (NDS)
  - SECDEF Message to the Force
  - Defense Climate Risk Analysis (DCRA)
  - Climate Adaptation Plan (CAP)*
  - DoD Sustainability Plan





OSD Organizational Update

- **Department of Defense Chief Sustainability Officer (CSO)**
  - **Mr. Joseph Bryan, Senior Advisor for Climate at Office of the Secretary of Defense**

- **Assistant Secretary of Defense for Energy, Installations & Environment**
  - **Mr. Paul Cramer, Performing the Duties of (PTDO) ASD(EI&E)**

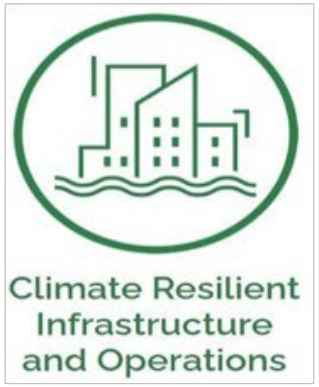
- **Deputy Assistant Secretary of Defense (Environment & Energy Resilience)**
  - **Mr. Richard G. Kidd IV**
    - Office combines historical energy and environment equities

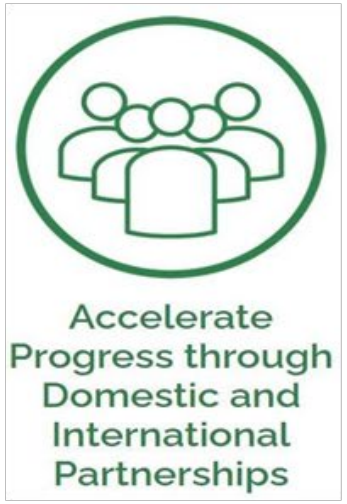
- **Executive Director for Climate Resilience (ODASD(E&ER))**
  - **Mr. Michael F. McGhee**
    - Holistically addressing climate resilience at DoD installations (energy and water)

Senior Leadership Focused On Addressing Climate Change / Resilience On A Department-wide Scale

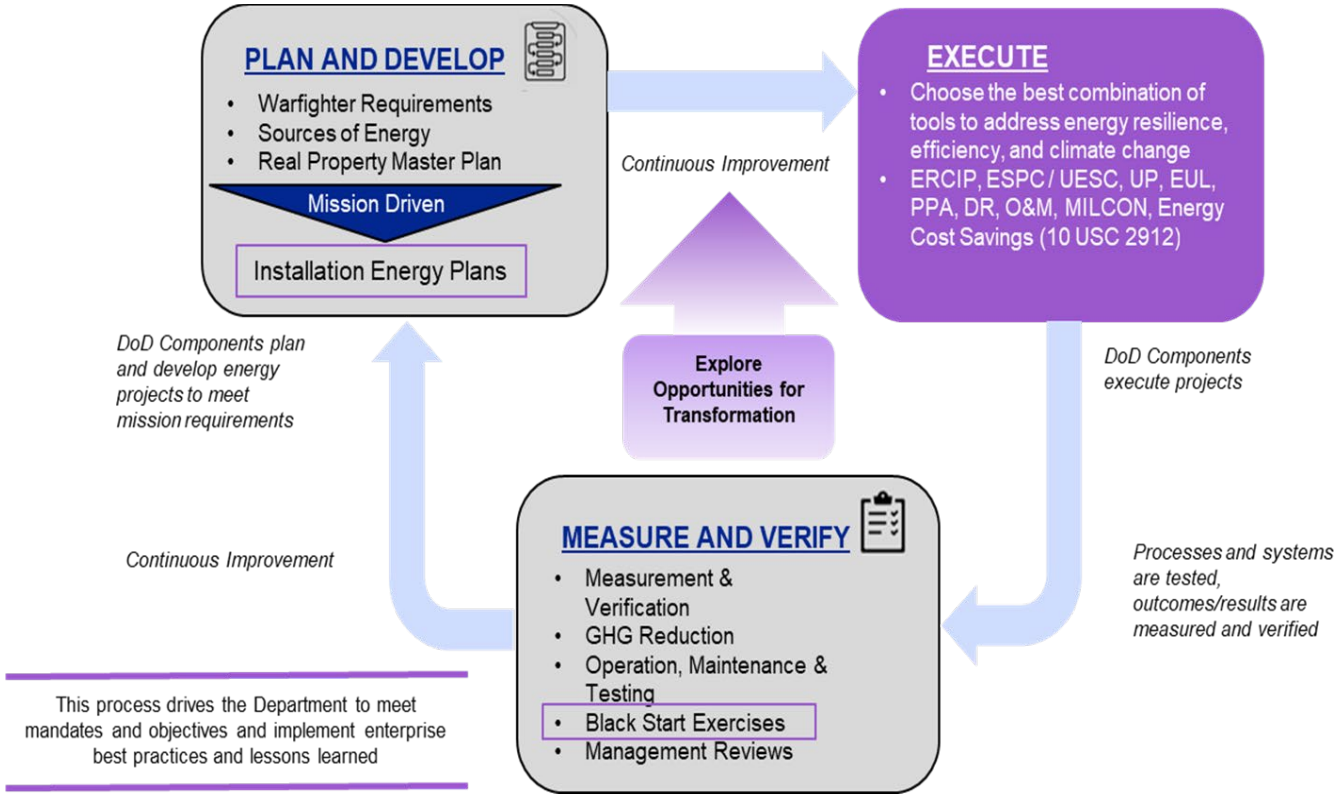
EO 14057 and Federal Sustainability Plan Goals

* = Buildings, Campuses & **Installations**





Installation Energy Plans (IEP)



- DoD is using the IEP process to close energy (and water) resilience gaps
  - IEPs to inform Installation Resilience Plans (IRPs)
  - Performance contracting can support mitigation and adaptation efforts
  - ERCIP: ESPCs/UESCs & Utilities Privatization
- DoD pre and post-award activities must scale commensurately

Summary

- **Climate change is a national security issue**
- **The Department is setting the conditions for success**
  - Senior leadership focus and alignment to include data-driven decision making
  - Definitization of strategy, policies and plans in alignment with statute and Administration
  - Working to synchronize and standardize across the DoD enterprise to prioritize efforts and optimize resources
  - Working with key stakeholders across the Federal government
- **DoD continues to leverage IEPs to identify and close energy (and water) resilience gaps**
  - Informing the PPBE process for FY23 Future Years Defense Program (FYDP)
- **OSD appropriately coordinating with Military Services to remove impediments and/or enable climate adaptation and mitigation efforts**

When we operate more sustainably, we become more logistically agile and ready to respond to crises.

-Secretary of Defense Austin, Leaders Summit on Climate 2021

Thank you!

Mr. Michael F. McGhee, SES, PE

Executive Director for Climate Resilience

Office of the Deputy Assistant Secretary of Defense for

Environment and Energy Resilience (ODASD(E&ER))

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Federal Utility Partnership Working Group
4 May 2022

Mr. J.E. "Jack" Surash, P.E.
Deputy Assistant Secretary of the Army for
Energy and Sustainability

Threats to Energy and Water Resilience

Physical

Sniper Attack on California Power Grid, 2013

Natural

Power lines knocked down during Hurricane Delta, October 2020, Ft Polk, LA

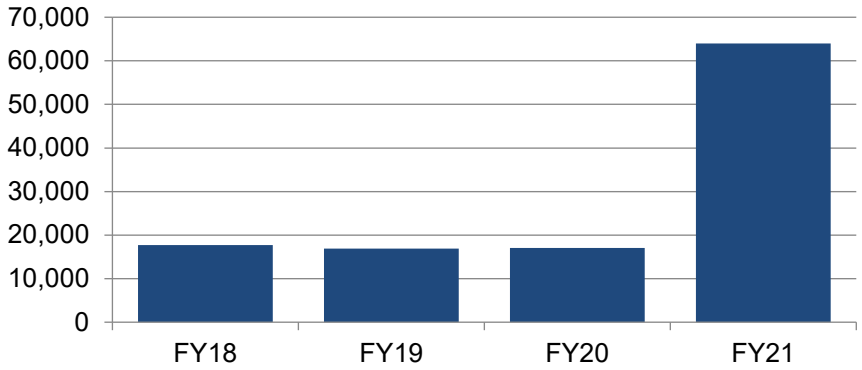
Cyber

Army cyberspace operations officer participates in field training exercise at Muscatatuck Urban Training, October 2020

Army Utility Outages

- Utility outages impact Army's access to electricity, natural gas, steam, water, & water treatment
- Spike in FY21 reflects more stringent Army reporting requirements
- Total of 3,579 outages reported

Total Unplanned Outage Hours



Army Installation Energy & Water Strategic Plan

VISION

Army installation energy and water infrastructure supporting critical missions in the Strategic Support Area will be:

RESILIENT

Ensure energy and water for critical missions under all conditions

Anniston Army Depot, AL
7.5 MW Solar Array (ERCIP)

EFFICIENT

Manage energy and water use to meet requirements effectively and sustainably

Ft. Irwin, CA
Water Treatment Plant (MILCON)

AFFORDABLE

Manage energy and water costs to enable the Army to refocus investment

Fort Knox, KY -- Godman Army Airfield, KY LED Lighting (ESPC)

Installations Must Make Energy and Water Choices that Maintain Critical Operations During Unexpected Grid Outages

Army Climate Strategy

END STATE The Army will be a resilient and sustainable land force able to operate in all domains with effective mitigation and adaptation measures against the key effects of climate change, consistent with Army modernization efforts.

INSTALLATIONS

Enhance resilience and sustainability by adapting infrastructure and natural environments to climate change risks,
securing access to training and testing lands into the future, and mitigating GHG emissions

ACQUISTIONS & LOGISTICS

Increase operational capability while reducing sustainment demand and strengthening climate resilience

TRAINING

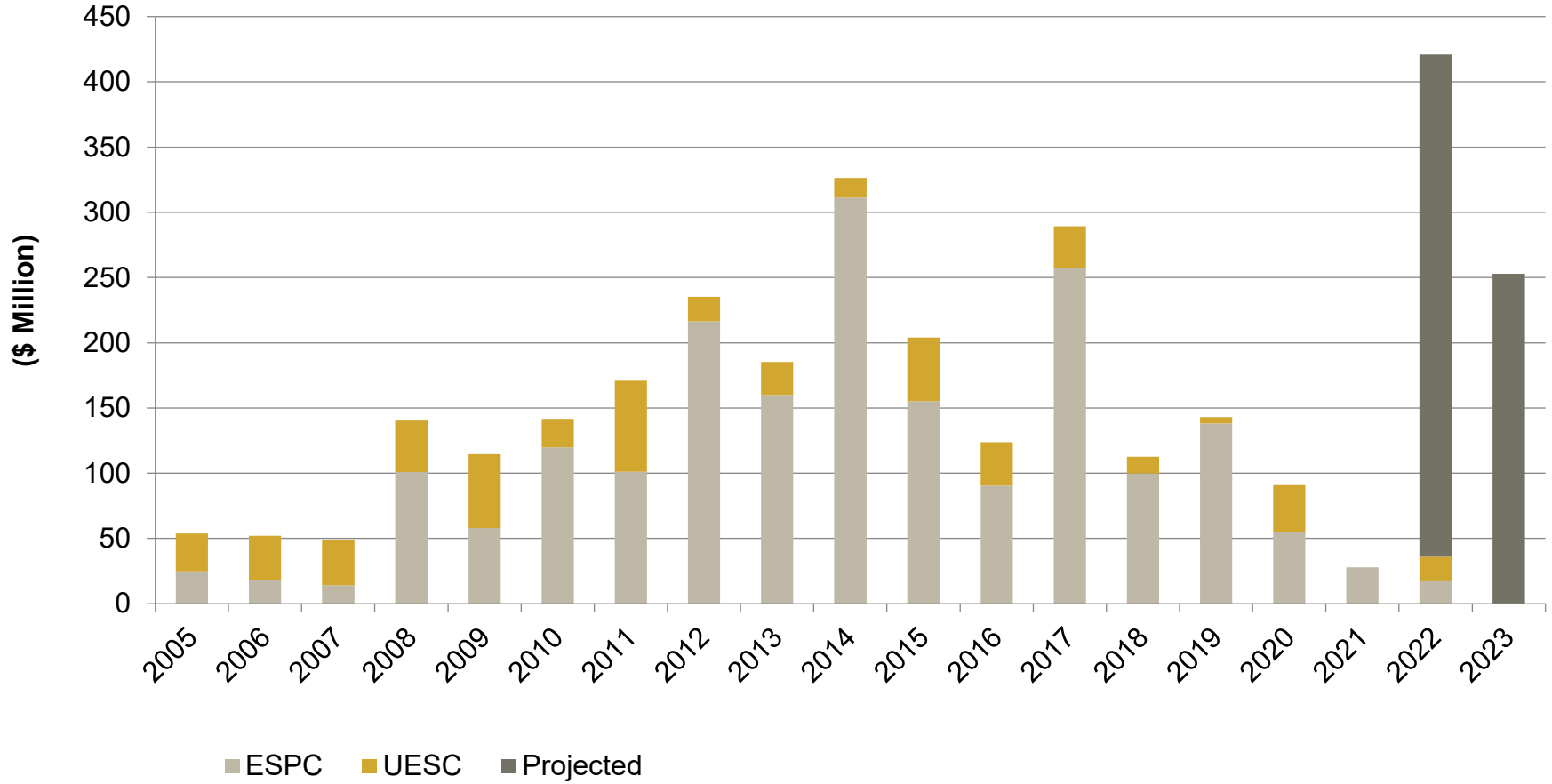
Prepare a force that is ready to operate in a climate-altered world

The Army Climate Strategy will strengthen our ability to accomplish the mission by strengthening climate preparedness and increasing the resilience of installations and the capabilities of the force

Resourcing & Executing Energy and Water Efficiency and Resilience

- **Private Equity**
  - Real Estate Outgrants (e.g. lease, easement) *10 U.S.C. § 2667, 10 U.S.C. § 2668*
- **Private Equity capable with Army payments**
  - Power Purchase Agreements *10 U.S.C. § 2922a*
  - Utilities Privatization (UP) *10 U.S.C. § 2688*
- **Third Party Financing**
  - Energy Savings Performance Contracts (ESPCs) *42 U.S.C. § 8287 et seq. and 10 U.S.C. § 2913*
  - ESPC ENABLE
  - Utility Energy Service Contracts (UESCs), *42 U.S.C. § 8256(c) and 10 U.S.C. § 2866 and 2913*
- **Upfront DoD or Army Appropriated Funds**
  - Operations and Maintenance (O&M)
  - Military Construction (MILCON)
  - Energy Resilience and Conservation Investment Program (ERCIP) *10 U.S.C. § 2914, 10 U.S.C. § 2802*
  - Availability and Use of Energy Cost Savings (REFoRM) *10 U.S.C. § 2912*
- **No Cost/ Low Cost Efforts**
  - Personnel Behavior Modifications and Establishing Energy-conscious culture
- **Department of Energy Grants**
  - Assisting Federal Facilities with Energy Conservation Technologies (AFFECT) *42 USC § 8256 (b)*
- **DoD Office of Local Defense Community Cooperation (OLDCC) Grants** *10 USC §2391*
  - Military Installation Sustainability
  - Defense Community Infrastructure Program (DCIP)
- **DoD Technology Grants**
  - Strategic Environmental Research & Development Program (SERDP) *10 U.S.C. §2901 - 2904*
  - Environmental Security Technology Certification Program (ESTCP) *10 U.S.C. §2901 - 2904*
- **State, Local, and Utility Company Rebates, Tax Deductions, and Grants**
  - Ability to use are often location and contract-vehicle and/or asset ownership dependent
- **Alternative Contract Execution Authorities** (using "normal" Appropriated Funds)
  - Utility Service Contracts *(FAR Part 41)*
  - Other Transaction Authority (OTA), *10 U.S.C. 2371b*
  - Intergovernmental Support Agreements (IGSAs) *10 U.S.C. 2679*

2005-2023: Energy Savings Performance Contract (ESPC) / Utility Energy Service Contract (UESC)



ENERGY ACTION MONTH

THANK YOU!

Questions?

VIRTUAL FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

May 3-4, 2022

Installation Resilience

Ms. Sandy Kline
Director of Installation Resilience
Assistant Secretary of the Navy
(Energy, Installations and Environment)

FEMP
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DON Installation Energy

Naval Installations are where combat power is developed, built and maintained, and where we train and equip Sailors and Marines.

Installation Energy is integral to mission accomplishment with new platforms and missions requiring exponentially more energy and quick recharge capabilities.

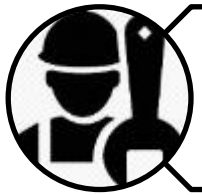
DON Installation Energy Goals = Energy Security

- Increase **Energy Resilience** for Task Critical Assets.
- Improve assured access to **Reliable and Quality Energy** for Task Critical Assets.
- Increase **Energy Efficiency** to Extend Operational Durations and enable mission execution.

Energy Resilience Principals

1. Use **Mission Assurance** to identify risks and **prioritize energy security gaps**
2. Benchmark **critical energy quantity, quality, and resilience** requirements (current & future)
3. Develop and execute **Installation Energy & Water Plans**
4. Consult and partner with Utilities and Service Providers to **increase resilience inside and outside the fence line**
5. Pursue **enhanced and secure generation and storage** (technology agnostic)

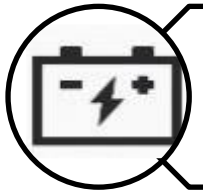
Shore Energy Focus Areas



Optimize Maintenance Performance

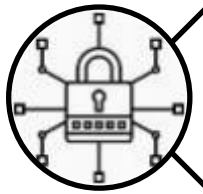
On-Base Generation Assets

Analyze System for Vulnerabilities

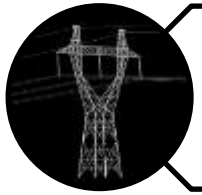


Energy Storage

Conserve Energy



Cyber-secure Control Systems



Redundant Sources of Electricity

Enhance Monitoring and Control Systems

Energy is critical to the Nation and to the Navy. The Navy needs reliable power ashore to ensure we are able to train, staff, and equip the Fleet.

Shore Energy Major Efforts

- Smart Grid & Metering
- Third Party Financing & ERCIP
- Micro-Grid & Battery Storage
- ERRE
- Electrification
- Master Planning & Community
- EO 14057 & DOD Policies

"There is little about what the Department does to defend the American people that is not affected by climate change. It is a national security issue, and we must treat it as such." (Secretary of Defense Lloyd J. Austin III, Jan. 27, 2021)

Installation Energy Financing Tools

ENERGY PROJECT AUTHORITIES

- Enhanced Use Lease
  10 USC § 2667
- Energy Savings Performance Contract
  42 USC § 8287
- Utility Energy Service Contract
  10 USC § 2913
- Power Purchase Agreement
  10 USC § 2922a
- Utility Service Contract
  40 USC § 501, FAR Part 41
- Energy Resilience & Conservation Invest-ment Program
  10 USC § 2914
- Utilities Privatization
  10 USC §2668
- Intragovernmental Support Agreements
  10 USC §2679


Portsmouth Naval Shipyard ESPC

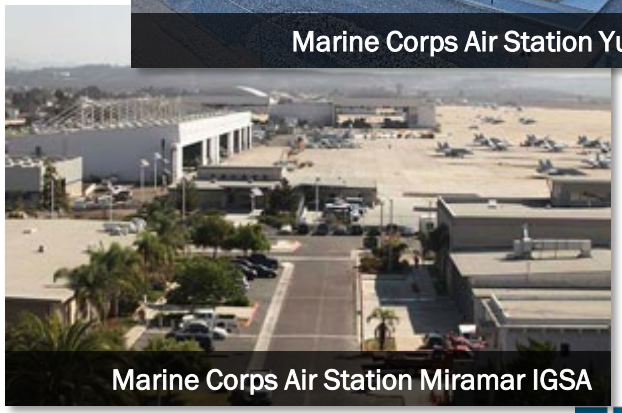

Naval Station Guantanamo Bay ESPC


Pacific Missile Range Facility EUL


Port Hueneme EUL


Marine Corps Air Station Yuma EUL


Naval Support Activity Mid-South EUL


Marine Corps Air Station Miramar IGSA

Executive Order 14057

- Reducing installation emissions 65 % by 2030 (2008 baseline)
- Achieving 100 % carbon pollution-free electricity by 2030, at least 50 % will be locally supplied clean energy to meet 24/7 demand;
- Acquiring 100 % zero-emission vehicles by 2035 and 100 % zero-emission light-duty vehicle acquisitions by 2027;
- Achieving a 50 % reduction in emissions from buildings by 2032;
- Annually diverting at least 50 % of non-hazardous solid waste from landfills, including food and compostable material, and construction and demolition waste and debris by 2025

Installation Resiliency Successes
Navy

Pacific Missile Range Facility (PMRF) Kauai, Hawaii (EUL): The agreement incorporates distributed energy resources (DER) which supports local base and regional grid stability by shifting the PMRF peak load demand to the new DER and energy storage infrastructure. DON invested approximately $1.3M and PMRF will receive a dedicated feeder, high-speed switching and microgrid capabilities valued at $6.5 million in IKC for the lease-value of the land.

Naval Station Guantanamo Bay, Cuba (ESPC): This project will increase the energy generation efficiency by 9.5% and coupled with energy savings measures included in the project scope, will reduce the total energy requirement for the installation by 26% once construction is completed. The $368M+ private capital infrastructure investment project includes a total DON investment of $5.6M. This will result in an annual savings of $1.7M in non-energy costs and $24M in energy costs in the first year alone.

Joint Base Anacostia-Bolling (JBAB), Washington DC (EUL): The Navy entered into an Enhanced Use Lease/Power Purchase Agreement for 7.5 megawatts (MW) of on-base solar power mounted on existing carports. JBAB received 9,063-megawatt hours (MWh) of Photovoltaic (PV) energy from these arrays in Fiscal Year 2020. The project will supply approximately 10% of JBAB's electrical requirements

Installation Resiliency Successes
USMC

MCAS Miramar San Diego, CA In summer 2020, the Marine Corps Air Station (MCAS) Miramar Microgrid Program completed work on the installation's full microgrid. The microgrid outperformed initial load expectations by providing power to all of the installation's critical and essential buildings when disconnected from the commercial grid. In fact, the microgrid and supporting elements can provide backup power to mission essential facilities for 21 days without external fuel resupply.

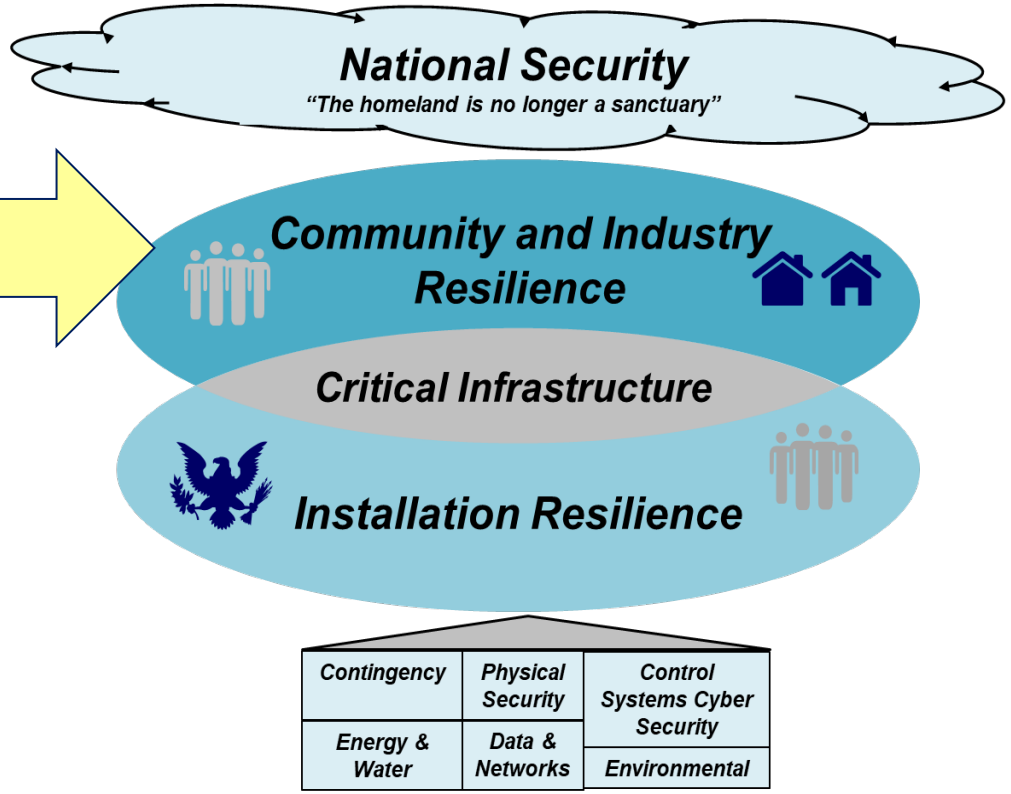
MCRD Parris Island: The $91M project, funded through an energy savings performance contract, provides 10 megawatts of on-site distributed energy generation, coupled with battery storage. The energy technologies are integrated into a microgrid control system capable of fast load-shedding, allowing the discretionary distribution of power across the grid to where it is needed most.

MCLB Albany: In October 2021, the U.S. Marine Corps ordered 21 mobile solar-powered electric vehicle (EV) charging systems, the Beam EV ARC, to be deployed across 14 Marine Corps bases. The Beam EV ARC system, now in operation at Marine Corps Logistics Base (MCLB) Albany, generates and stores its own clean electricity without using any of the base's power.

Installation Resilience Initiatives

Initiative Focus Areas

- Master Planning Updates
- Installation Energy & Water Plans
- DOD Climate Assessment Tool
- Defense Sea Level Rise Database
- Resilience Tools & Capabilities (P&D)
- Updating Unified Facilities Criteria
- Industry & Community Partnerships and Third-Party Financing



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Climate Policy Documents

- **Existing DOD and DON Policy & Guidance**:
  - DOD 2021 Sustainability Report and Implementation Plan
  - DODD 4715.21 Climate Change Adaptation and Resilience
  - DOD Memo Floodplain Management on DOD Installations
  - DOD Installation Exposure To Climate Change at Home and Abroad Report 2021
  - DOD Master Planning UFC – Climate Update 2020
  - DOD 2014 Climate Change Adaptation Road Map
  - SECNAV Installation Energy Resilience Strategy 2020
  - NAVFAC Climate Adaptation Handbook 2017

VIRTUAL FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

May 3-4, 2022

Installation Energy Overview

Mr. Douglas Tucker
Dir., Installation Energy Policy & Programs
Office of the Deputy Assistant Secretary
(Environment, Safety, and Infrastructure)

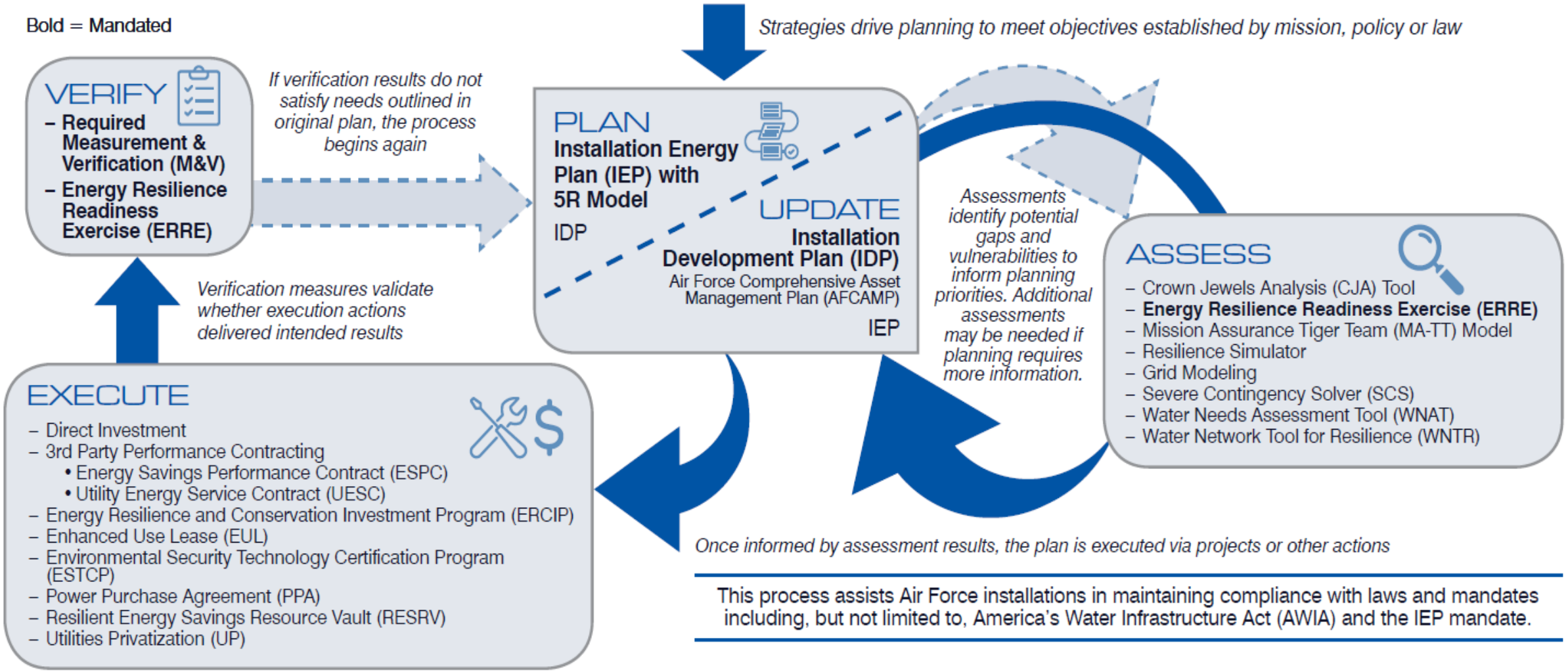
FEMP
Federal Energy Management Program

Agenda

- The Full Picture
- Energy Resilience Readiness Exercises
- Utilities Privatization
- Micro-Reactor Development
- Zero Emission Vehicle Pilot Programs

The "Full" Picture

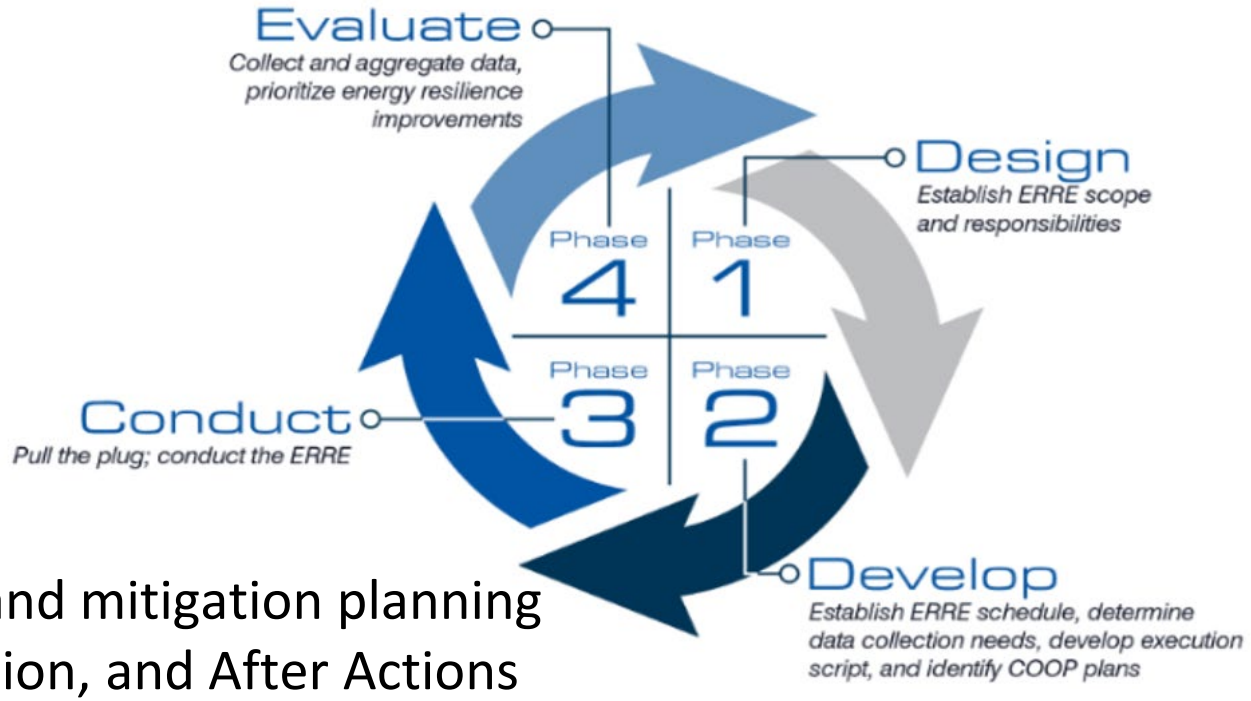
Mission Capabilities



This process assists Air Force installations in maintaining compliance with laws and mandates including, but not limited to, America's Water Infrastructure Act (AWIA) and the IEP mandate.

FEMP Federal Energy Management Program

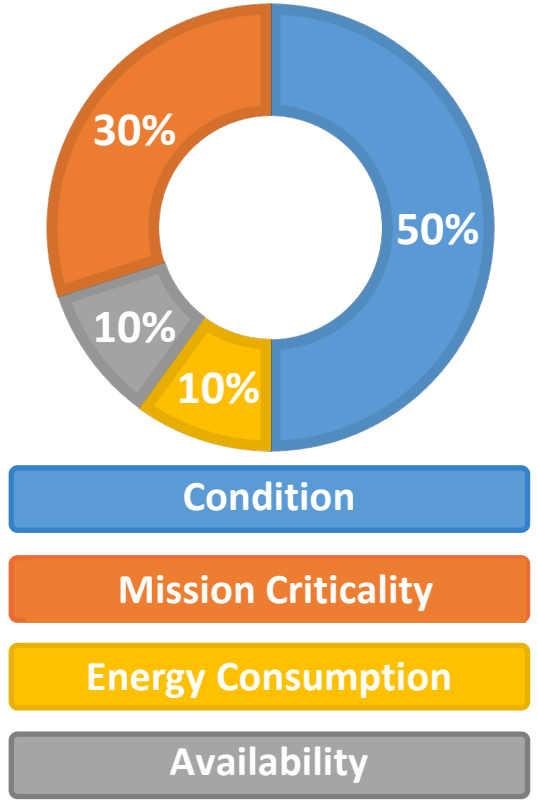
Energy Resilience Readiness Exercises



- **Overview:** Mission-focused exercise aimed at testing operations in a degraded energy environment (no commercial power for 12+ hrs) to identify hidden interdependencies among missions & enabling infrastructure
- **Required Inputs:**
  - Mission Owner involvement in interviews and mitigation planning
  - Installation Leadership for Planning, Execution, and After Actions
  - 3rd Party Technical Facilitation throughout the process
- **Efforts to Date:** Conducted ERREs at Hanscom AFB, Vandenberg SFB, JB MDL, Eielson AFB, Wright Patterson AFB, and Springfield-Beckley ANGB
- **Planned Efforts:** Planned & budgeted for 5 ERREs per year. Potential for 1-2 additional ERREs in FY23 if funds become available.

Utilities Privatization Supports Mission Assurance

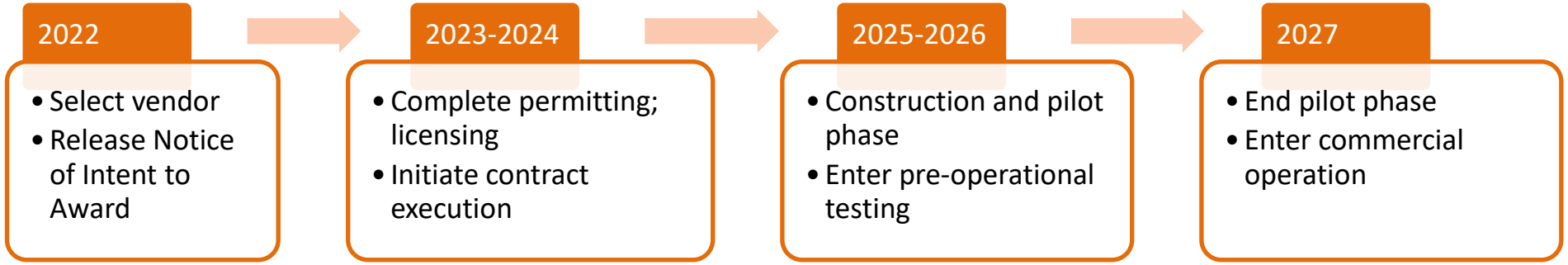
- Holistic Utility System Working Group (HUSWG)
  - Established April 2017
- Leverage AF enterprise data to prioritize utility investment
- Critical system upgrades utilizing full spectrum of execution tools – including UP
- Future UP acquisitions based on HUSWG prioritization and UP business rules:
  - Utility Systems must be CONUS
  - Utility Systems must be mission critical
  - UCI<60, on IEP, Elec/Gas systems only
  - Utility Systems previously exempted may be reconsidered based off above criteria
- Securing funds assurance for new acquisitions



HUSWG Prioritization Scoring Model

Eielson AFB Micro-Reactor Project

- Project Status:
  - Publically announced Eielson as chosen pilot location in Oct 2021
  - Coordination of draft Request for Proposal (RFP) is ongoing
  - Obtain OSD approval & release final RFP (Target Summer 2022)
- Anticipated Timeline:



- Stakeholder Engagement:
  - Continue coordination with base, local community & State to ensure clear communication & project support

ZEV Fleet Updates

- **Whole Fleet:** 77,000 vehicular assets, including material handling assets
- **Infrastructure**
  - 33 Level 2 ports installed
  - 12 Level 2 ports purchased, not yet installed
- **ZPAC Recommendations:** 538 ZEV acquisitions
- **Pilot Installations:** JB Andrews and JBMDL
  - SAF/IEE exploring next locations of interest
- **Funding**
  - DAF currently has $2.4M in FY23 POM for AFV incremental cost
  - FY23 GSA replacement eligible vehicles require additional $3.4M
    - Maximizes leased PHEVs compared to FY22 schedule
    - BEV leases would require additional infrastructure and budget analysis

Zero Emission Vehicle Planning and Charging (ZPAC) Tool predicts potential for vehicles to be replaced by ZEVs based on CEQ's FY22 replacement eligibility and existing vehicle type

24/7 Carbon-Free Energy by 2030

Accelerating the transition to a carbon-free future

Reid Spolek

Global Clean Energy Lead

Google

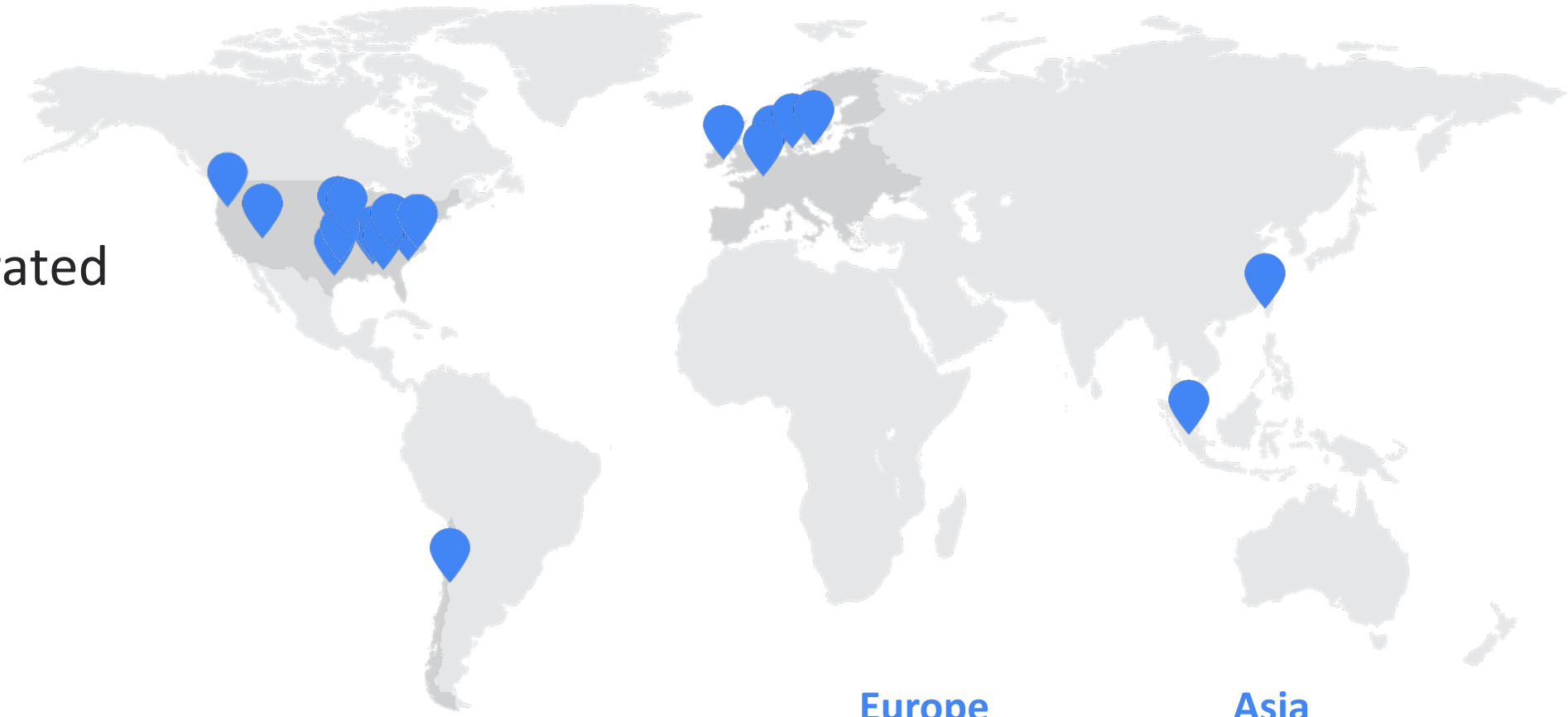
May 2022

21

locations for owned and operated data centers

4

continents



Americas

Berkeley County, South Carolina
Council Bluffs, Iowa
The Dalles, Oregon
Douglas County, Georgia
Henderson, Nevada
Jackson County, Alabama
Lenoir, North Carolina
Loudoun County, Virginia
Mayes County, Oklahoma
Midlothian, Texas
Montgomery County, Tennessee
New Albany, Ohio
Papillion, Nebraska
Quilicura, Chile

Europe

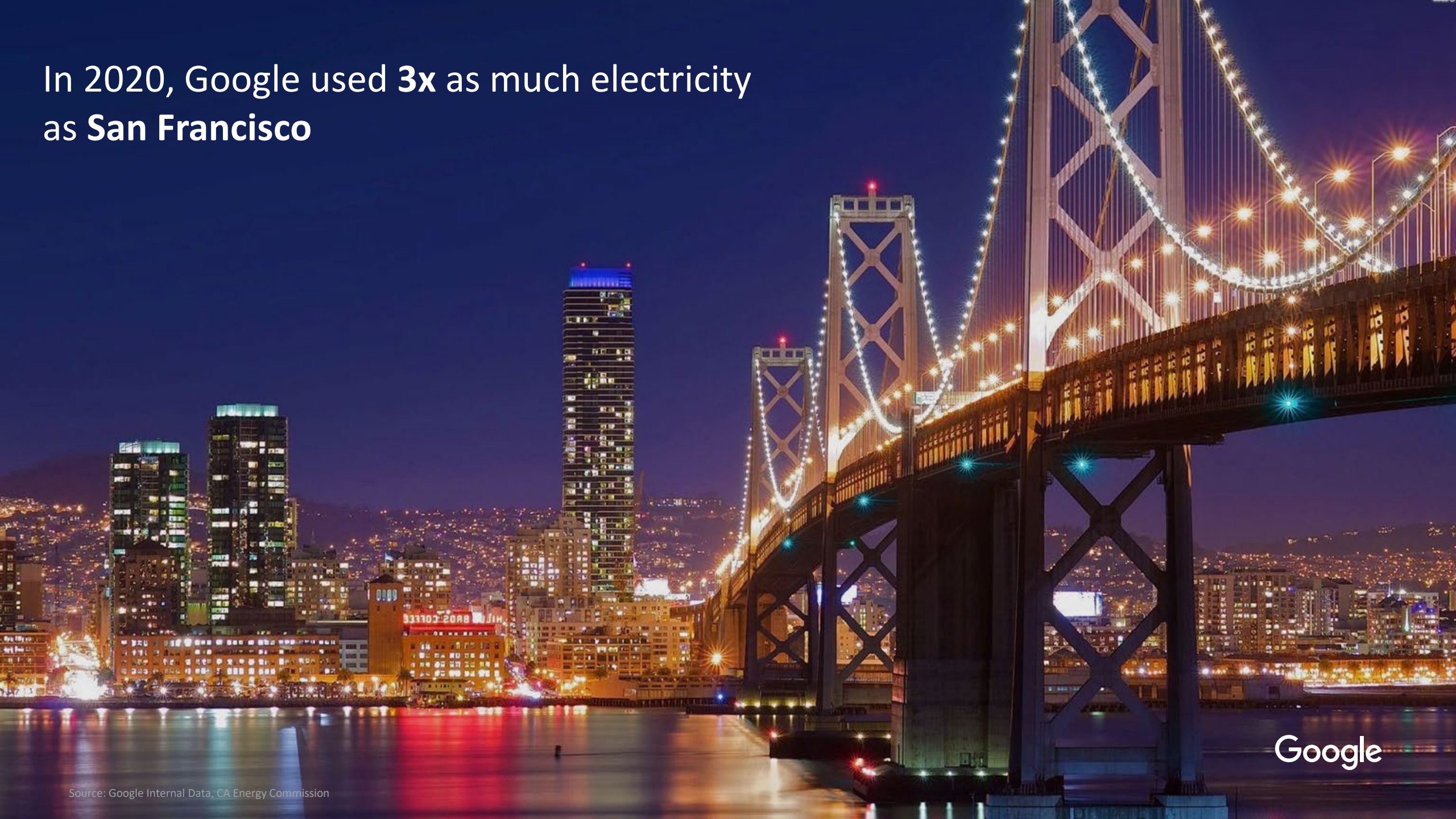
Dublin, Ireland
Eemshaven, Netherlands
Fredericia, Denmark
Hamina, Finland
St Ghislain, Belgium

Asia

Changhua County, Taiwan
Singapore

Google

In 2020, Google used **3x** as much electricity as **San Francisco**

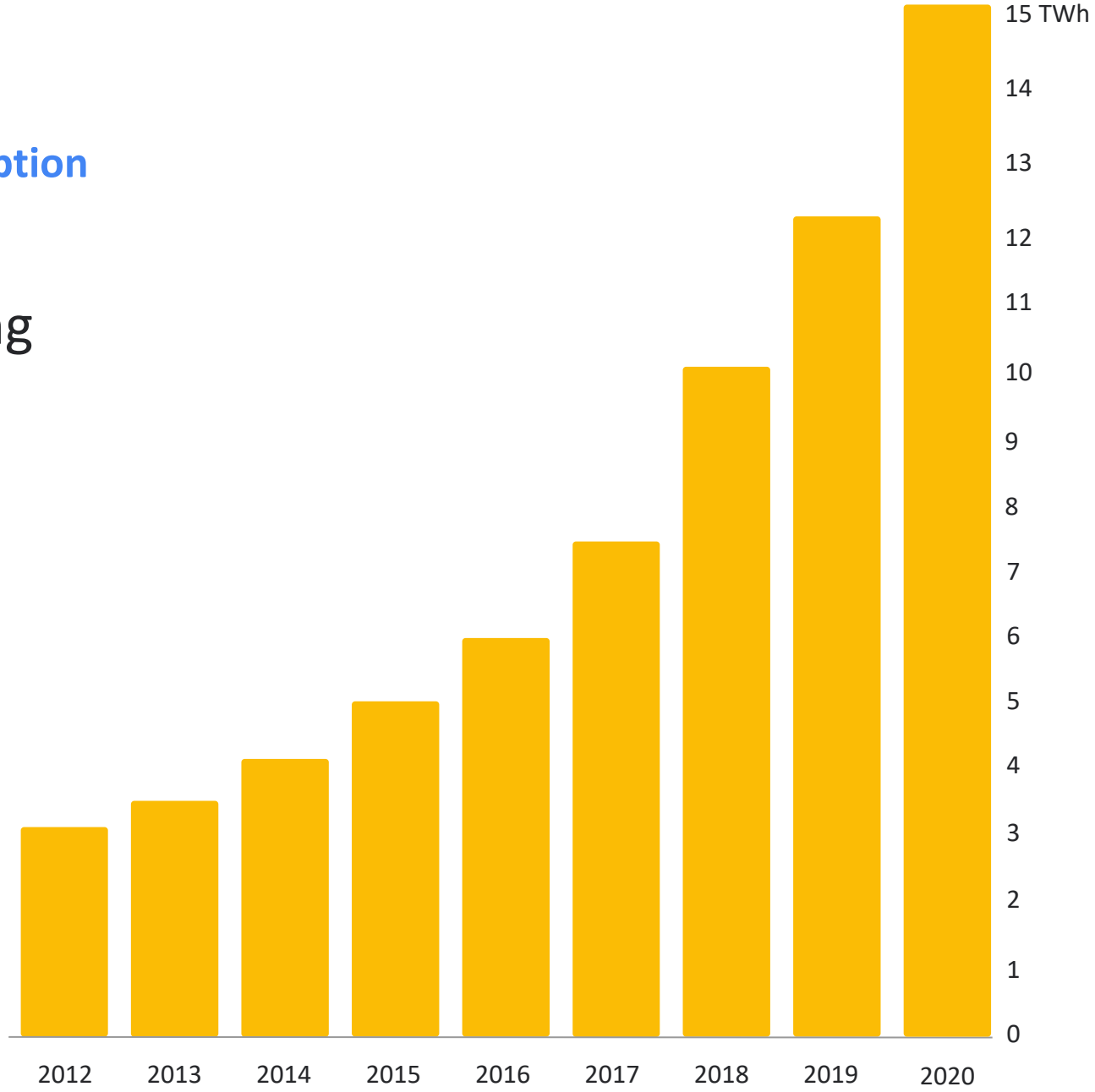


Google

Source: Google Internal Data, CA Energy Commission

Google's annual electricity consumption

Demand for our services is growing every year, driving continued growth in our energy use



Total electricity consumption (TWh)

Source: Google Internal Data

Google

Google’s energy journey

Since 2007

Carbon Neutrality

Compensating for operational emissions

Since 2017

100% Renewable Energy

Reducing emissions

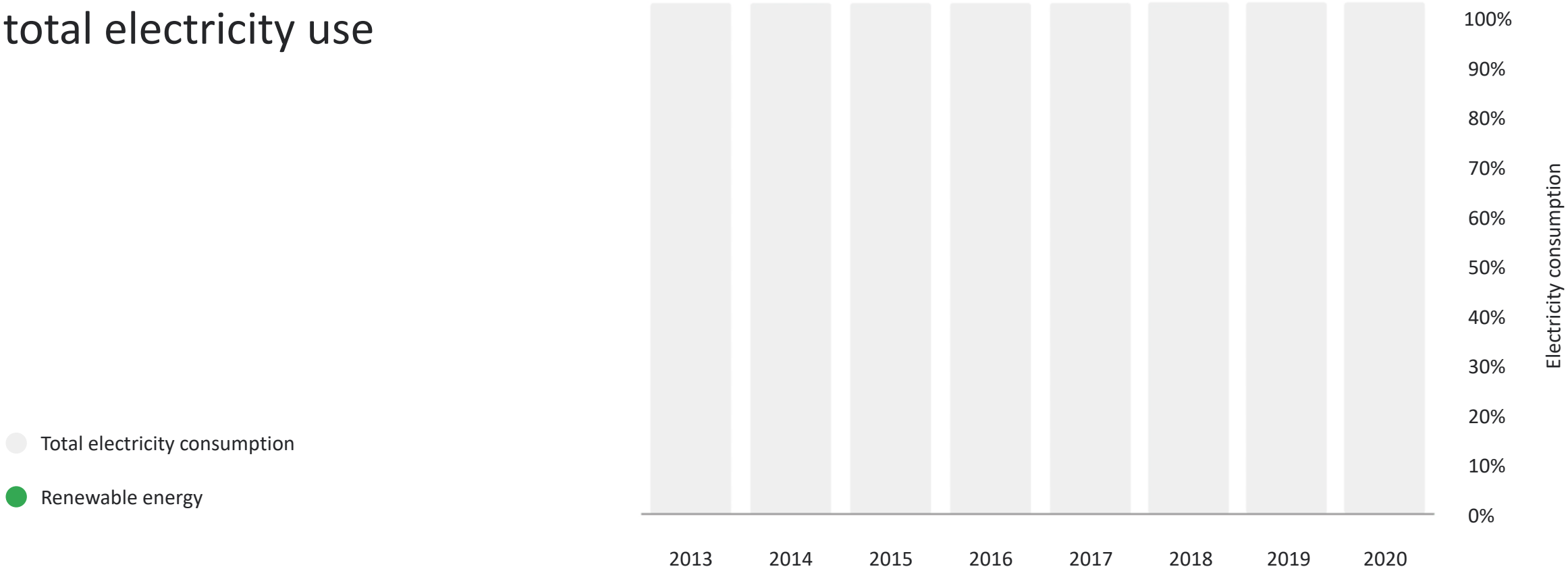
By 2030

24/7 Carbon-Free Energy

Eliminating electricity emissions

Google

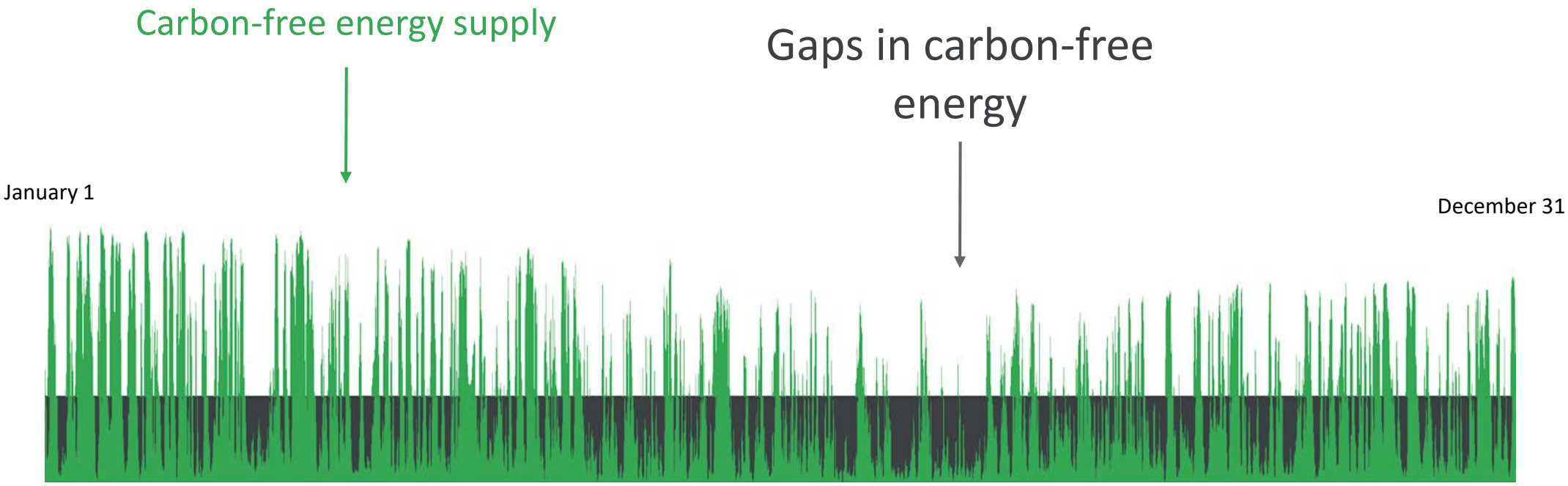
Renewable energy purchasing compared with total electricity use



Google

100% RE does not fundamentally solve the problem

Due to the variability associated with renewables, we still rely heavily on coal and gas from the grid during periods of low wind or solar

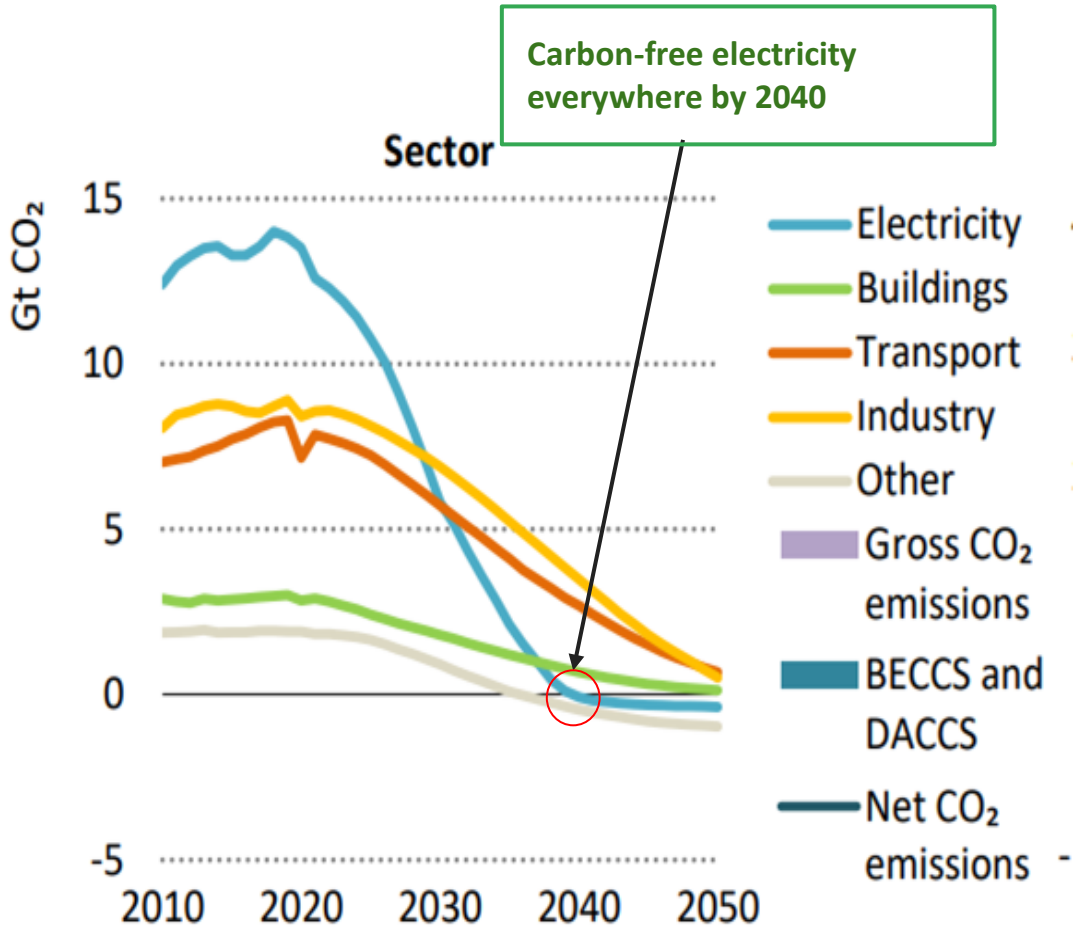


Google's Iowa data center hour by hour


24/7 Carbon-Free Energy
By 2030, we intend to source carbon-free energy for Google’s operations in all places, at all times
Google

Why is 24/7 carbon-free energy necessary?

To achieve a net-zero emissions global economy, **we must create zero-carbon electricity systems even faster.**



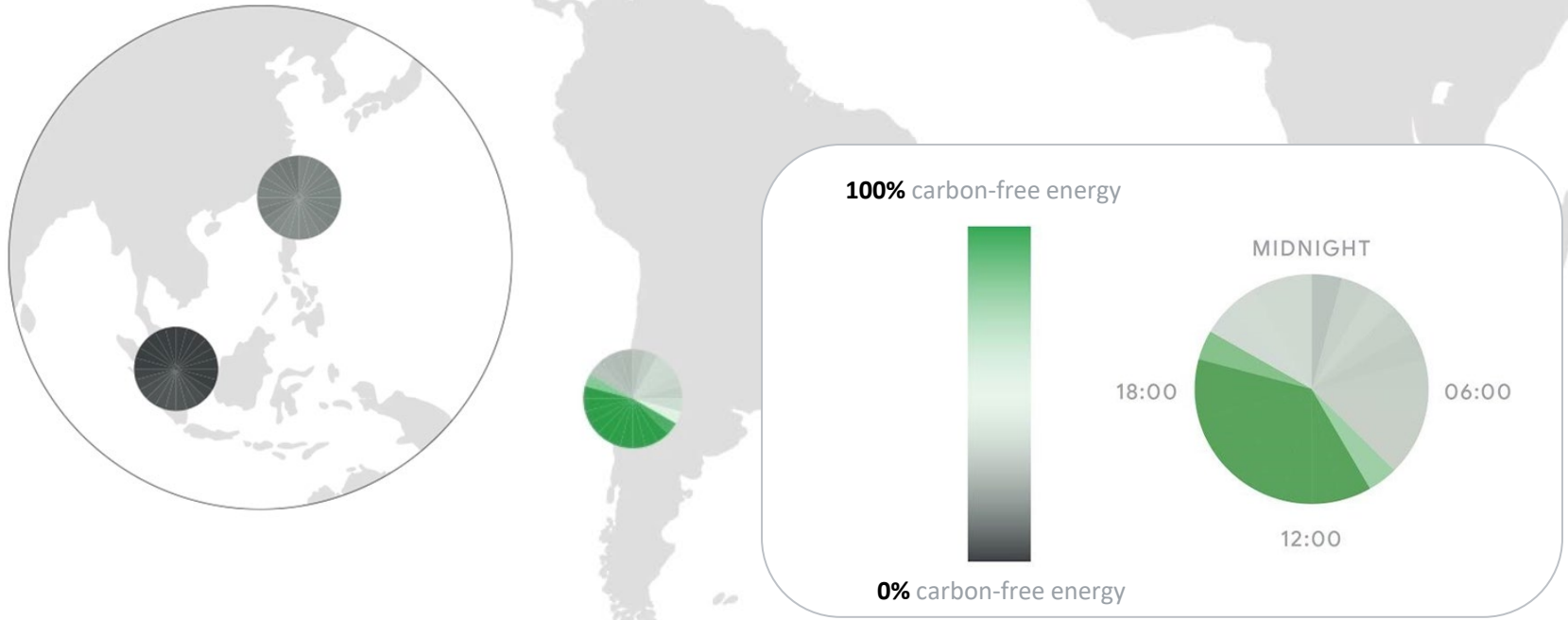
Source: IEA Net Zero by 2050 report, fig. 2.3

Google

Progress

In 2020, Google reached **67% carbon-free energy** globally on an **hourly basis**.

In the same year, **five of our data centers** operated at **90% carbon-free energy.**



Every hour of Google's carbon-free energy sourcing in January 2020

Program Principles

1. **Time-based Matching**: moving from annual volume-based goal to **hourly** matching of load
2. **Local Procurement**: moving from global matching of demand to **local** (regional grid)
3. **Technology-inclusive**: moving from renewable energy only to **all carbon-free energy** (includes nuclear, carbon capture sequestration (CCS), etc.)
4. **Additionality**: adding new clean energy projects to the grid through procurement, but recognize additionality is a spectrum.

Our Third Decade of Climate Action

24/7 Carbon-Free Energy by 2030

Our approach

- **Purchasing:** Buy more and different types of clean energy deployed locally
- **Technology:** Accelerate energy technology innovation
- **Policy:** Advocate for policy changes to decarbonize electricity grids

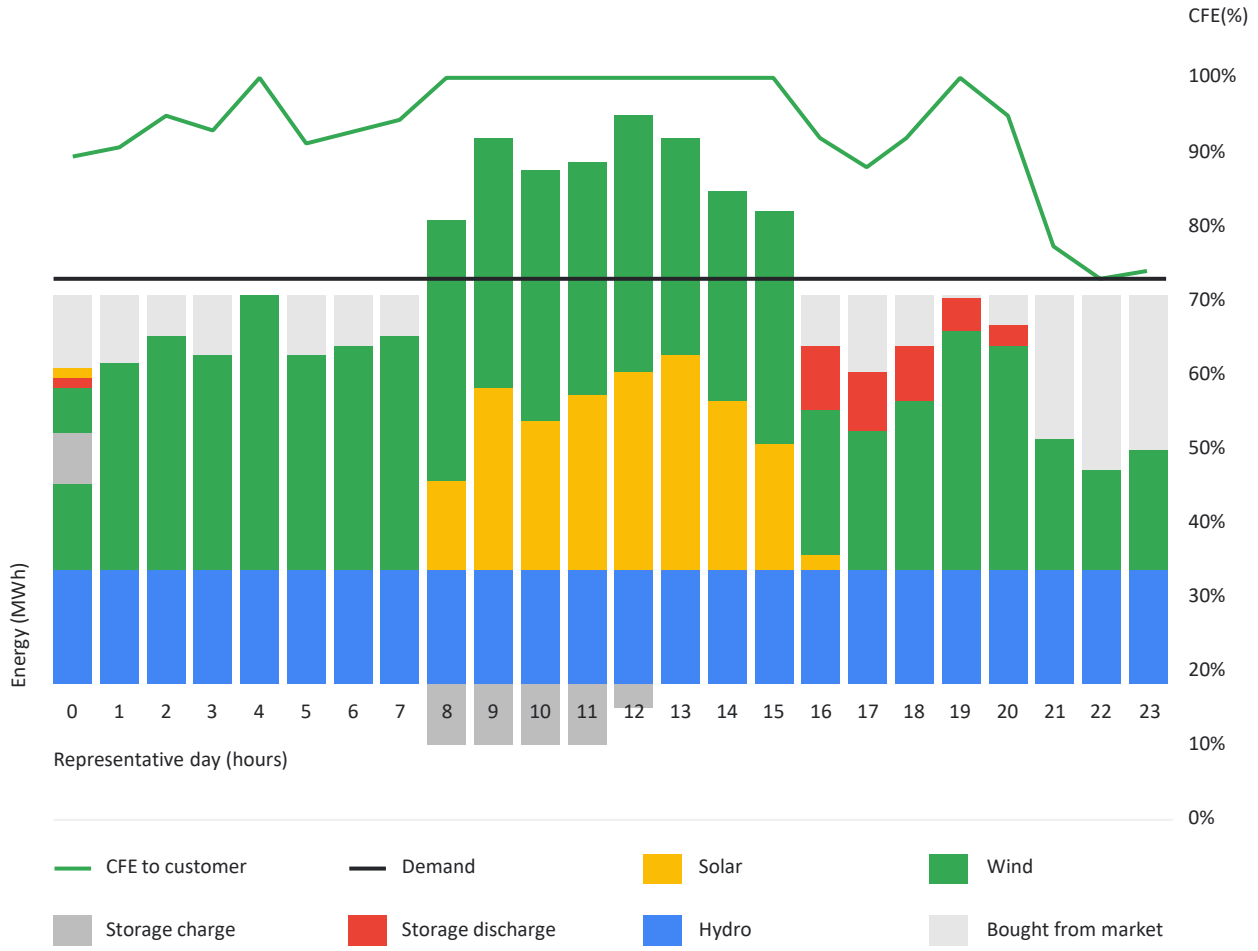
Example: Purchasing

First-of-its-kind energy deal

In May 2021, Google and AES announced a first-of-its-kind supply agreement that will guarantee that Google's data centers in Virginia will operate on **90% carbon-free energy by 2024**.

500 MW

New clean energy portfolio added to PJM electricity grid, comprising wind, solar PV, battery storage, and run of river hydro.



Source: AES Case Study

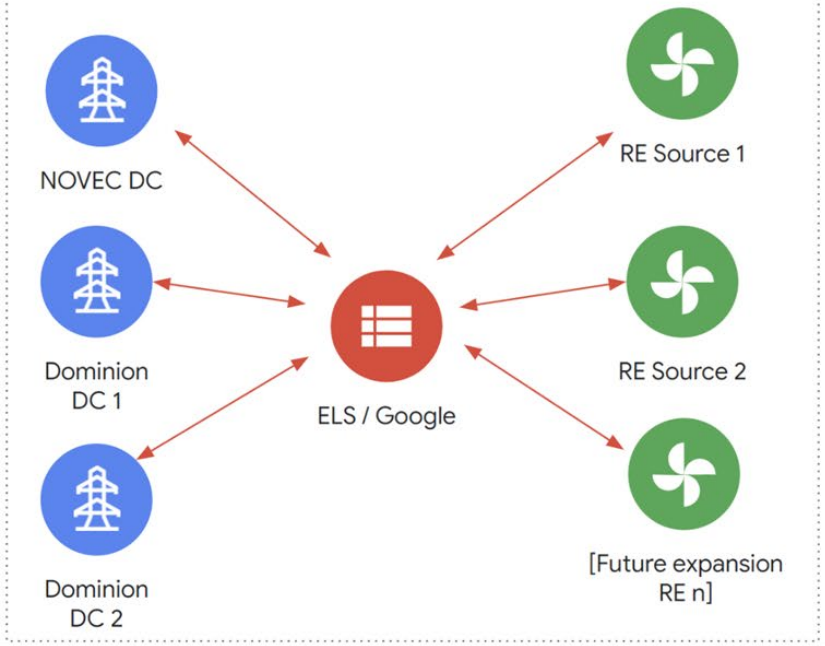
Google

Example: Purchasing

24/7 CFE delivered through third-party “Energy Manager”

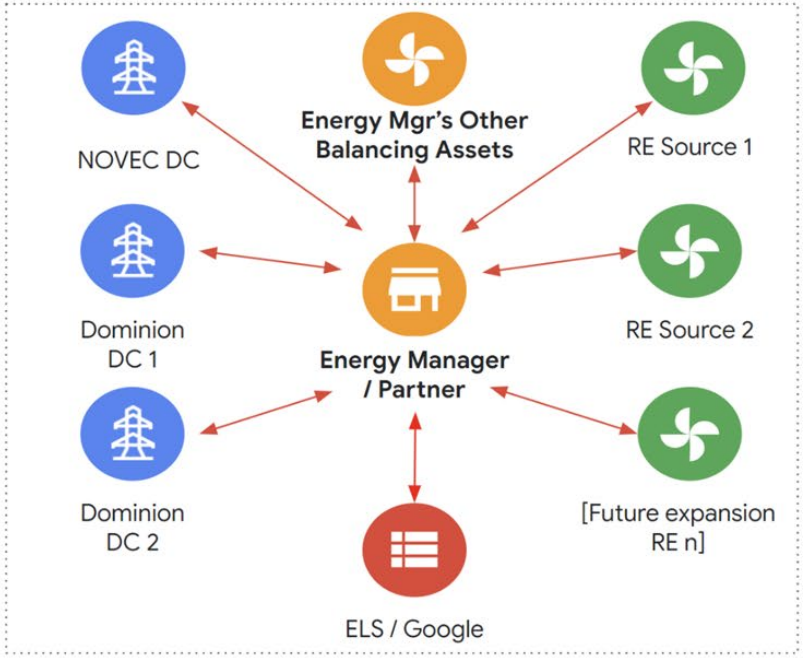
Virginia: Current State

PPAs	Supply Agreements	DC Sites	Effective Price	CFE %
2+	3+	3+	?	?



Virginia: Future State (w/ EM)

PPAs	Supply Agreements	DC Sites	Effective Price	CFE %
⬇ 0	⬇ 1	3+	Known	Floor 90%



Source: AES Case Study

Google

Example: Purchasing

Five Key Benefits of Energy Manager Approach for End Buyer

- Reduces Transaction Costs
- Reduces Risks
- Scalable Model
- Greater Liquidity and Optionality
- Increased Hourly Carbon-Free Energy Matching

Source: AES Case Study

Google

Example: Purchasing

Lessons Learned: CFE Procurement

Find partner willing to run lots of analytics

Find partner with asset experience in that market

Benchmark the value to you

Don’t shy away from giving “outs” in the deal

Source: AES Case Study

Example: Technology

Next-generation geothermal

Partnership with Fervo Energy to develop **“always-on”** clean energy for Nevada’s electricity grid.

A step taken locally to advance geothermal energy use globally.

Example: Technology

Time-Based Energy Attribute Certificates (T-EACs)

A new and growing system that enables energy consumers to know exactly what kinds of energy are being produced, consumed, and traded on an hourly basis across electricity grids around the world

Example: Policy

Spurring a Global Movement

U.N. 24/7 Carbon-free Energy Compact

A global group of companies, governments, and organizations actively engaged in accelerating the technologies, policies, tools, ideas, and advocacy that will collectively realize 24/7 CFE for all. ~60 signatories and counting.

GoCarbonFree247.com

Clean Energy Buyer's Association

A community of ~300 energy customers and partners committed to achieving a 90% carbon-free U.S. electricity system by 2030.

cebuyers.org

Momentum: Others Adopting 24/7 CFE goals

U.S. Federal Government, Microsoft, Iron Mountain,
City of Des Moines, +++

Google

24/7 carbon-free energy
everywhere
all the time
for everyone.

Thank you!

goo.gle/carbonfreeenergy

24-7cfe@google.com

Reid Spolek (LinkedIn)

Closing Remarks – FUPWG Day 2

- Thank you for attending
- Thank you to our presenters
- Thank you to the team behind the scenes
- Best wishes, Susan!
- Go to the FUPWG Website to sign up for future FUPWG updates

- UESC Overview Training – Part 2 is next!

U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Utility Energy Service Contract (UESC) Overview | Day 2

May 4, 2022 | 3:05 – 3:50 PM (EDT) | Federal Utility Partnership Working Group

FEMP Federal Energy Management Program

Instructor Introductions

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Technical Project Lead
Accelerated Deployment & Decision Support Center
National Renewable Energy Lab

Matt Joyner
Project Manager
Accelerated Deployment & Decision Support Center
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Project Manager
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FEMP Federal Energy Management Program | NREL NATIONAL RENEWABLE ENERGY LABORATORY

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What are IACET-Certified CEUs?

What is a CEU?

According to the International Association for Continuing Education and Training (IACET), a CEU is a unit of credit equal to 10 hours of participation (contact hours) in an accredited program designed for professionals with certificates or licenses to practice various professions (e.g., engineers, lawyers, accountants, educators, nurses, architects, mental health professionals, and social workers). The CEU provides a standard unit of measurement for continuing education and training, quantifies continuing education and training activities, and accommodates for the diversity of providers, activities, and purposes in adult education.

What is the IACET?

The IACET offers the most industry-wide accreditation of official continuing education units (CEU). IACET worked with the U.S. Department of Education to create and define the CEU in 1970. The Federal Energy Management Program (FEMP) is an authorized provider of CEUs under the ANSI/IACET 1-2018 Standard. IACET Course Accreditation is an industry-recognized training quality control system; FEMP is utilizing this system to ensure our trainings meet the highest standards for professional development.

How do I earn CEUs for a training I've taken?

When you take a FEMP IACET-certified training, you will be provided with a link to the assessment and evaluation for the training completed. To earn CEUs, attendees must score 80% or higher on the assessment and complete the course evaluation.

Benefits of Having a WBDG Account

The National Institute of Building Sciences' (NIBS) Whole Building Design Guide (WBDG) hosts the FEMP training program's learning management system (LMS).

The NIBS WBDG LMS:

- Allows for taking multiple trainings from multiple organizations through one platform
- Houses the assessments and evaluations for all accredited courses
- Allows you to:
  - Track all of your trainings in one place
  - Download your training certificates of completion
- Eases the CEU-achievement process
- **Log into the WBDG LMS by choosing a course at** https://www.wbdg.org/continuing-education/femp-courses

To Receive IACET-Certified CEUs

- **Attend the training in full–no exceptions**
- **Within six weeks of the training:**
  - Complete the assessment (a minimum score of 80% is required)
  - Complete an evaluation of the training

Access the UESC Training Assessment and Evaluation

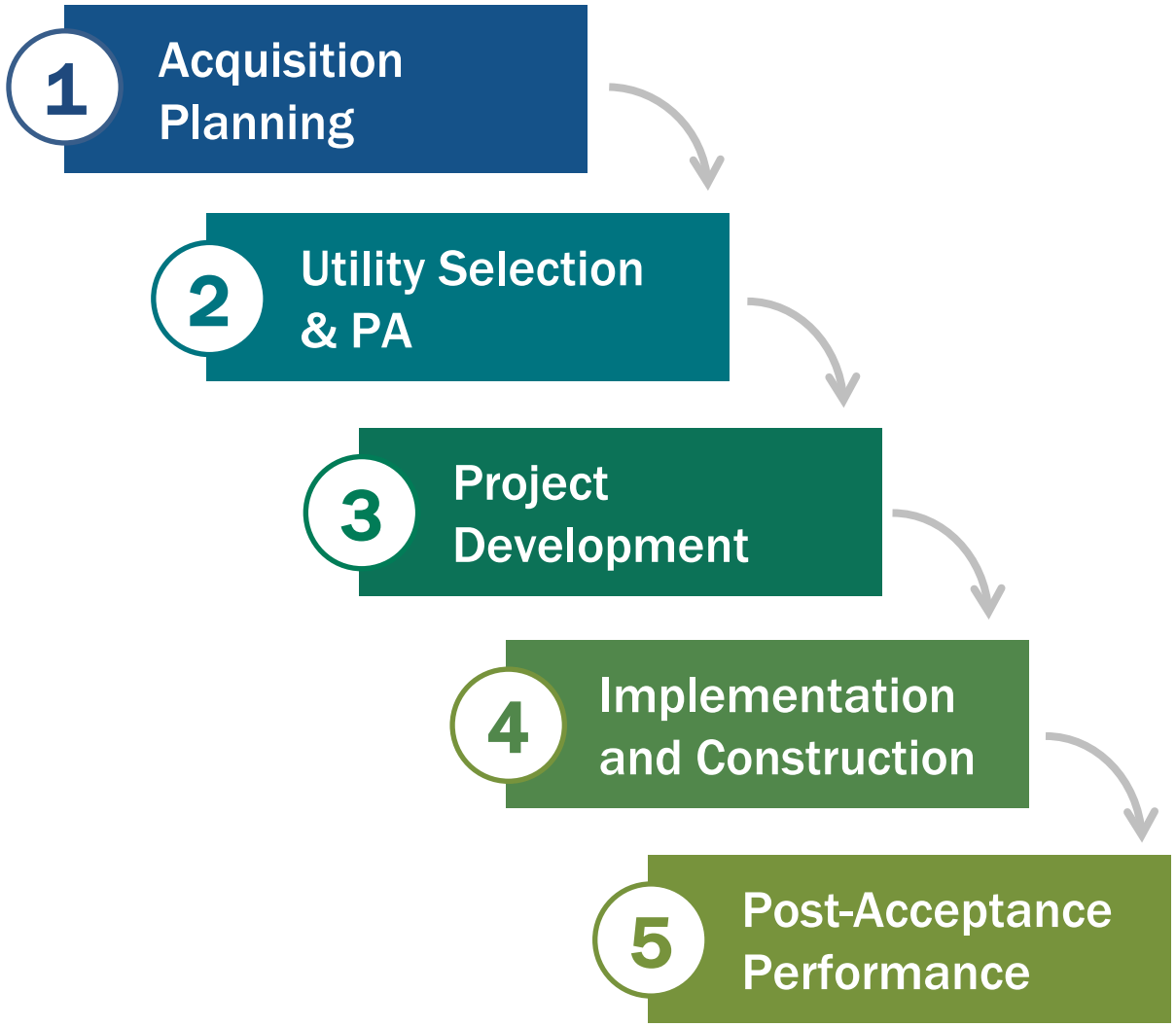
Click here to view WBDG's FEMP Course Catalog

For logistical questions related to the webinar or evaluation, email Elena Meehan at elena.meehan@ee.doe.gov.

Training Agenda - Day 2

- UESC Development and Implementation Process
  1. Acquisition Planning
  2. Utility Selection and Preliminary Assessment
  3. Project Development
  4. Implementation & Construction
  5. Post-Acceptance Performance
- Resources and Q&A

The UESC Implementation Process



Start with Your Agency's Process

- FEMP's process describes general best practices
- Get to know your agency-specific UESC procedures and approval process before initiating a project

Phase 1: Acquisition Planning

1. Acquisition Planning
2. Utility Selection & PA
3. Project Development
4. Implementation and Construction
5. Post-Acceptance Performance

Phase 1 Actions:

- Agency forms team
- Agency develops initial scope of work
- Agency defines acquisition plan and funding strategy
- Agency drafts Justification and Approval (J&A) if required

Acquisition Planning Overview

Objective of this phase is to ensure that the acquisition:

- Reflects program mission
- Follows statutory requirements, regulations, and agency-specific policies and practices
- Considers technical, business, management, and other influences
- Includes resource planning and milestones

Initial Project Scope

The initial project scope may be influenced by:

- Agency energy program priorities
- Decarbonization and resilience goals

And driven by:

- Site priorities and unfunded infrastructure improvements

Agencies should follow FAR 7.105 and refer to agency-specific requirements when developing the acquisition plan.

Mandates (Legislation & EOs)

Agency Goals

Facility Needs

Agency Identified ECMs

Utility Costs and Incentives

UESC Project Team

Project Facilitators (PFs) are recommended but not required

Funding Strategy: Maximize project value and impact

- Implement a comprehensive project
  - Economies of scale
  - Include multiple sites in a single procurement
  - Do more with fewer procurement actions
- Pay for assessments with available agency funds
- Finance to capitalize on energy savings rather than waiting for appropriations
- Leverage appropriations to include improvement projects that qualify as ECMs
- Identify the funding account during acquisition planning

Justification and Approval (J&A)

- **The Competition in Contracting Act (CICA) requires:**
  - J&A to be executed prior to negotiations leading to the award of a contract with other than full and open competition
  - J&A may also be referred to JOFOC
- **Initiated during acquisition planning**
  - Typically to receive approval to initiate a UESC
- **Finalized when scope and pricing are firm**
  - The price may be stated as "not to exceed" to give time for approval while finalizing the price
  - Project price sets J&A approval thresholds
- **FAR Part 6.303-2 describes the content of a justification for other than full and open competition**

Planning Recommendations

- **Form acquisition team early**
  - Define roles and responsibilities, manage expectations
- **Identify a project champion to lead efforts to:**
  - Build site and agency support
  - Educate project team and stakeholders, including tenants
  - Encourage team to attend UESC training
  - Keep team on track, keep process moving forward
- **Keep communication protocols clear and avoid miscommunication**
- **Document agency process and decisions (audit-ready!)**

Acquisition Planning: Decarbonization Considerations

Include decarbonization goals in initial acquisition team meetings

- **Key considerations:**
  - Determine site needs and how decarbonization opportunities will be prioritized
  - Discuss potential ECM alternatives for existing boilers, other equipment using fossil fuels
  - ECMs with greatest decarbonization potential may not result in greatest cost savings
- **FEMP can provide decarbonization education and consultation**
- **Stakeholder engagement**
  - Ensure team is aware of and supports carbon reduction goals, opportunities, and challenges

Keep the long view in mind:

- **Aim for 100% carbon pollution free energy, 100% of the time**
- **Reuse waste heat**
- **Consider alternatives to evaporative cooling**

Phase 2: Utility Selection and PA

1. Acquisition Planning
2. **Utility Selection & PA**
3. Project Development
4. Implementation and Construction
5. Post-Acceptance Performance

Phase 2 Actions:

- Agency identifies and notifies eligible serving utilities of the UESC opportunity
- Agency provides eligible utilities with an opportunity to be considered
- Agency selects utility
- Utility conducts the preliminary assessment
- Agency evaluates PA results and makes go/no go decision

Agency Approach to Utility Selection

When agency sites have multiple serving utilities providing electricity distribution, natural gas distribution, and water, agencies should:

- Identify all eligible utilities
- Have the contracting officer survey the interest of each eligible utility in offering an incentive program such as UESC
- Have the contracting officer post a Letter of Interest and a Sources Sought Notice on sam.gov
- Provide interested utilities an opportunity to be considered
- Make selection based on evaluation criteria
- Document process and selection for file

Evaluating Utilities

The utility should address:

- Evaluation criteria
- All available energy, water, and renewable energy incentives
- UESC experience and capabilities
  - How does the utility's business model address competition, project management, project development, performance assurance over the life of the contract, and assure fair pricing?
  - Describe typical level of detail for a preliminary assessment, cost or no-cost
  - Describe typical level of analysis and engineering and design completeness for an investment grade audit; basis of pricing
  - Describe utility role as self-performing or with competitively selected ESCO subcontractor

The Preliminary Assessment (PA)

A high-level energy assessment to describe existing conditions and identify potential energy efficiency, distributed energy and water opportunities.

Includes:

- Summary of findings
- Recommendations for each ECM opportunity
- Rough estimate of ECM cost
- ECM descriptions and projected energy savings
- Carbon emission reductions
- Performance assurance approach

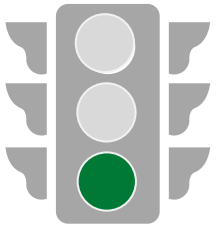
PA Scope of Work (SOW)

- Begin the PA process with a kick-off meeting to clarify priorities, objectives, and expectations, including decarbonization goals
- Specify desired level of design
- Provide existing equipment conditions and utility usage patterns
- Ensure evaluation is comprehensive and consider combining long payback and short payback ECMs
- Communicate that a performance assurance plan is required should the project move forward
- Include commissioning and retrocommissioning opportunities
- Include Buy American Act requirements - clauses 52.225-9, 10 or 11 (Buy America requirements construction materials) as appropriate for the project.

All potential ECMs should be explored and considered in the PA.
It is easier to remove ECMs than add them in later project stages.
FEMP can help identify technologies validated in federal facilities.

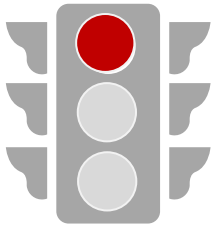
"Go" or "No Go" Decision

After the agency reviews the PA, a decision point is reached: Will the agency go forward with the project based on this PA?



"Go": CO should provide comments to utility about the PA

- Include any adjustments needed in the utility's approach or direction as the utility team prepares to conduct the IGA



"No Go": Agency must treat the PA in accordance with the PA authorization

- A no-cost PA may be considered proprietary information and the agency would not be able to use it to develop future projects

Phase 3: Project Development

Acquisition Planning 1

Utility Selection & PA 2

Project Development 3

Implementation and Construction 4

Post-Acceptance Performance 5

Phase 3 Actions:

- Agency Issues an Authorization for the IGA
- Utility Conducts the IGA
- Utility Develops the IGA Report and Performance Assurance Plan
- Agency Evaluates the IGA Report and Begins Developing the UESC Task Order
- Agency and Utility Negotiate the Final UESC Task Order
- Agency Finalizes the J&A
- Agency Awards the UESC Task Order

Investment Grade Audit (IGA)

The IGA* is a detailed engineering analysis, design, and cost estimate of recommended infrastructure improvements.

- The IGA should address:
  - Considered ECMs and their feasibility
  - Energy savings calculations
  - Carbon emission reductions
  - Rationale for ECM selection, including decarbonization impact
  - Costs to implement each ECM with detailed backup information
  - Savings of each ECM with detailed supporting data

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

IGA Considerations

IGA Cost and Design Level Requirements

- IGA cost will be influenced by level of ECM design required
- Level of design should be sufficient to obtain competitive subcontractor bids
  - 100% design is not always needed—match level of design to complexity of ECM
  - LED lighting: minimal design to obtain competitive bids
  - Control system upgrade: customized, in-depth design

Price Estimates and Financial Schedules

- Use ePB to develop Task Order/Financial Schedules
- Pricing summary should be supported by open-book details, including subcontractor and financing bids (FEMP recommends at least 3)

The Performance Assurance Plan

Performance assurance plans* prepare agencies to sustain savings and meet federal performance requirements.

- Establishes performance metrics, requirements for commissioning (Cx), O&M, and ongoing Cx
- Consider requiring ECM, commissioning, and performance assurance plan workshops
- Must include requirements for resources and training to prepare agency staff to sustain ECM performance and demonstrate savings
- Should be developed and delivered in conjunction with the IGA and UESC task order
- Requirements established by:
  - OMB Memo 12-21 (Sep. 2012)
  - 42 U.S.C. § 8253(f)(5) Follow-up on Implemented Measures

**Also called Performance Verification Plan*

What is in the Plan?

A performance assurance plan is a collection of information and actionable subplans, including:

- A complete and accurate baseline
- Design with ECM-specific operational instructions and performance metrics
- Commissioning (Cx) subplan including templates, schedules, and procedures
- Operations, maintenance, and repair subplan (O&M subplan)
- Recommissioning (RCx) subplan, including redlined templates, schedules, and procedures
- ECM training subplan

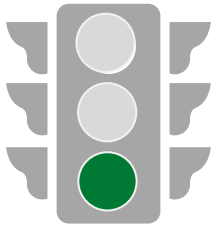
Evaluating Pricing

The contracting officer is responsible for a determination of fair and reasonable pricing.

- Applies to all price components, ECMs, performance-period services, and financing costs
- Adequate price competition is necessary for a CO to exempt a firm-fixed-price contract from the requirement of certified cost and pricing data (FAR 15.403-1)
- Agency team will provide input
  - Review competitive bids and provide contracting/finance team with comments and a financial summary of the project
  - Finance team reviews interest rate and spread (adders), payment schedules, and budget process
- Agency CO develops the price negotiation memorandum
  - The CO will obtain approval to negotiate and award the contract for construction

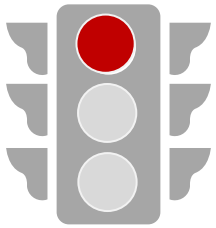
Agency “Go / No-Go” Decision

After the agency reviews the IGA, a decision-point is reached: Will the agency proceed with the project?



“Go”: CO and agency team provide feedback and the utility makes adjustments to the IGA accordingly

- The CO presents the project for management approval and documents the decision
- Agency pays for IGA up-front or rolls cost into the UESC task order
- The agency proceeds with task order development



“No Go”: The agency pays the agreed upon IGA cost and it is theirs to keep

UESC Financing

Financing is a significant cost element in UESCs

- Utility covers costs up front, and agency pays utility over the life of the contract
- Financing includes project development and ECM costs (equipment, materials, labor, etc.), minus upfront payments (capital contributions, savings during construction)
- Securing competitive financing helps ensure government gets the best possible deal
- FEMP recommends the utility/ESCO solicit at least three competitive offers
- Documents to make financing offers directly comparable:
  - Investor Deal Summary (IDS)
  - Standard Financing Offer (SFO)
  - Agency may have preferred templates

Finalizing the UESC TO for Award

After reviewing the IGA and utility's proposal, the agency must negotiate the firm-fixed price and final details of the UESC task order.

- Address any remaining technical and price issues
- Review termination language to determine if it is in the government's best interest
- Revise the task order to incorporate changes resulting from ongoing discussions and negotiations leading up to award
  - The final TO supersedes all prior versions and must be updated to reflect the final negotiated terms and conditions of the award
- Update price negotiation memorandum to reflect any changes since negotiation of the IGA
- Finalize the J&A - typically drafted early in the project but must be finalized along with the task order

Project Data Reporting

GSA Reporting - Send to energy@gsa.gov

- FAR Part 41 requires agencies to report to GSA on use of AWC and service agreements including the EMSA

FEMP Reporting

- Compliance Tracking System - request project data in CTS format
- eProject Builder (ePB) - outputs a CTS-ready upload spreadsheet, simplifying agency reporting
- FEMP Utility Team - report project data to the FEMP Utility Team
  - Data is confidential and used only in aggregate to demonstrate the value and impact of the UESC program

FEMP Resource

Guidance and Recommendations for Streamlining Reporting for Federal Energy and Water Efficiency Projects

eProject Builder (ePB)

Secure web-based energy project tracking/reporting

- **Follow your agency policy about using ePB**
- **Free tool maintained by LBNL for U.S. DOE**
- **ePB enables contractors and their customers to securely:**
  - Preserve and track project information in perpetuity
  - Develop project scenarios using standardized calculations
  - Output financial schedules, M&V reports, analysis on portfolio of projects
  - Compare proposed projects against historical ones
- **We recommend use of the ePB financial schedules for all projects, even if they are not reported in ePB**

eProjectBuilder

eprojectbuilder.lbl.gov

Need Help?

epb-support@lbl.gov

On-Demand Training

ePB for UESCs: Enhancing Project Comprehension and Transparency with eProject Builder

Phase 4: Implementation & Construction

1. Acquisition Planning
2. Utility Selection & PA
3. Project Development
4. **Implementation and Construction**
5. Post-Acceptance Performance

Phase 4 Actions:

- Utility finalizes design and performance assurance plan
- Utility installs ECMs and agency provides oversight
- Utility commissions ECMs and submits commissioning report
- Agency verifies ECM performance meets design specifications
- Agency accepts project

Construction Oversight

Government oversight is critical.

- Verify equipment delivered meets design specifications, e.g., quality, size, and efficiency
- Oversee ECM installation - Coordinate site and building access, tenant disruptions, equipment laydown and parking needs
- Observe commissioning and proof of performance
- Develop punch list to capture items needed prior to acceptance

Commissioning

Commissioning is a systematic process of ensuring that a building (or specific equipment) performs in accordance with the design intent, contract documents, and the owner's operational needs.

- Consider commissioning workshops to ensure Agency staff understanding before they observe the Cx process
- Agency has a responsibility to witness ECM Cx
- Verify ECMs are properly installed, perform as designed, and will not negatively impact any existing systems
- Verify the interactions between ECMs are appropriate and performance is optimized
  - Confirm ECMs as installed will not negatively impact existing systems
- Cx report must be submitted and accepted prior to project acceptance

Performance Verification

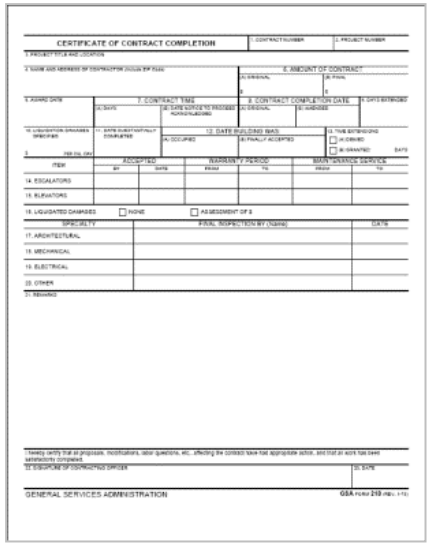
In accordance with 42 U.S.C. § 8253(f)(5), energy savings of all implemented measures must be measured and verified:

- Performance verification methodology for each ECM is included in the performance assurance plan and will be agreed to in the TO
- Recommend use of FEMP M&V Guidelines: Measurement and Verification for Performance-Based Contracts Version 4.0
- Verify ECMs will deliver expected energy savings
  - Confirm baseline data is consistent with agreed-upon baseline conditions
  - Compare actual measurements to key performance indicators (KPIs)
- Post-installation performance verification report must be submitted and accepted prior to project acceptance

Project Acceptance Activities

After all ECMs are installed, tested, and commissioned and all deliverables are received, the CO/KO will sign a Certificate of Completion.

- Sign and enclose acceptance checklist
- Document any outstanding items or services with completion schedule
- Confirm payments can begin


CERTIFICATE OF CONTRACT COMPLETION

GSA Form 218 or equivalent

When beneficial to the project, consider allowing invoices and payments to begin after testing and commissioning individual ECMs.

Phase 5: Post-Acceptance Performance

1. Acquisition Planning
2. Utility Selection & PA
3. Project Development
4. Implementation and Construction
5. Post-Acceptance Performance

Phase 5 Actions:

- Utility submits invoices and agency makes payments
- Agency and utility execute performance assurance plan activities per the TO:
  - O&M activities
  - RCx or ongoing Cx
  - Performance verification and documentation

Invoices

- **Invoices can be accepted and processed after:**
  - The CO/KO has formally accepted the project
  - The Certificate of Completion is signed and delivered to the utility
- **Payments can be issued after:**
  - Services are documented and verified on the invoice

Best Practice

Provide a copy of the TO, the payment schedule, and an invoice sample to each office that will receive, review, approve, and make payments.

Post-Acceptance Responsibilities

Pursuant to 42 U.S.C. § 8253(f)(5), performance services such as post-acceptance O&M and recommissioning may be accomplished via following options:

- Agency implementation (in-house or existing contract)
- Utility implementation (assigned in TO)
- Contracts with a third party (separate performance service contract)

Considerations

- Responsibilities may vary by ECM
- Utility typically provides a one-year wraparound warranty
  - Agency may negotiate and document longer warranties in the UESC task order
- Responsibilities should be clearly assigned in task order

Contract Closeout

- **CO notifies utility:**
  - Performance period is complete
  - TO is physically complete (FAR 4.804-4)
  - Payments will cease
- **CO submits final performance evaluation to CPARS**
- **Agency assumes ECM O&M, repair, and replacement responsibilities**
  - May negotiate for continuing services from utility

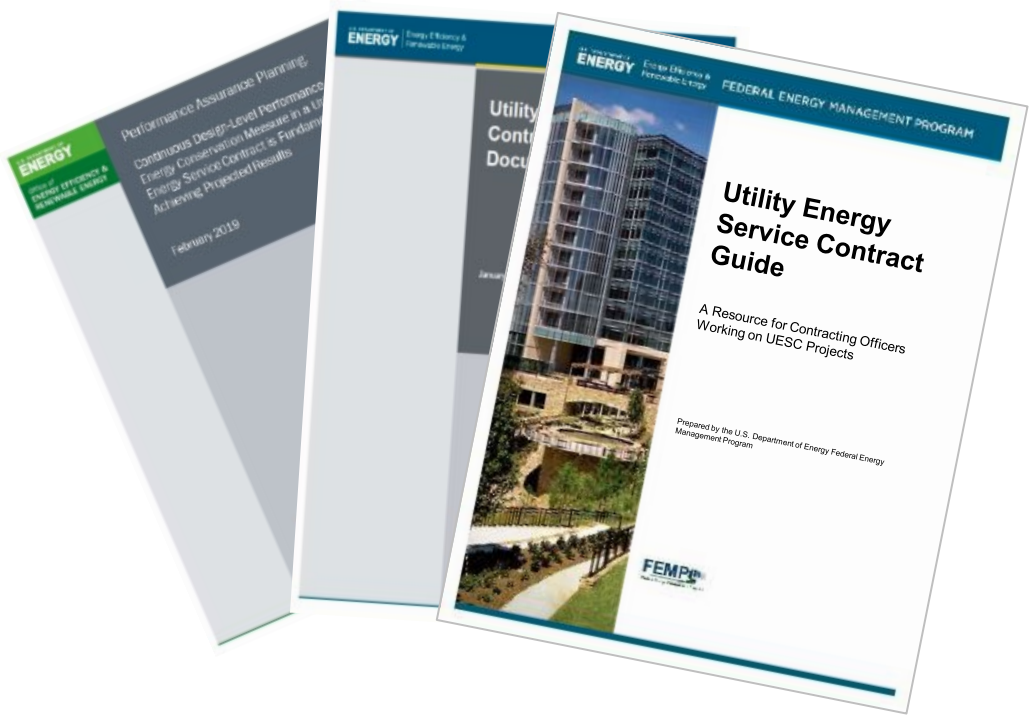
Congratulations!

Project success is determined and proven by how the project performs over the entire term of the task order.

FEMP Resources Review and Project Support

UESC Resources

- **UESC Website** – access to basic information, case studies, resources, and more!
- **UESC Project Development Resources** – downloadable guides, templates, and tools listed by topic and project phase
- **On-Demand Training** – learn at your own pace (CEUs available)
- **Step-by-Step Implementation Process**



Upcoming Training and New On-Demand Courses

Upcoming Live Webinars and Training

- UESC Implementation Best Practices for Utilities | May 24, 2022
- 2-Day Advanced UESC Training | June 28-29, 2022

New On-Demand Courses

- Financing For UESCs: Ensuring The Best Value For The Government
- Leveraging Utility Partnerships For Fleet Electrification
- Decarbonization Considerations: Performance Contracting (Coming soon)
- Decarbonization Considerations: Onsite DE Projects and Offsite Purchases (Coming soon)

Courses will be listed in the FEMP Training Catalog when available!

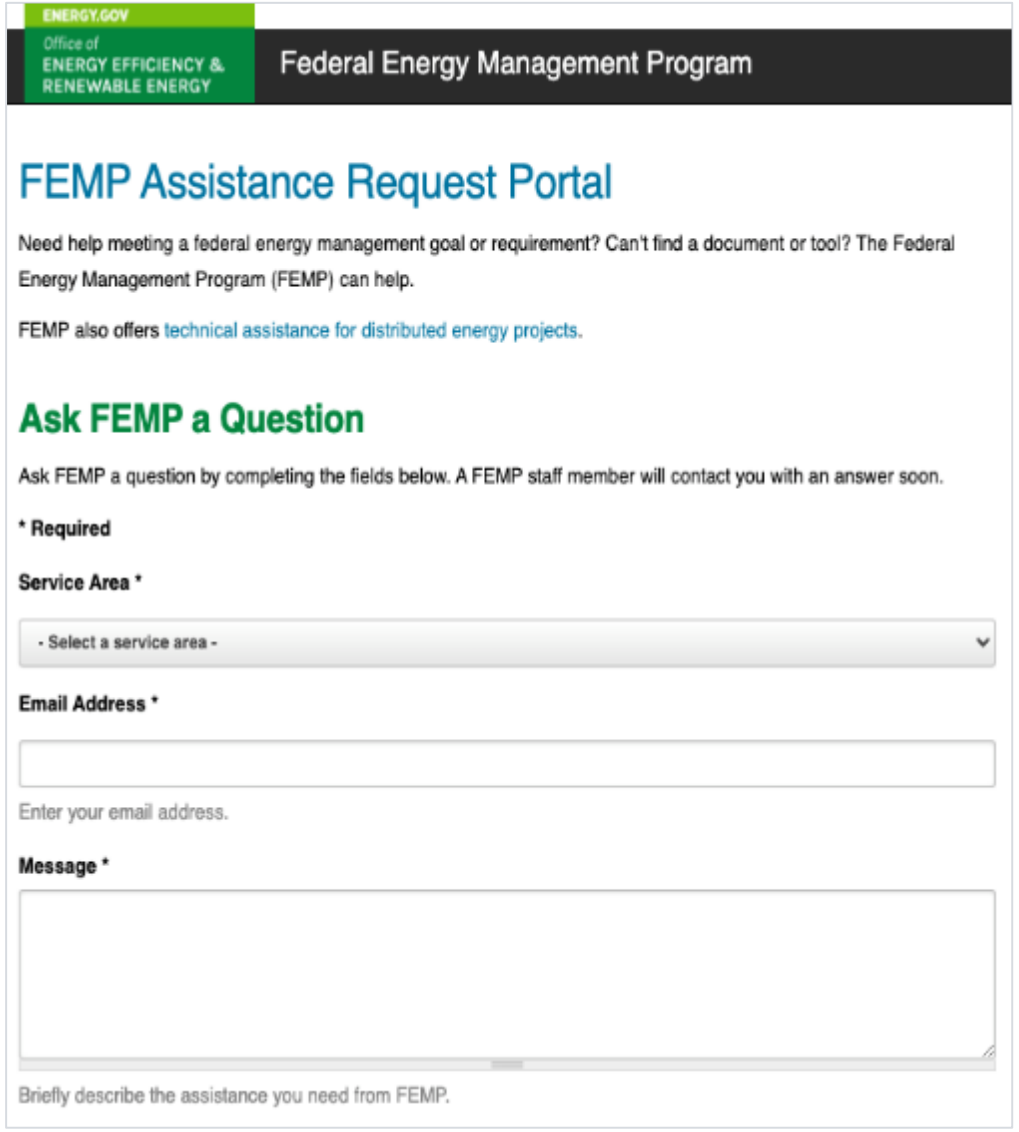
FEMP Project Support

- Project guidance and discussions with Federal Project Executives (FPEs)
- Technical assistance provided by DOE National Labs
- Tailored training for agencies and utilities
- Strategic partnership meetings between utilities and federal customers

Submit questions or requests for support through the

FEMP Assistance Request Portal

(https://www7.eere.energy.gov/femp/assistance/)



Taking the First Step

Talk to the FEMP Federal Project Executive (FPE) in your region for assistance.

energy.gov/eere/femp/energy-savings-performance-contract-federal-project-executives-0

Northeast Region

Tom Hattery
Northeast Region
202-256-5986
thomas.hattery@ee.doe.gov

Southeast Region

Doug Culbreth
Southeast Region
919-870-0051
culbrethcd@ornl.gov

Western Region

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

Q&A

To Receive IACET-Certified CEUs

- **Attend the training in full–no exceptions**
- **Within six weeks of the training:**
  - Complete the assessment (a minimum score of 80% is required)
  - Complete an evaluation of the training

Access the UESC Training Assessment and Evaluation

Click here to view WBDG's FEMP Course Catalog

For logistical questions related to the webinar or evaluation, email Elena Meehan at elena.meehan@ee.doe.gov.

Thank You!

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