



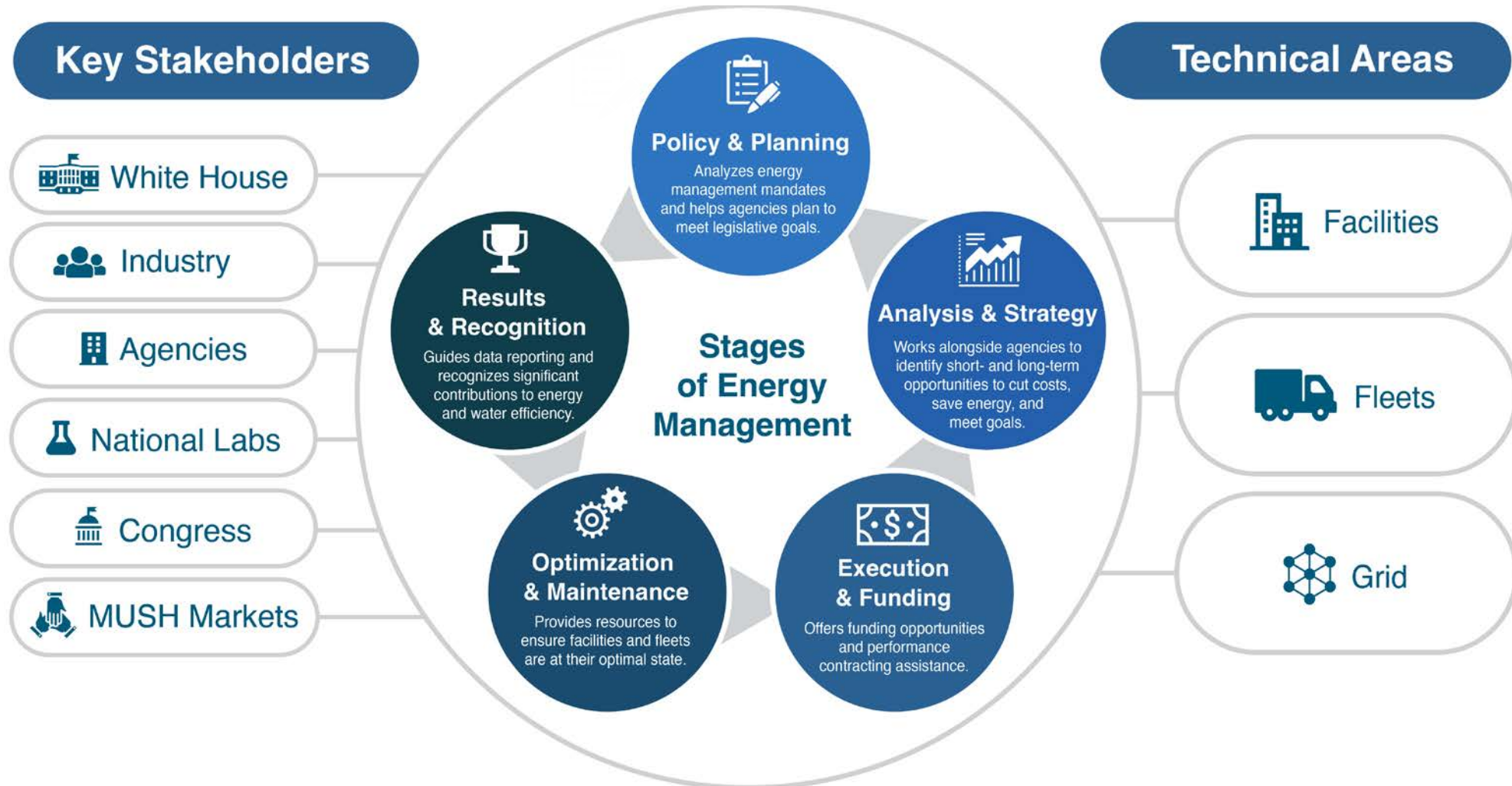
Workshop: Advanced Metering for Decarbonization: Electric Vehicles and 24/7 Carbon-Free Electricity

Instructors: Jeffery Murrell, Benjamin Ford, Emily Kotz

Monday, March 25, 2024

FEMP Focuses on Federal Agency Support

FEMP works with **key stakeholders** to support **all stages of energy management** in federal agencies' **critical areas**



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Instructors



*Jeffery Murrell,
FEMP Program
Manager*



*Emily Kotz, NREL
Federal Fleet Team
Lead*



*Ben Ford, PNNL
Advanced
Metering Lead*



Agenda

- *Presentations on Metering Topics*
 - *Introduction (Jeffery Murrell)*
 - *Electric Vehicle Charging Station Metering Best Practices (Emily Kotz)*
 - *24/7 Carbon Pollution-Free Electricity (CFE) Core Concepts (Ben Ford)*
- *Breakout sessions*



Learning Objectives

The purpose of this workshop is to learn more about advanced metering best practices for meeting the goals of EO 14057. This will be a 2-part session, first part to include presentations on the FEMP best practice work related to metering: 1) Electric Vehicles (EVs) and EV charging station electricity use. 2) Integrating data sources to calculate hourly carbon pollution-free electricity (CFE). Second part will facilitate small group discussions with a problem-solving activity.

- At the end of this workshop, trainees will know the measuring and reporting requirements for EV charging stations on their facility and zero emissions vehicles (ZEVs) in their fleet.*
- This workshop will help trainees identify what metering option(s) are best suited to track EV charging station and ZEV fleet charging electricity use.*
- Trainees will understand how 24/7 CFE differs from the traditional definition of CFE, and they will learn how to estimate an hourly CFE score for their facility.*



Why is this important?

- *This training is for Fleet Managers, EV Charging Program leads, Facility Managers, Engineers, Cybersecurity Subject Management Experts, and Facility Metering Leads.*
- *Attendees will learn more about advanced metering best practices for meeting the goals of EO 14057, as well as FEMP's Federal Metering Guidance and FEMP's Electricity Measurement and Reporting Best Practices for EV Charging Stations and ZEVs.*



EVSE and ZEV Metering Best Practices

Emily Kotz

National Renewable Energy Laboratory

New FEMP Best Practices on ZEV Charging



EVSE Electricity Use at Federal Buildings:

Best Practices for Federal Facility Measurement and Reporting Electricity Use from Electric Vehicle Supply Equipment



Fleet Vehicle Charging Electricity Use:

Best Practices for Federal Fleet Measurement and Reporting Electricity Use in Electric Vehicles



Why track EVSE electricity use at buildings?



EVSE Electricity Use at Federal Buildings

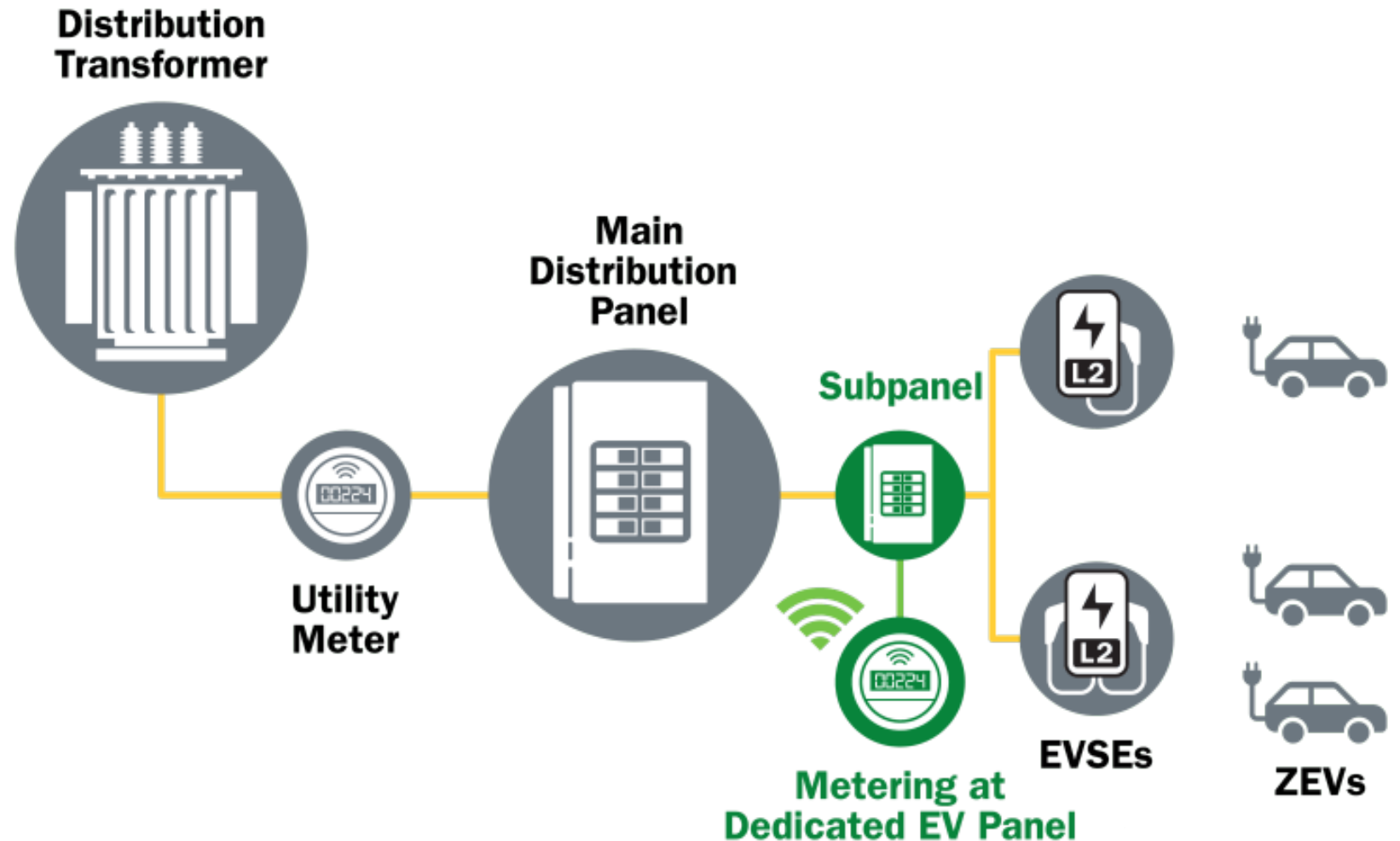
- Compliance with EO 14057: The Implementing Instructions state “Agencies must separately track energy used for vehicle charging and overall facility energy consumption.”
- Benchmarking: Facilities are required to benchmark building energy performance. Installation of EVSE units can affect a building's electricity use, making separate tracking essential to avoid impacting energy performance ratings
- Reporting Requirements: Agencies are required to report EVSE electricity usage in their Annual Energy Management Data Report and the FAST Fueling Center and EVSE Inventory submission.



Options for Tracking EVSE Electricity Use

Metering at the Panel

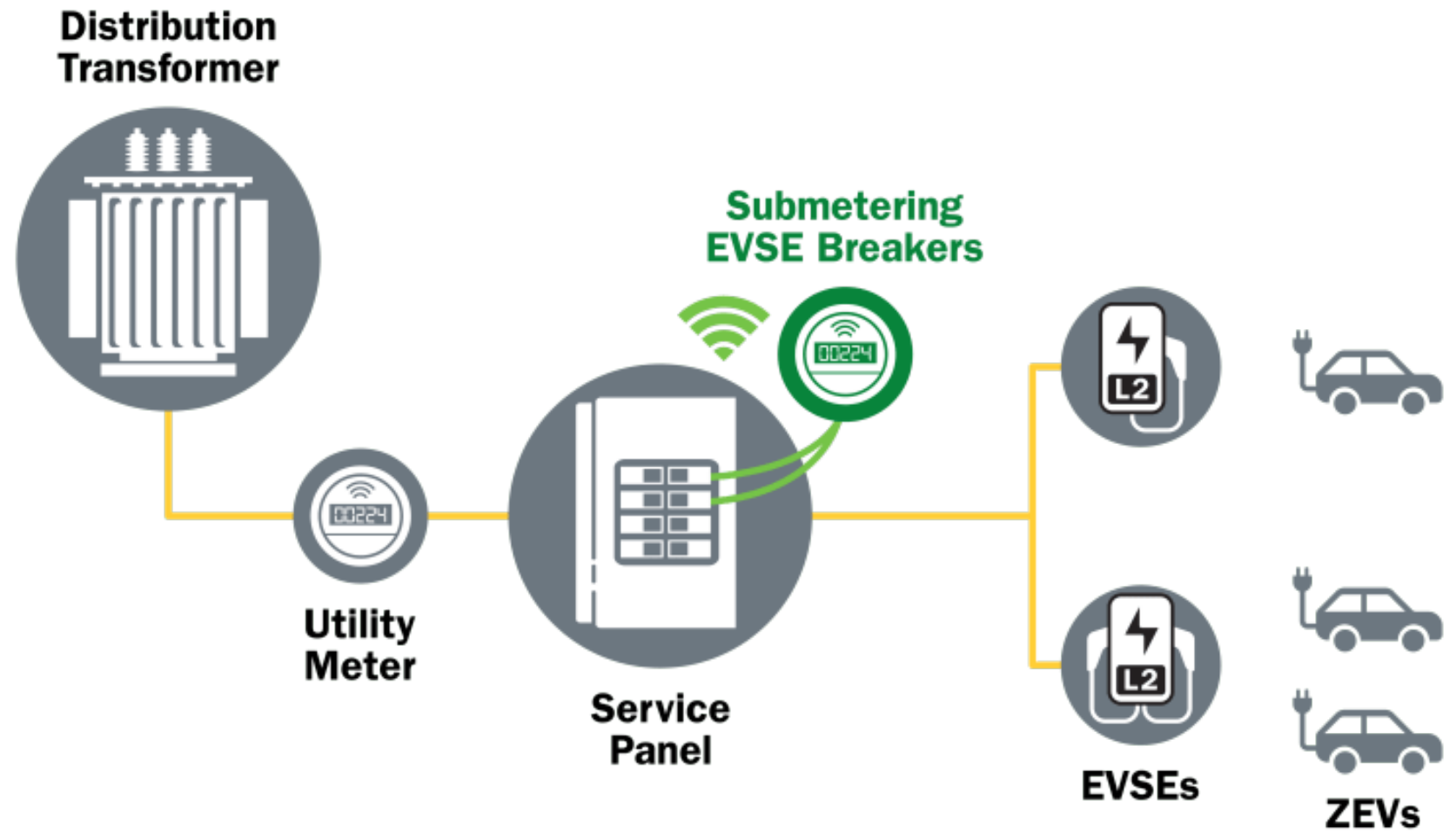
- Consider for larger EVSE installations that have a dedicated panel
- If installing a networked meter, it requires connectivity



Options for Tracking EVSE Electricity Use

Submetering at the Panel

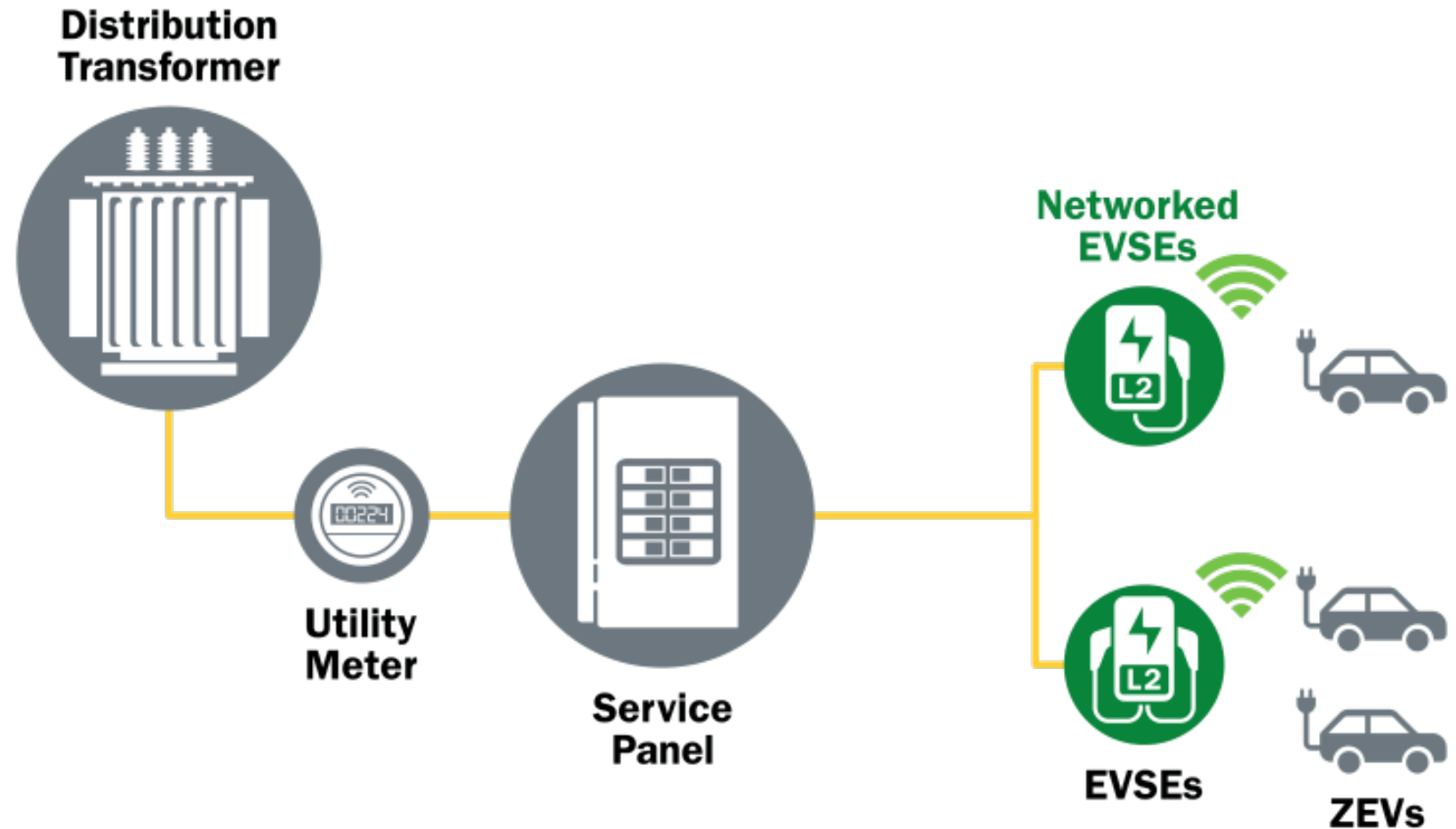
- Consider for smaller installations where the panel is used for more than just EVSE units
- If installing a networked meter, it requires connectivity



Options for Tracking EVSE Electricity Use

Networked EVSE

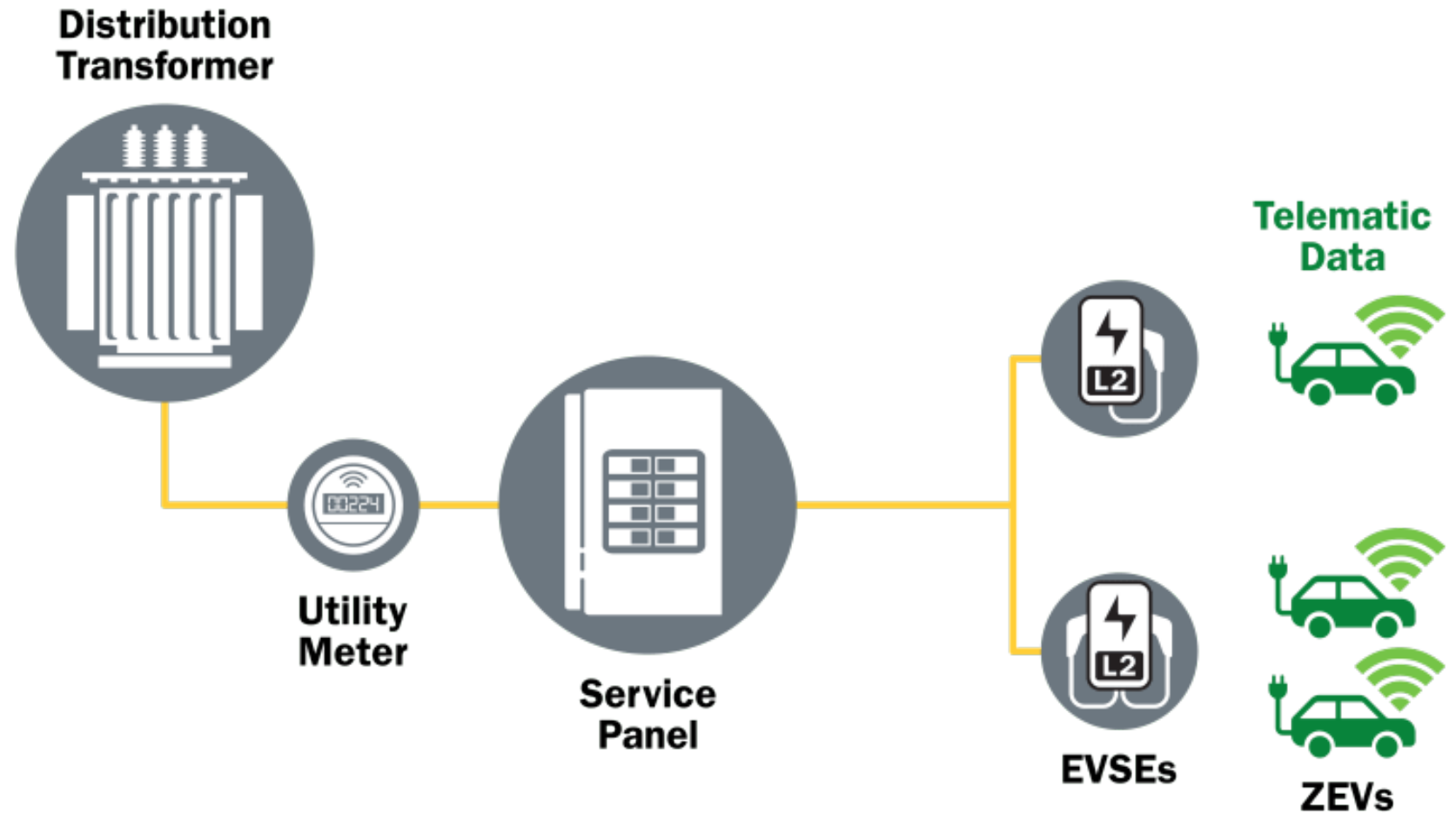
- Ideal for workplace charging with payment collection
- Requires connectivity
- Higher purchase cost and networking fees



Options for Tracking EVSE Electricity Use

Telematics

- Only collects data on vehicles with telematics installed
- Requires agency enrollment in the telematics data plan (monthly fee)



Tracking GOV vs. POV at a Shared EVSE

FEMP Annual Energy Management Data Report requires separation of GOV vs. POV charging electricity use.

When selecting a method to track EVSE electricity use at a building, consider how charging events between GOV and POV will be separated if the EVSE is shared.

Options to track at shared EVSEs:

- Networked EVSE tracks session data by user
- Telematics



Photo by Werner Slocum / NREL



Best Practices for Reporting on EVSE Electricity Use



EVSE Electricity Use at Federal Buildings

1. Determine early on in your project how to track the EVSE electricity use at the facility.
2. Select the best method to track the EVSE electricity use for each facility (dedicated panel metering, submetering, networked EVSE, or telematics).
3. Determine the importance of having the ability to automatically upload the EVSE electricity use to your Energy Management Information System and confirm compatibility, if needed.
4. Ensure there is a way to separate electricity used to charge GOV vs. POV.



Reporting on ZEV Charging Electricity Use



Fleet Vehicle Charging Electricity Use

FAST Vehicle-Level Data (VLD), Fueling Data

Fueling data reported for all fleet vehicles, including kilowatt-hours (kWh) added to the ZEV during charging for the previous fiscal year. The following vehicle-level data is required:

- Vehicle identification
- Date of charging session
- Location of charging session
- Type and volume of fuel added to the vehicle (i.e. kWh)
- Fuel cost (if any)



Use This Method to Track Charging Electricity Use if the ZEV:



Telematics

BEST PRACTICE

Has a telematic device installed, and the fleet has a method to track public charging session costs



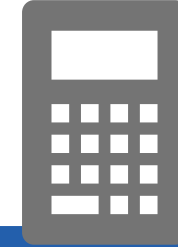
Networked EVSE

Charges on-site at a networked EVSE, and the fleet has a method to log other charging sessions, including costs



Charging Session Logs

Does not have telematics, doesn't charge at a networked EVSE, and the fleet as a method to log and collect charging sessions



Estimate

Does not have telematics, doesn't charge at a networked EVSE, and driver logs are not feasible

Best Practices to Track ZEV Charging



Fleet Vehicle Charging Electricity Use

1. Install telematics devices on fleet vehicles, where feasible.
2. Use public charging stations that accept WEX. Track receipts for public charging sessions where the WEX is not accepted.
3. Develop a process to track charging session data for vehicles that do not have telematics, including:
 - a) How to track and sum charging sessions completed on-site at networked EVSEs
 - b) Reporting and logging charging session data at non-networked EVSEs



Tools and Resources Wrap-Up

- *Best Practices for Federal Facility Measurement and Reporting Electricity Use from Electric Vehicle Supply Equipment*
 - <https://www.energy.gov/femp/best-practices-federal-facility-measurement-and-reporting-electricity-electric-vehicle-supply>
- *Best Practices for Federal Fleet Measurement and Reporting Electricity Use in Electric Vehicles*
 - <https://www.energy.gov/femp/best-practices-federal-fleet-measurement-and-reporting-electricity-use-electric-vehicles>



Thank you!

Questions? Reach out to Emily Kotz at Emily.Kotz@nrel.gov
Or Contact the Fleet Team
Federal_fleets@hq.doe.gov

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<https://www7.eere.energy.gov/femp/assistance/>

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24/7 Carbon Free Electricity Workshop

Ben Ford

Pacific Northwest National Laboratory

Presentation Outline

- Why 24/7 carbon-free electricity (CFE)?
- What is 24/7 CFE?
 - How does it differ from Net Annual CFE?
- Ways to achieve CFE goals
- EACs: traditional vs hourly
 - Traditional: widely used today
 - Hourly: not available yet, but coming soon
- Illustrated hourly CFE calculation



Why 24/7 CFE? E.O. 14057



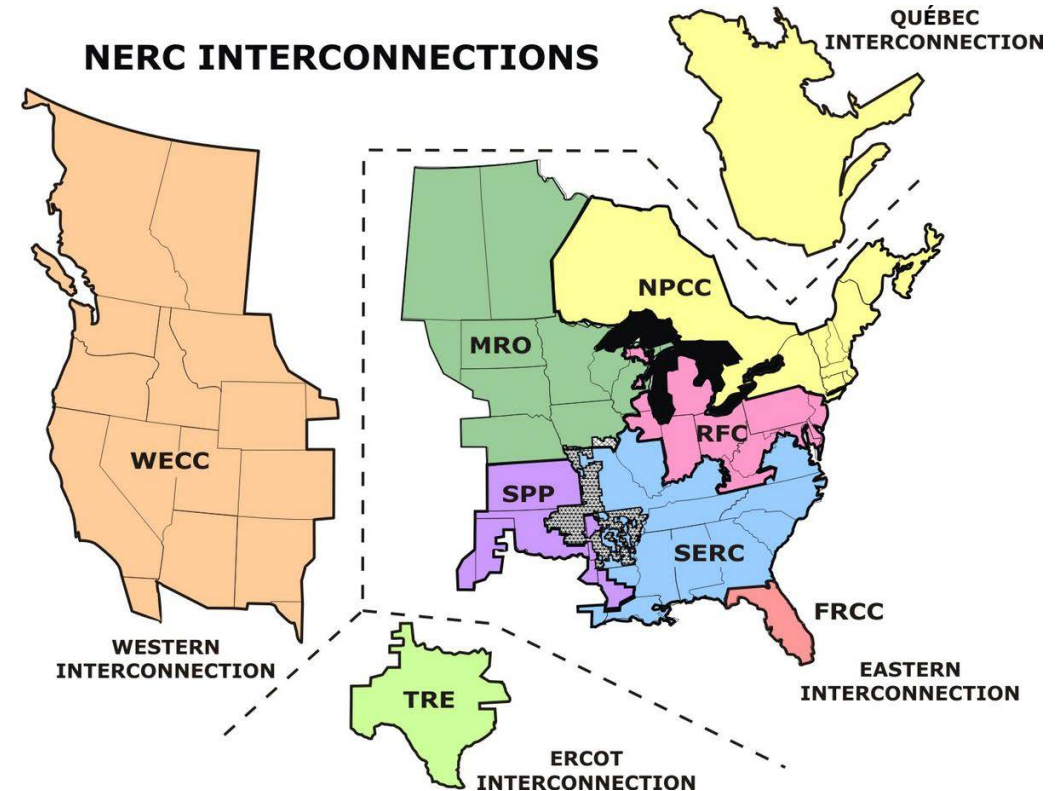
**100% Carbon
Pollution-Free
Electricity by
2030,
including 50%
on a 24/7
basis**

- By 2030, Federal government will achieve:
 - 100% CFE on a **net annual basis**
 - 50% CFE on a **24/7 basis**
- What generation sources qualify as CFE?
 - Marine energy
 - Solar
 - Wind
 - Hydrokinetic
 - Fossil fuels with **CCS**
 - Geothermal
 - Hydroelectric
 - Nuclear
 - Clean hydrogen



What is CFE?

- CFE goals under E.O. 15047 intend to lower Federal emissions by requiring that every kWh of electricity consumption is matched by a kWh of carbon-free electricity procured:
 - during the same year, for *net annual CFE* calculations.
 - during the same hour and within the same regional grid, for *24/7 CFE* calculations.

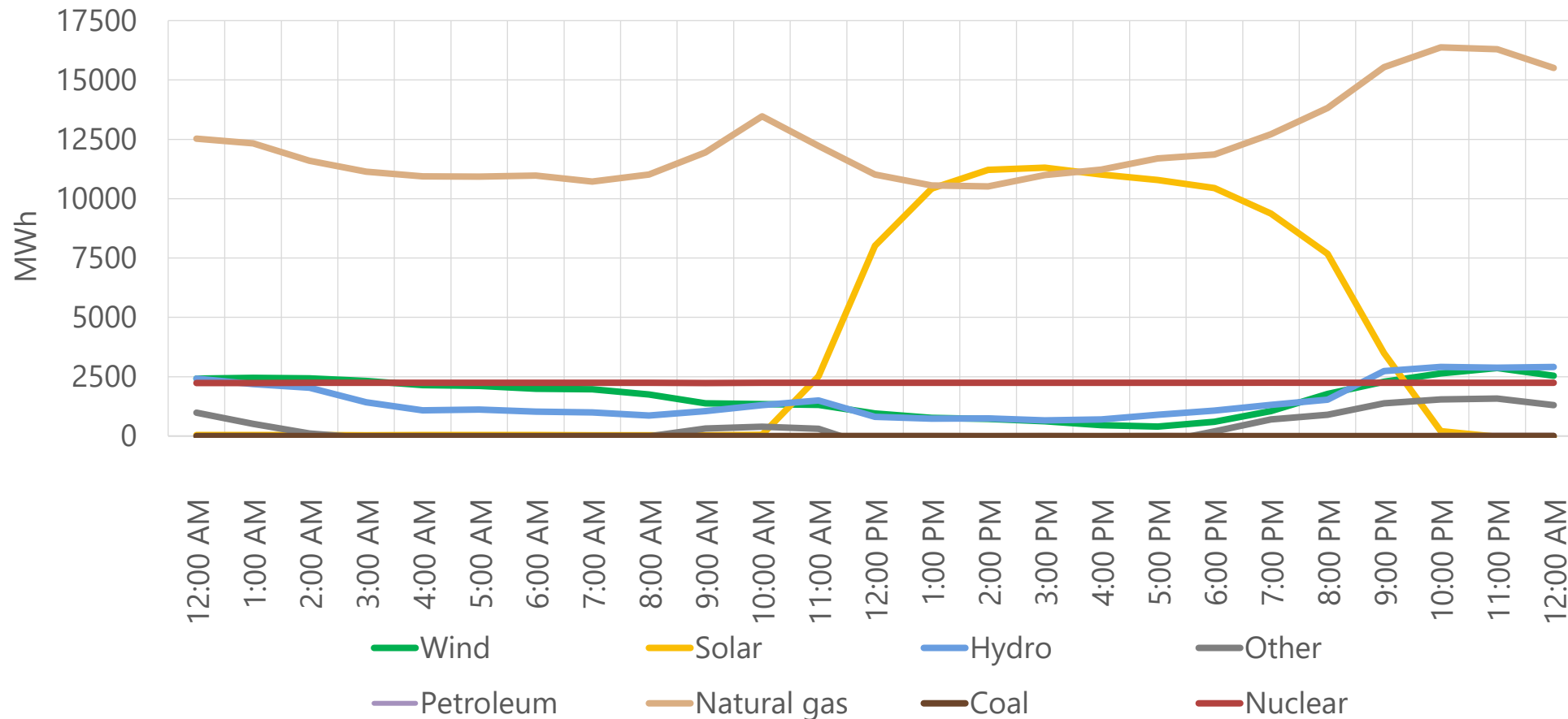


The U.S. grid is divided into three major regions. Source: [North American Electric Reliability Corporation](#)



24/7 CFE: Generation Sources Vary over Time

California Independent System Operator Electricity Generation by Source 10/3/2022



Source: U.S. Energy Information Administration

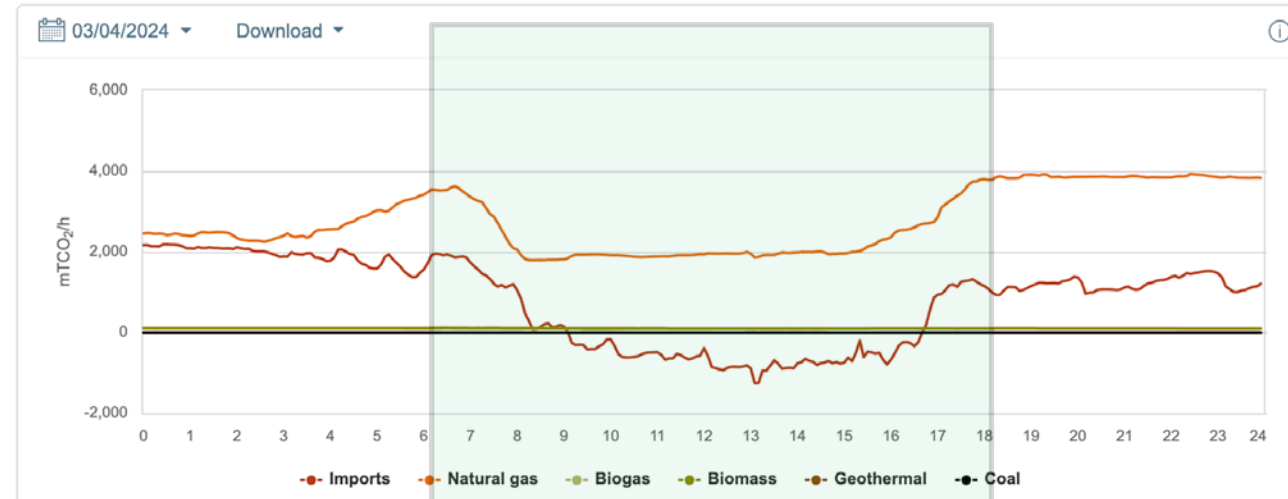


Generation sources vary throughout a 24-hour day and emissions correlate with what is available.

When CFE is available, emissions go down. 24/7 CFE aims to sustain that result.

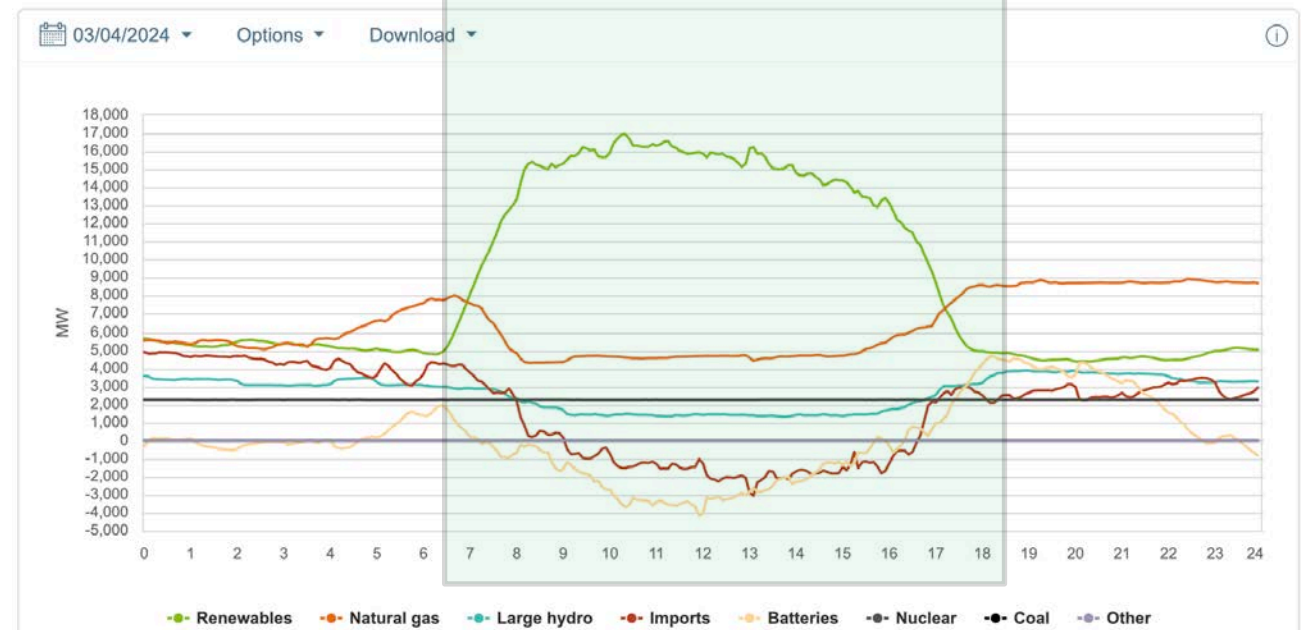
CO₂ per resource trend

CO₂ broken down by resource in five-minute increments.



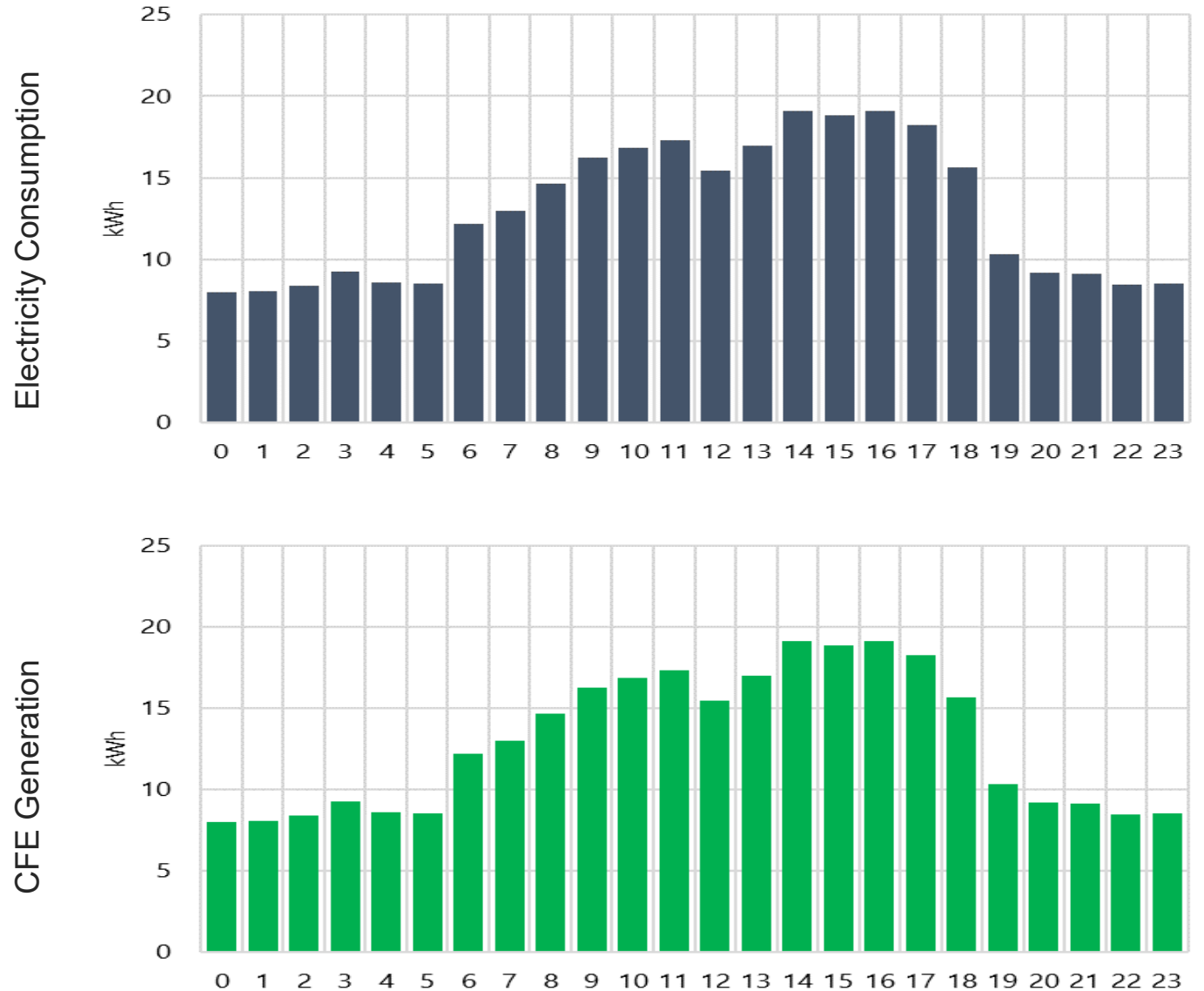
Supply trend

Energy in megawatts broken down by resource in 5-minute increments.



Visualizing Hourly CFE

During every hour of every day, every kWh of electricity consumption is matched with a kWh of procured CFE generation from the same regional grid



Net Annual vs 24/7 CFE Accounting

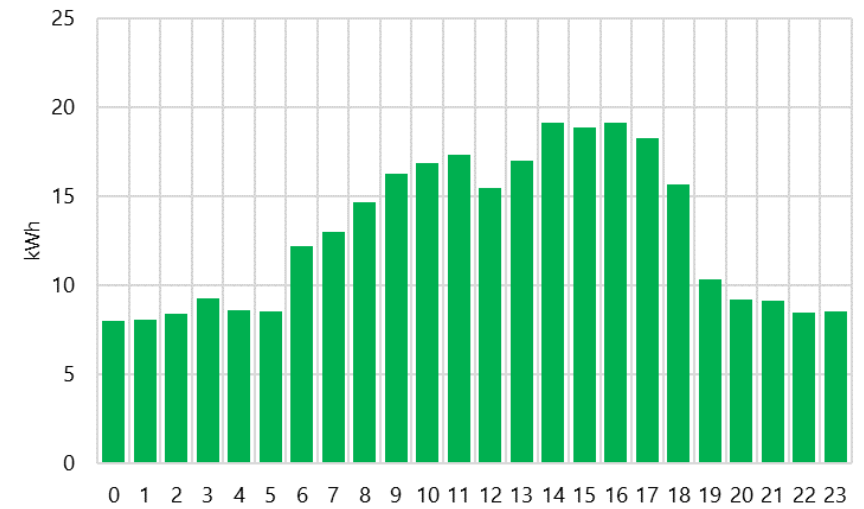
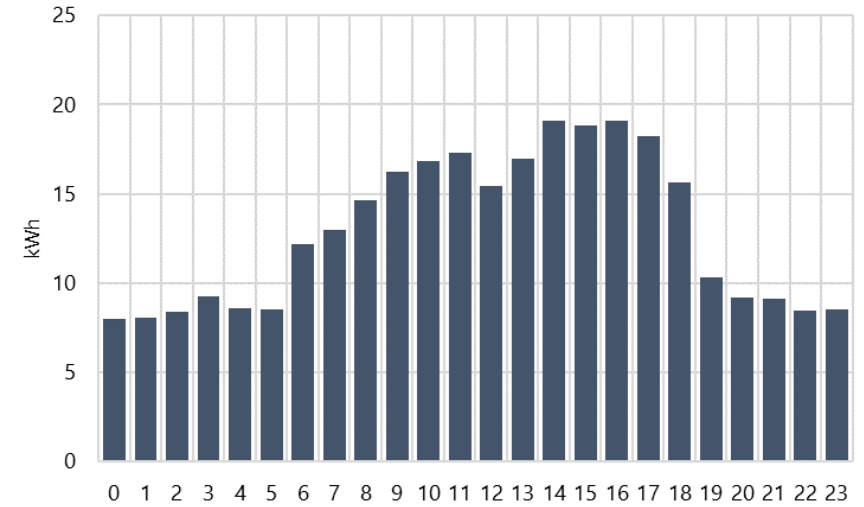
Net Annual CFE



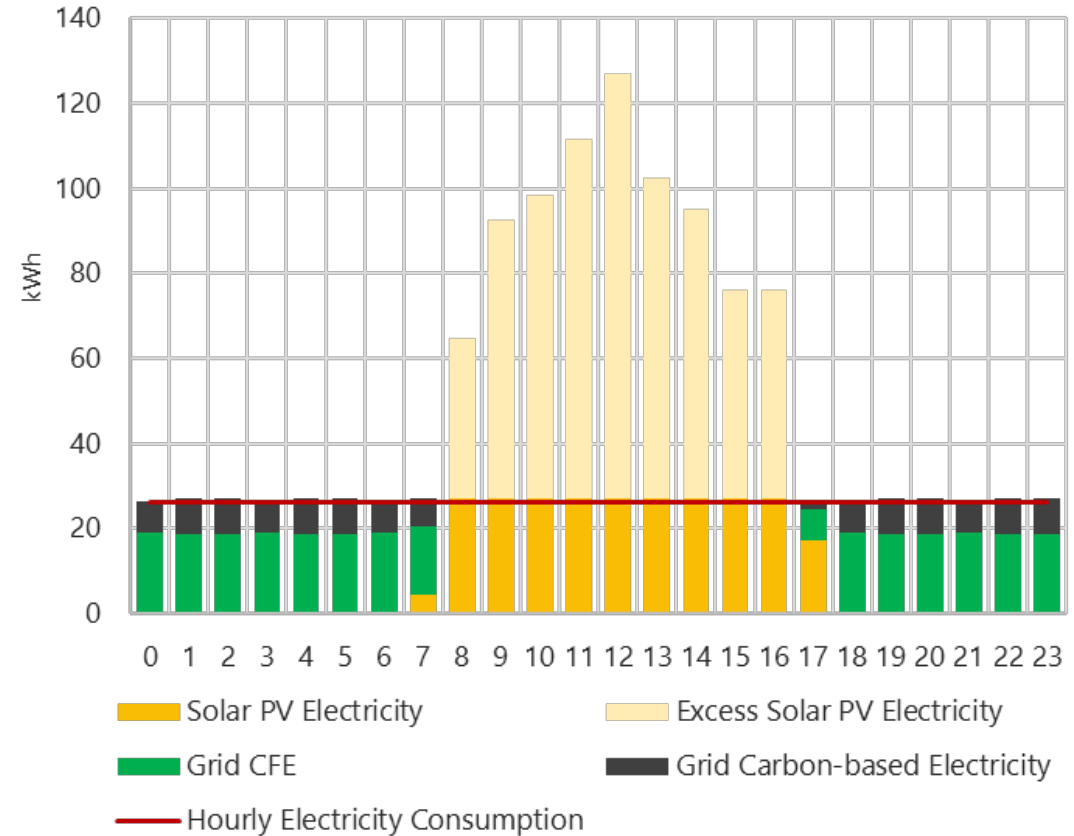
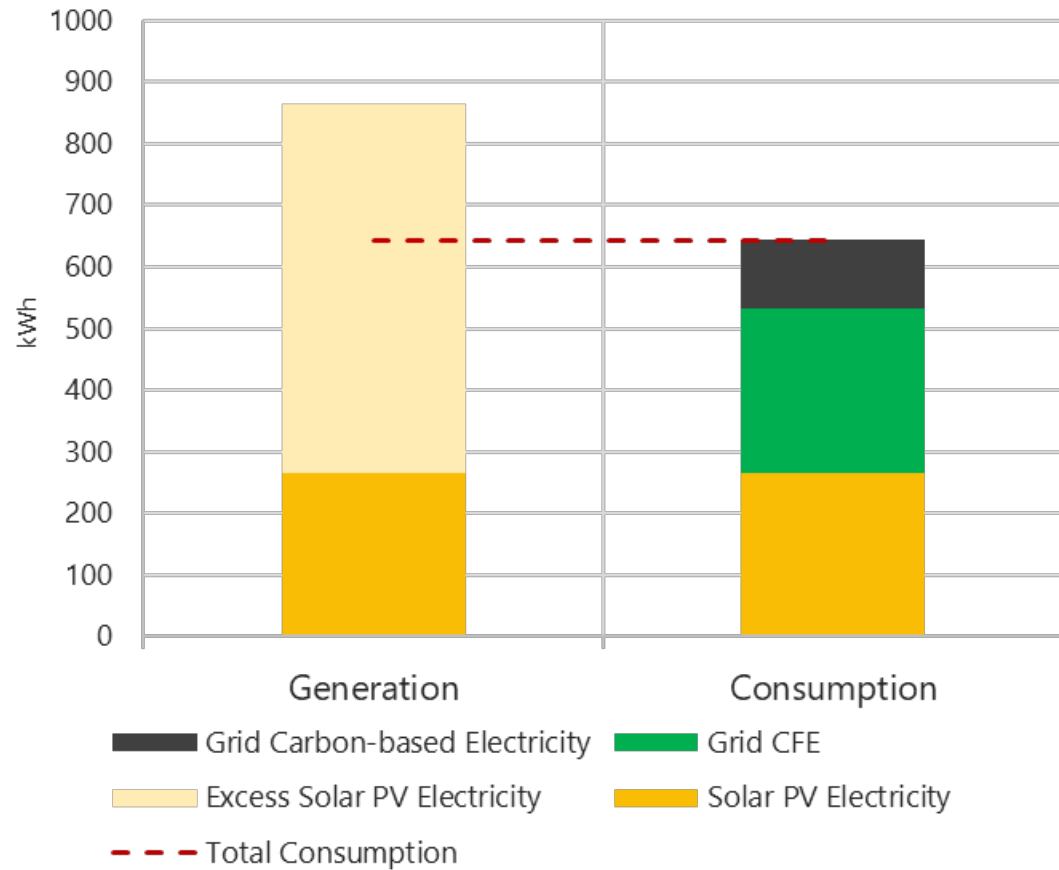
Electricity Consumption

CFE Generation

24/7 CFE



Net Annual vs Hourly Accounting: Data Center



Google Source: Google



Ways to achieve CFE goals

1. Energy efficiency and demand management
 - Less electricity consumption, less CFE required
2. Onsite CFE generation and storage
 - Distributed energy resources can replace grid power
 - Energy attribute certificates (EACs) must be retired
3. Offsite CFE procurement
 - Bundled or unbundled purchases of power and/or EACs
4. Grid-supplied CFE



Environmental Attribute Certificates (EACs)

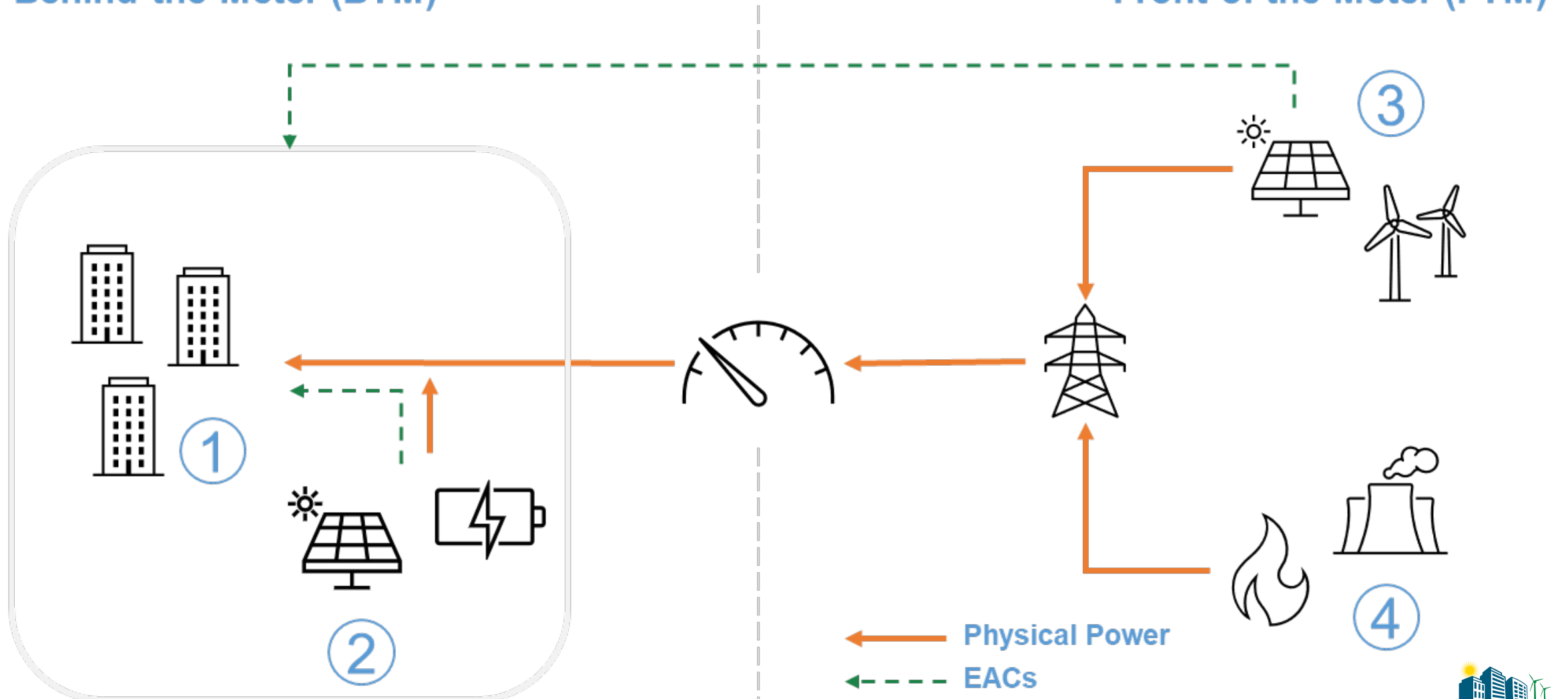
- EAC: instrument generated with physical CFE
 - Basis for **Net Annual CFE** compliance accounting
 - Current system: 1 MWh CFE = 1 EAC
 - **No hourly information**
- Acquired with CFE power purchase or traded unbundled on secondary market
- Must be retired on official registry (e.g., M-RETS, PJM GATS)
 - Show compliance with RPS
 - Sustainability/decarbonization goals



Power and EAC Flows

Behind the Meter (BTM)

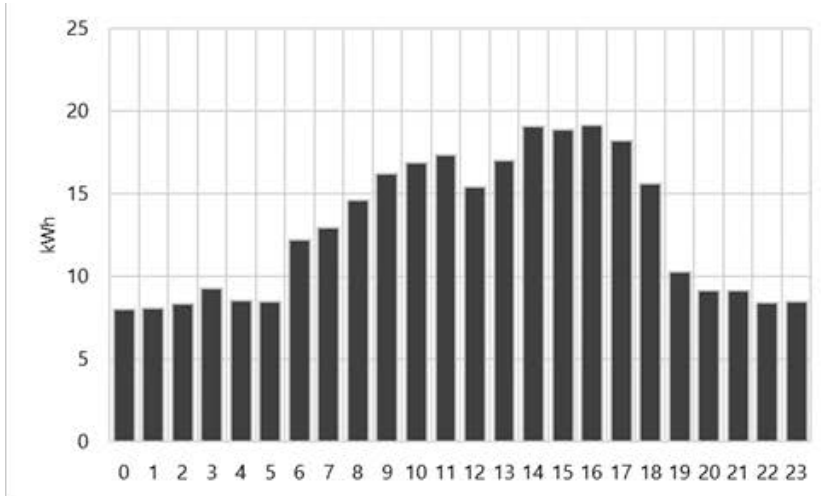
Front of the Meter (FTM)



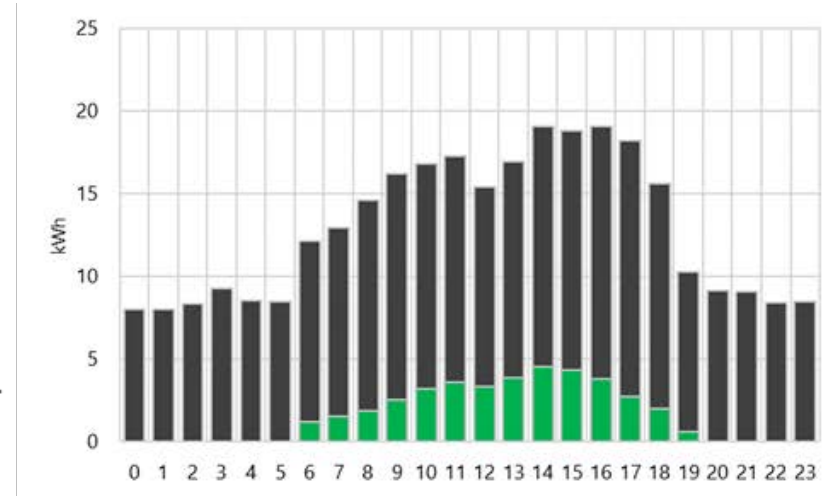
**Challenge for 24/7 CFE:
Hourly EACs DO NOT EXIST YET**

Illustrated 24/7 CFE Calculation

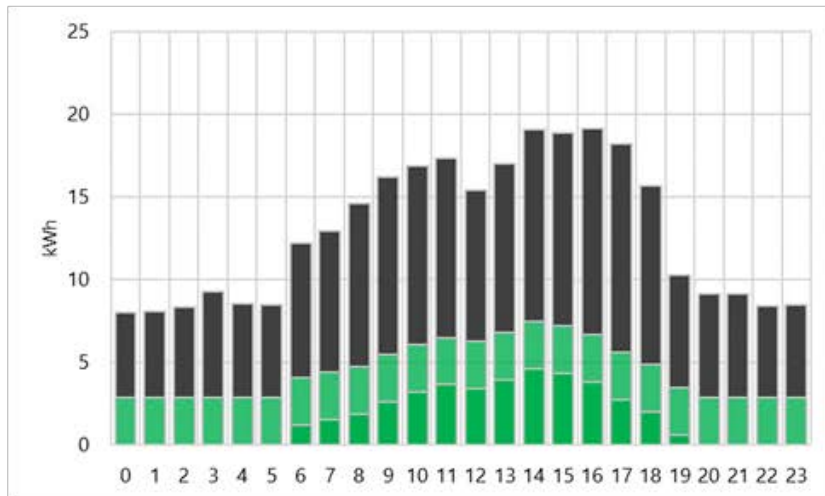
1) Consumption



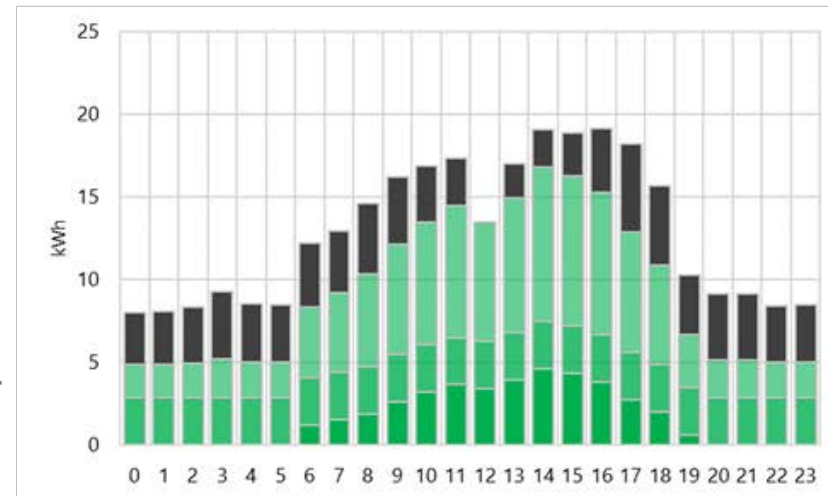
2) +Onsite CFE



3) +Offsite CFE



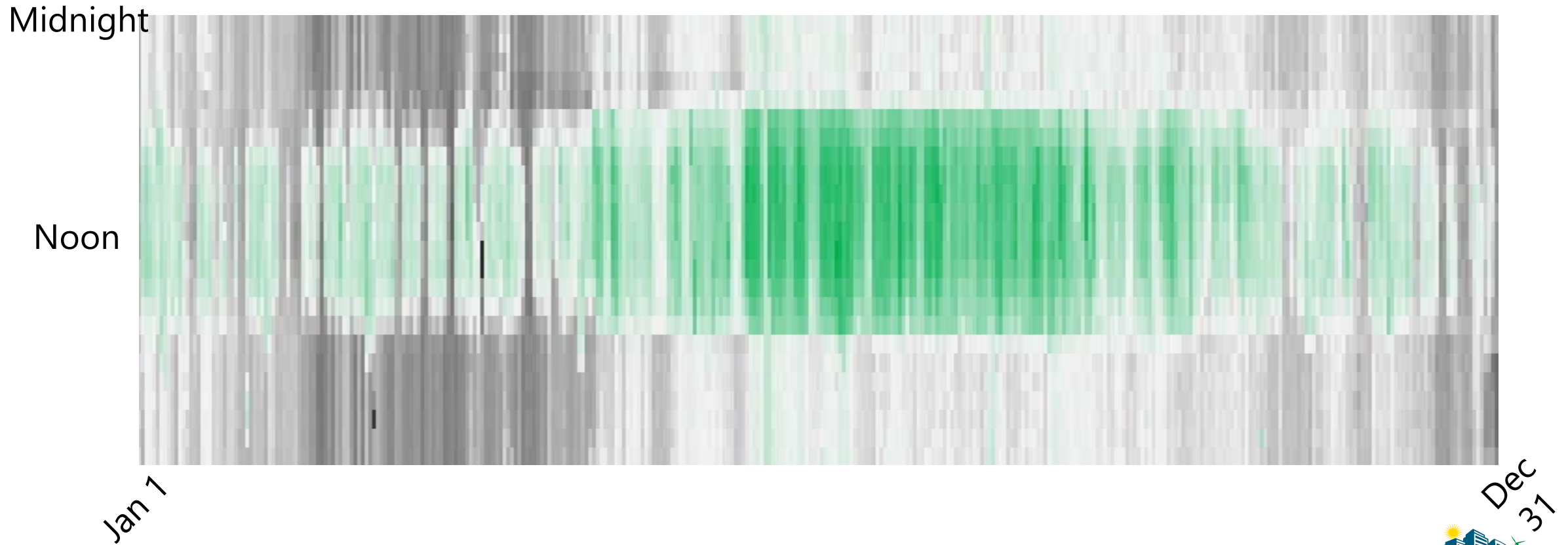
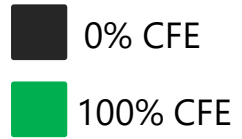
4) +Grid CFE



■ Non-CFE ■ CFE



Hourly CFE over a Year



What is CFE? Legal References & FEMP's Role

- [E.O. 14057 original text](#) (Dec 2021)
 - “Carbon pollution-free electricity” means electrical energy produced from resources that generate no carbon emissions, including marine energy, solar, wind, hydrokinetic (including tidal, wave, current, and thermal), geothermal, hydroelectric, nuclear, renewably sourced hydrogen, and electrical energy generation from fossil resources to the extent there is active capture and storage of carbon dioxide emissions that meets EPA requirements.
 - “24/7 carbon pollution-free electricity” means carbon pollution-free electricity procured to match actual electricity consumption on an hourly basis and produced within the same regional grid where the energy is consumed.
 - As set forth in section 509(c) of the E.O., DOE-FEMP, in consultation with CEQ and OMB, will provide tools and technical support to agencies to develop targets as indicated in section 201 of the E.O. and collect, analyze, and report agency data for the purposes of monitoring and evaluating performance toward E.O. goals. Agencies must coordinate with DOE-FEMP to provide necessary data and meet reporting requirements established under the E.O.
- [E.O. 14057 Implementing Instructions](#) (Aug 2022)



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