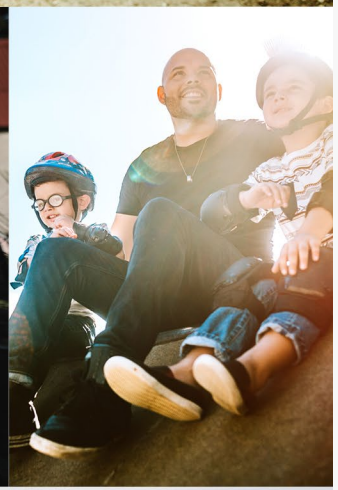


# Learning Lab

Learning Lab # 1 | 24 – February 8, 2024

# Meeting Logistics


Audio


Microphone


Chat box


Video


Raise Hand


Closed Caption

# Operating Agreements

Establishing norms with our communities is foundational to building trust

To create a **safe space**, we established **common agreements** such as **respect, honoring diversity of thought**, and **inclusivity**

**Practice curiosity** and **seek to understand different perspectives**

**Stay Engaged**

**Be Willing To Experience Discomfort**

**Speak Your Truth**

**Expect and Accept Non-closure**

**Share the Airtime**

The courageous conversations framework
by Glenn Singleton and Curtis Linton

# Agenda

10:00 – Welcome & Meeting Logistics

10:10 – Distribution System Plan (DSP) 2024 Framing

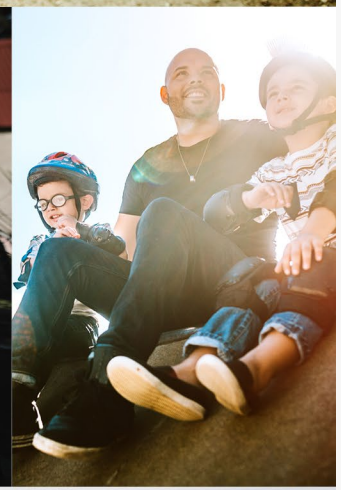
10:20 – DSP – Empowered Communities

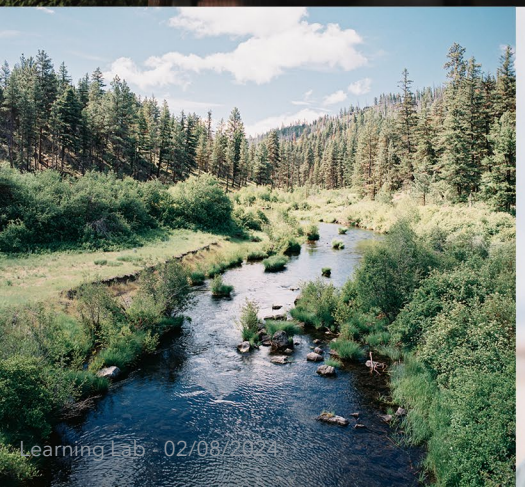
11:20 – PGE+ On-Bill Payments

11:55 – Closing Remarks & Next Steps

12:00 – Adjourn

Appendix: DSP – Distributed Energy Resources Forecast Update





# DSP 2024 Framing

Jason Salmi-Klotz, Senior Manager Distributed Energy Resources

Learning Lab # 1 | 24 – February 8, 2024

# Learning Objectives

Level set on DSP current state & procedural recap

Share current state of DSP Activities

Restate DSP vision & its areas of focus

# Distribution System Plan (DSP) Procedural Recap

## Commission-Defined DSP

- DSP Investigation (UM 2005) initiated in March 2019
- Final guidelines issued in December 2020
- Required to file every two years

**OBJECTIVES:**

- Insight into Distribution Planning process
- Stakeholder participation
- Evaluate whether investments maximize operational efficiency and customer value

## Procedural Activity to Date

- Inaugural DSP filed in two parts:
  - Part 1 filed in Oct 2021
  - Part 2 filed in Aug 2022
- Commissioners adopted Staff recommendation of Acceptance in March 2023
- Order included the continued suspension of requirement to file a SmartGrid report
- Staff has stated a need to update guidelines

# Current State of the DSP Activities

## Acknowledgments

### Non-Wires Solution (NWS)

Requires new tools & practices within PGE

PGE will propose a series of NWS projects informed in part by our Smart Grid Test Bed:

- Controlling costs & providing community investments & customer solutions
- Test capabilities to orchestrate & maximize benefits of DERs
- Central to NWS & meeting our carbon goals

## Opportunities

### Customer Value Proposition:

- Access behind the meter investments (EVs, Solar rooftop, heat pumps, water heaters, EE, & DR)
- Place more PGE investments into the distribution system (keeping rate payer dollars closer to home)

### Resiliency:

- Add resources closer to communities & customers
- Support for climate adaptation

### Stakeholder Transparency:

- Share the vision, timeline and anticipated costs of implementing the first steps through these NWS Projects

# Distribution System Plan (DSP) Areas of Focus

**Empowered Communities**

Support equitable participation in the clean energy transition

**Grid Modernization**

Enable an optimized grid platform for a safe, affordable, reliable, resilient and equitable system

**DER Strategy**

Using Distributed Energy Resources (DERs) & new technologies to deliver energy & energy solutions to PGE customers

**Plug and Play**

Improving access to grid edge investments to accelerate customers' clean energy transition

**Evolved Regulatory Framework**

Regulatory framework to support utility investments and community centered solutions

# Questions/ Comments

# DSP Empowered Communities

Samantha Thompson, Energy Equity Partner

Jake Wise, ETO Liaison

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# Learning Objectives

Revisit DSP Empowered Communities focus area

Share our approach and scope of work

Request ideas and recommendations

# Empowered Communities | Vision

**DSP/MYP Goal**

Identify DER investments & community/customer/system benefits

**Objectives**

- Use an equity lens framework in DSP strategy & planning
- Collaborate with community leaders/partners & EJ communities
- Share updates & provide opportunities for feedback

**Desired Outcomes**

- Reduce energy burden for customers & communities
- Identify how to make investments that create more resilient communities
- Reduce GHG emissions

**Capabilities Needed**

- ***An equity lens framework***
- Grid modeling/analysis
- Local EE & Solar forecasts
- DER control/dispatch
- **Contractor training/management**
- Provide customers with energy solutions
- New cost & benefit perspectives to influence planning & new investments

**Impact**

Continue to provide safe, reliable, affordable service and include resilient & equitable clean energy to communities and customers

# Empowered Communities | Accomplishments to Date

**Implemented Community Benefits & Impacts Advisory Group**

**PGE evolving equity lens –** internal hire processes and engagement

**Created Learning Labs** venue to socialize all plans' development

Built a **Learning Lab** presentation **library**

**Piloted Smart Grid Test Bed** – Salmon Project (lessons: Low Income, DER development, Flex load potential, multifamily projects)

**Documented process/criteria for incorporating equity** into prioritization of grid needs

**Performed equity analysis** overlaying geographic & socio-economic indicators in mapping exercise for **DSP & TEP**)

**Identified & cataloged PGE programs driving equity**

**Launched Medical Certificate Battery Program** in public safety power shut off (PSPS) zones

**Launched Income Qualified Bill Discount Program** (IQBD) and enrolled ~80k customers

**Invested in Energy Trust of Oregon's** (ETO) community partner funding model

# Empowered Communities Approach

# Empowered Communities | Proposed Scope of Work

- Adopt an equity lens framework for NWS demos, grounded in industry best practice, that seeks to balance technical feasibility and community need & which draws on lessons learned from the PGE Smart Grid Test Bed
- Identify public data sets for locational demographics & propose equity outcomes/metrics
- Elicit directional guidance from PGE's CBIAG on the proposed approach, identify & integrate community needs/preferences (e.g., energy burden assessment, equity index/mapping).
- Provide an inventory of PGE investments in equity-focused programs, associated income eligibility & community-based organization capacity building (est. ~$100M/annually*)
- Provide a co-deployment framework for energy efficiency & income qualified bill discount (IQBD) in partnership with the Energy Trust of Oregon

**Includes LIHEAP/OEAP, PPC LiWx and LiHousing, IQBD and Energy Trust low/no-cost programs and community partner funding (CPF) .*

# Action Plan with Energy Trust of Oregon

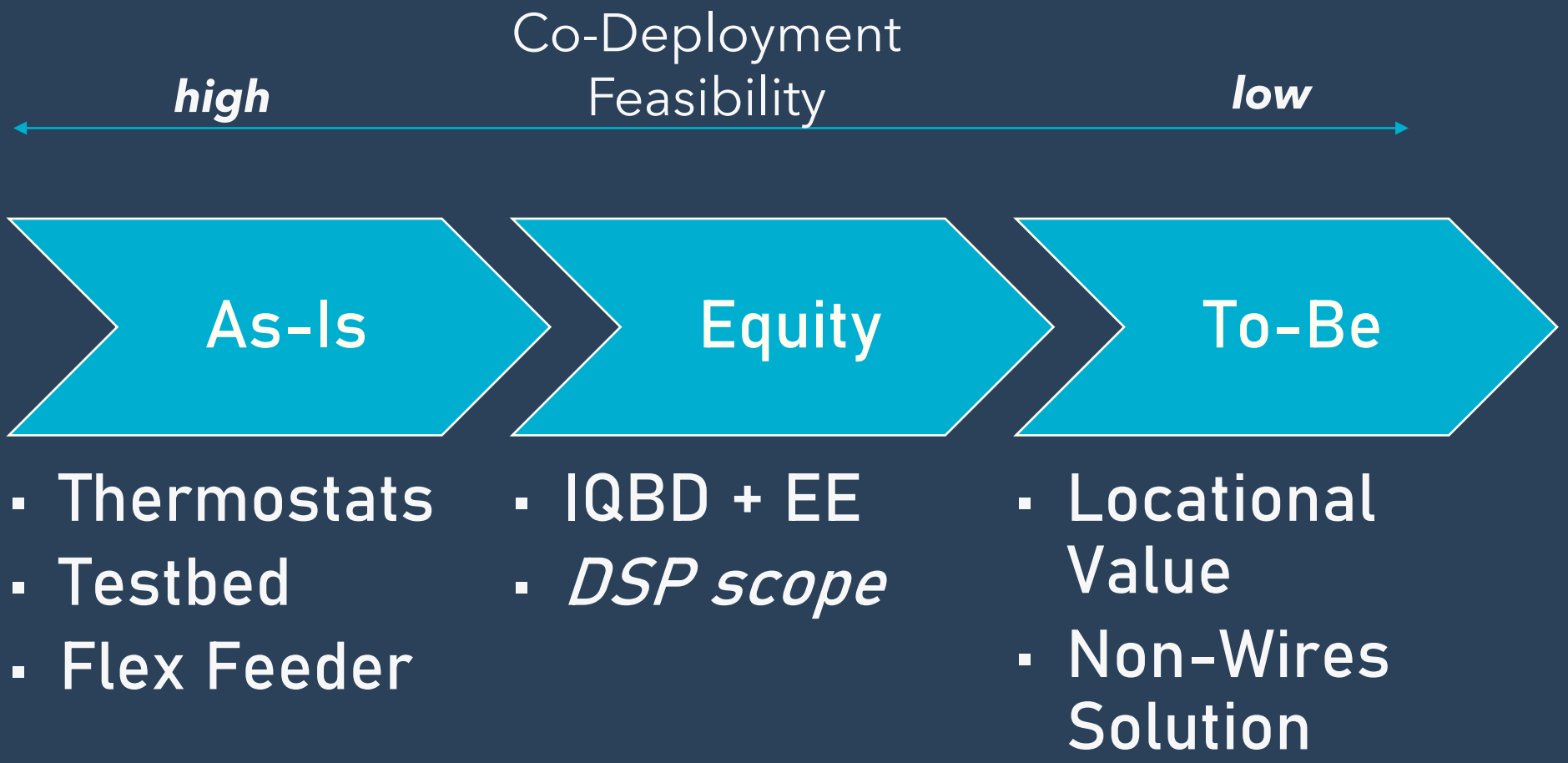
**Collaborate to develop an outcomes-based co-deployment framework in partnership with PGE**

- Establish a shared definition, explore the viability & feasibility of co-deployment & develop a framework that includes Flex Feeder measure work (***EE+Flex***) for inclusion in the DSP.

- With respect to low-income program design & delivery, pursue the design of a holistic approach that includes utility bill discounts & no-cost measures that help reduce energy burden to increase participation.

This work serves to address the feasibility of delivering non-grid outcomes (e.g., equity & non-energy benefits) in the short-term, grid outcomes (e.g., locational value) in the long term, with the desire, ideally, to accomplish both.

# Action Plan with Energy Trust of Oregon

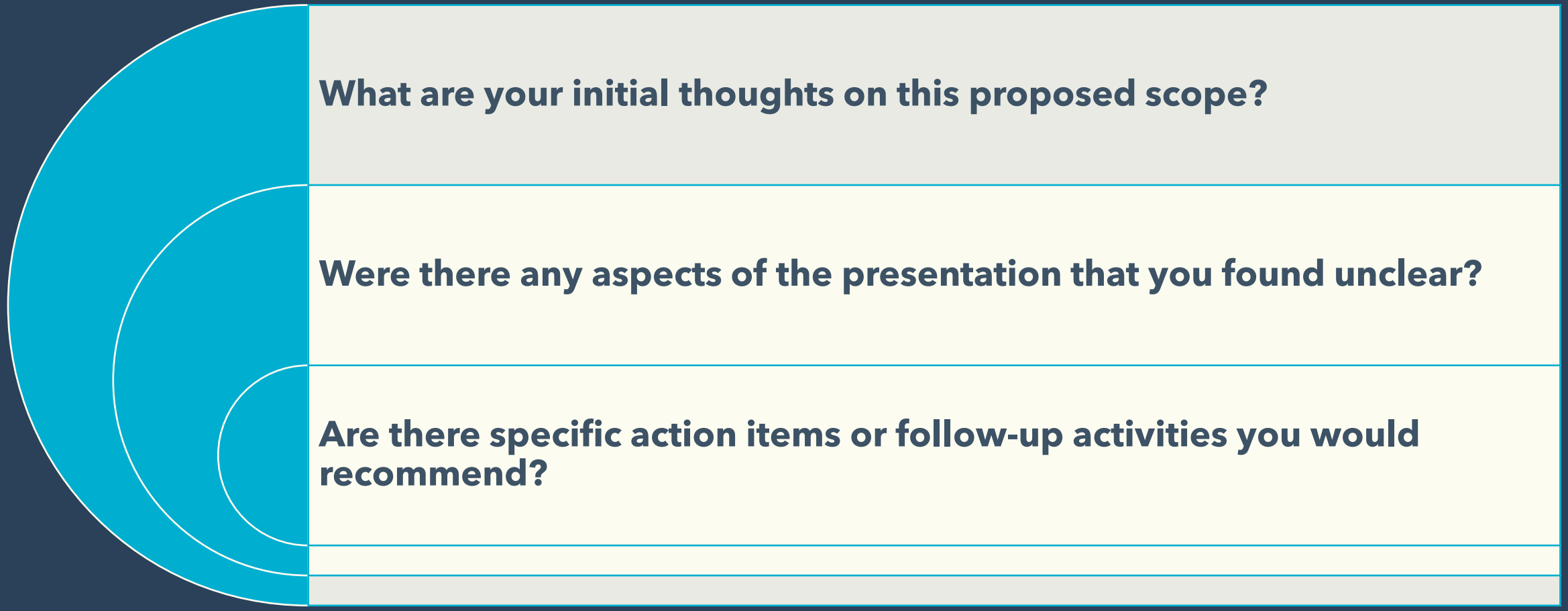


# DRAFT Equity-Focused Program Landscape & Income Eligibility

| Administration | Program | Eligibility Criteria | Est. Annual Funding |
|---|---|---|---|
| Energy Trust of Oregon (ETO) | Savings/Solar Within Reach | **< 120% SMI (Low-to-moderate income (LMI))** | PGE funds ETO through rates; ~25% of 2024 budget **$130M** |
| | Landlord Provided Cooling Space | **Any multi-family property** | |
| | Community Partner Funding | **various** | |
| Oregon Department of Energy (ODOE) | Home Electrification (IRA HEERA, Sec. 50122) | **< 80% AMI** | Statewide **$110M** (2025 – 2030) |
| | Home Efficiency (IRA HOMES, Sec. 50121) | | |
| | Oregon Rental Home Heat Pump Program | **n/a** | Statewide **$10M** |
| | Oregon Community Heat Pump Deployment Program | **n/a** | Statewide **$5M** |
| Oregon Housing & Community Services (OHCS) | Weatherization Assistance Program (WAP)/ Energy Conservation Helping Oregonians (ECHO) | **< 80% AMI** | PGE PPC **$15 - 30M** |
| | Low-Income Home Energy Assistance Program (LIHEAP) | **< 60% SMI** | PGE PPC **$10M** |
| | Oregon Energy Assistance Program (OEAP) | | |
| Oregon Energy Fund (OEF) | Oregon Energy Fund (OEF) | **< 70% SMI** | n/a |
| Portland Clean Energy Community Benefits Fund (PCEF) | Heat Response Program | **< 60% AMI** | n/a |
| Portland General Electric (PGE) | Income Qualified Bill Discount (IQBD) | **< 60% SMI** | PGE rates **$45M** |

***Area/State Median Income (A/SMI) ; Public Purpose Charge (PPC)***

# Questions for Learners



# Questions/ Comments

# PGE+ On-Bill Payments

Binh Lu, Manager
Product Management & Product Portfolio Management

Learning Lab # 1 | 24 – February 8, 2024

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# Objective

Inform on PGE+ learnings from recent launch

Inform on potential on-bill repayment activities

Share Next Steps

# Recap from the September Learning Lab

## Feedback from conversations with the community

**HISTORICALLY EXCLUDED COMMUNITIES**

Historically excluded communities should be part of the design considerations from the beginning

**COST NO MATTER HOW "SMALL"**

Any cost, no matter now "small", is a barrier for those below median income

**THAT'S FOR THE RICH & POWERFUL**

There is the perception that adopting energy efficient, flexible load, or resilient devices are just for the rich & powerful. Even if they could afford it, they are just helping the rich get richer

**LACK OF FINANCING**

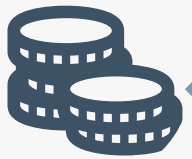
Customers that are part of vulnerable communities (BIPOC, rural, etc.) lack access to traditional financing methods. It is also time intensive to research options, which adds to the burden

# Recap from the September Learning Lab

## Areas that PGE could support customers

### EQUIPMENT AND INSTALLATION COSTS

- Helping customers understand installation choices that make expenses go up.
- Making agreements with installers to set fair prices (standards).



### REBATES AND INCENTIVES AT PURCHASE

- Get a lower starting cost with instant discounts and rebates.
- Combine other incentives from outside companies that are available (ex. Energy Trust of Oregon).

### 3RD PARTY FINANCING

- Work with lenders that are open to considering more than just your credit score when deciding if you can borrow money.
- Team up with lenders that have very low or no extra charges.
- Streamline repayment through your regular bills.

### 3RD PARTY SAVING

Work with lenders who offer tools to assist customers in either saving money or improving their credit.

# What is PGE+

A resource & journey for our customers to learn about equipment, programs & services that meet their electrification needs.

Launched December 19, 2023:

https://portlandgeneral.com/save-money/pge-plus

**With PGE+ our customers will be able to easily:**

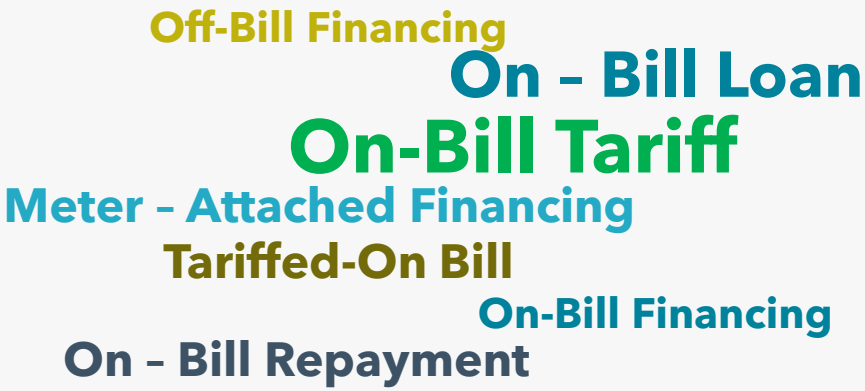
- Purchase the right equipment or appliances
- Immediately receive rebates & incentives
- Connect to third-party financing options directly through a lender
- Get installed from our approved contractor network
- Automatically enroll in PGE programs for ongoing savings

# Customer Journey Design Principles

- Clear & straightforward communications
- Tailored communications based on the customer's situation
- Transparent options & upfront expectations to lower cost
- Simple & accessible customer journey
- Communication in their preferred language
- Customer journey that is easy to navigate

# On-Bill Financing Research

## Example program types and terms:




## Themes we learned:

1. 3rd party lending would allow us to support more customers
2. Historical examples of on-bill programs have specific aspects that do not work for flexible load enabled devices (ex. bill neutrality)
3. Other program would turn off electric service when on-bill loans were not repaid

# On-Bill Financing Design Principles

- Seek 3rd party lender to meet our customers lending needs
- Get customers direct access to small loans provided by lender
- Meet the needs of our diverse customer base (underserved, rural, low-to-moderate income experienced individuals)
- Ensure lender practices provide consumer protections & support customers that have fallen on a hardship
- Provides loans to customers in our service area
- Electric service should not be tied to status of loan repayment

# Development Considerations

**PGE Consideration**

How to pay for the costs of administrating PGE+ on-bill payment services?

**Questions During Development**

- How do we set a fair admin charge?
- Should the admin charge be a percent vs. a flat fee?
- What type of costs should be included in the admin charge?
- What happens if we don't collect enough or if we collect too much?

# Administrative Charge

**Direct recoverable cost line items assumptions**

1. Contract labor for program implementation
2. Purchase incidentals & remedies
3. Promotional costs related to on-bill

## Recoverable cost assumptions

- Direct, incremental operating costs only
- Outside of current rate base & specific to repayment activities
- Can reasonably & accurately be tracked & aligned to accounting fundamentals
- Cost is incurred after effective date of tariff

## Sample Administrative Charge Structure

*Table content are for illustrative purposes only*

| Product | Avg. Cost | Sample Charge |
|---|---|---|
| EV Charger | $2,000 | $20 |
| Ductless Heat Pump | $7,500 | $60 |
| Heat Pump | $10,000 | $80 |

## Timeline

Q1 2024 Discuss with Commission Staff

Q2 2024 Submit for approval and go-live

# Next Steps

Answer the remaining the on-bill questions.

Determine how to integrate low-income specific experiences (e.g., Savings Within Reach, CAP agencies, etc.) to PGE+.

File with the Commission for approval & implementation

Add resources & journeys for customers to learn about HVAC

# Questions/ Comments

# Next Steps and Closing Remarks

Please share your feedback for us to improve

# Next Steps

03/21/2024 Learning Lab Topics:

Grid Needs Assessment

Non-Wire Solutions

# Next Steps & Closing Remarks

- February 28 | 10a-12p | Zoom | Community Benefits & Impacts Advisory Group (CBIAG) Meeting
- March 21 | 10a-12p | Zoom | Learning Lab # 2
- April 3 | 9-11:30a | Zoom | Integrated Resource Plan (IRP) Roundtables #1

Meeting materials and recording will be posted to our Plan's Engagement webpage at Plan's Engagement | Portland General Electric

For more information or if you have questions, please email us at LearningLabs@pgn.com

Thank You for your participation in our plans

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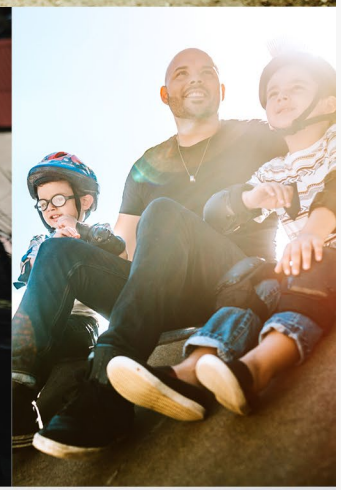
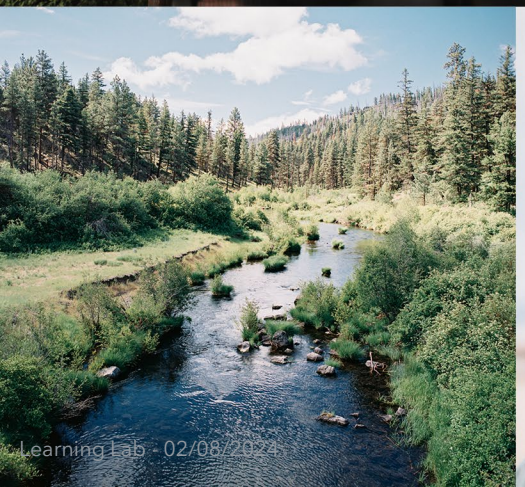
# Appendix





# DSP Distributed Energy Resources Forecast Update

Andy Eiden, Senior Principal Analyst

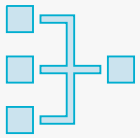
Learning Lab # 1 | 24 – February 8, 2024

# Objective

Recap PGE's distributed energy resources (DER) forecasting practices & tools
(*link to past ppt* Current Distribution System Planning Process)

Share updates initiated since DSP Part 2 was filed
(*link to past ppt* Long Term Plan: Grid Modernization)

# Forecasting DERs for IRP & DSP



IRP looks at DER forecast in terms of these resource's contributions to bulk system resource needs (i.e., large-scale generation and transmission).

In current iteration, IRP does not factor in locational DER forecast but rather **potential systemwide resource impacts**.

We include a low/reference/high DER forecast that contributes to the different resource **"need futures"** assessed by the IRP.

***For example:***

low solar adoption, high EV adoption = "high need"

For DSP, we have begun introducing DER forecasting into grid planning workflows.

DSP Part 2 included DER forecast at **substation & feeder-level** & results were incorporated into capital portfolio planning

Evolution of DER forecasting for DSP will factor in sensitivities such as **"high EV growth"** & allow planners to assess potential implications

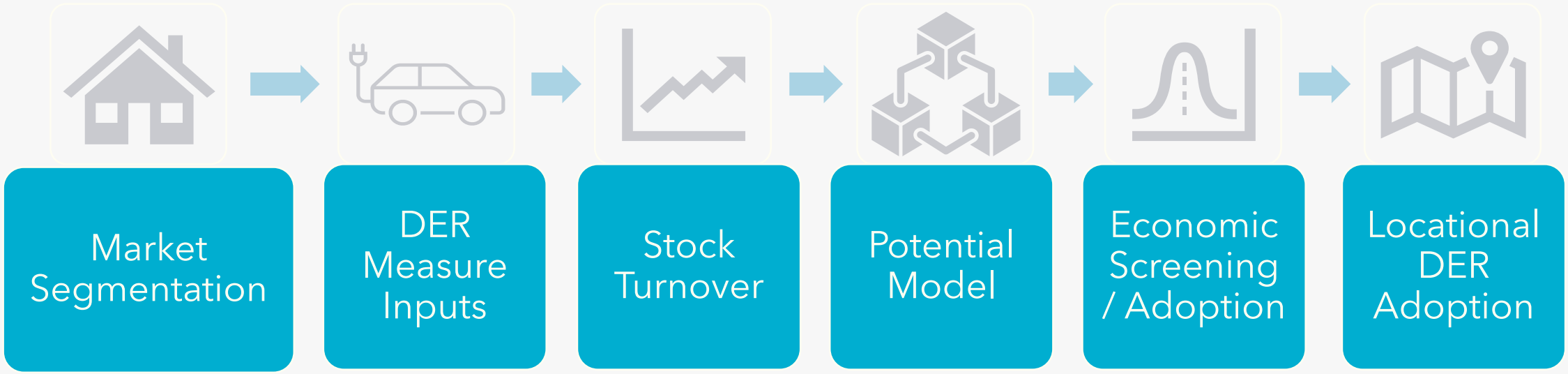
AdopDER is a

site-level simulation model that estimates

locational, hourly annual load impacts from the co-adoption of

40+ distributed energy resources

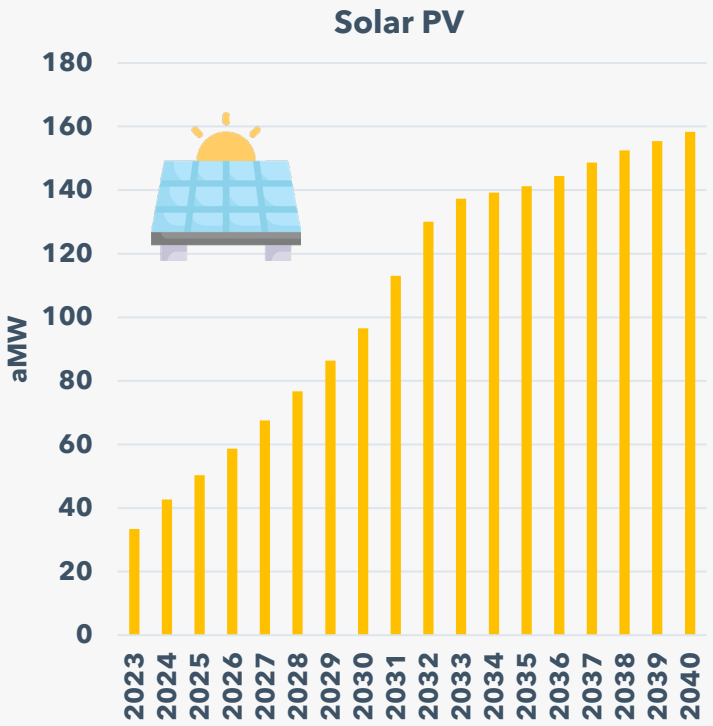
# AdopDER Simplified Workflow

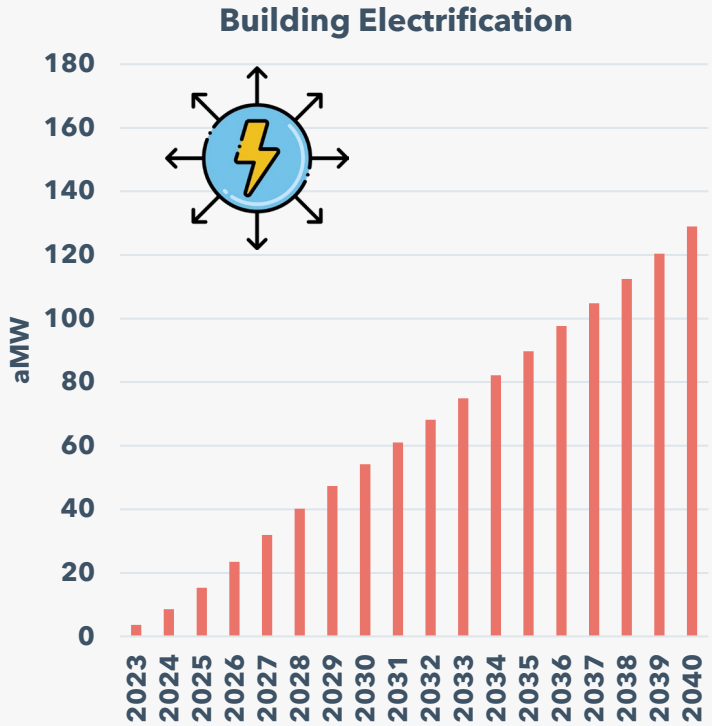


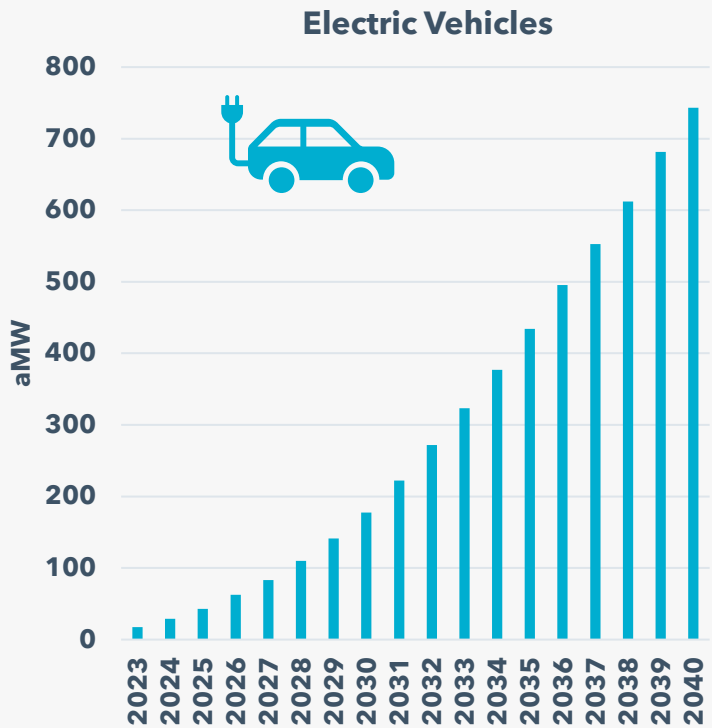
# DER Measure Inputs

- **Solar & Storage**
  - Solar PV
  - Battery Energy Storage
  - Single-site microgrid
  - Campus microgrid
- **Electric Vehicles**
  - Light-Duty Vehicles
  - Medium-Duty Vehicles
  - Heavy-Duty Vehicles
- **Basic EVSE**
  - Residential Level 1 charging
  - Residential Level 2 charging
  - Non-res Level 2 charging
  - Non-res DC Fast Charging
- **Smart Charging**
  - Res Smart EV charging
  - Non-res Smart EV charging
- **Smart Water Heating**
  - ERWH retrofit switch
  - ERWH smart controls
  - New construction Smart ERWH
  - HPWH smart controls
- **Smart HVAC**
  - Res smart tstat controls
  - Res DHP controls
- **C&I DR**
  - Commercial smart tstat
  - Irrigation load control
  - Large C&I tariff
  - Cold thermal storage
- **Non-firm DR**
  - Peak Time Rebates (PTR)
  - Time of Day (TOD) rates
  - EV-TOD

# Long-term Energy Impacts from Distributed Energy Resources (DERs)

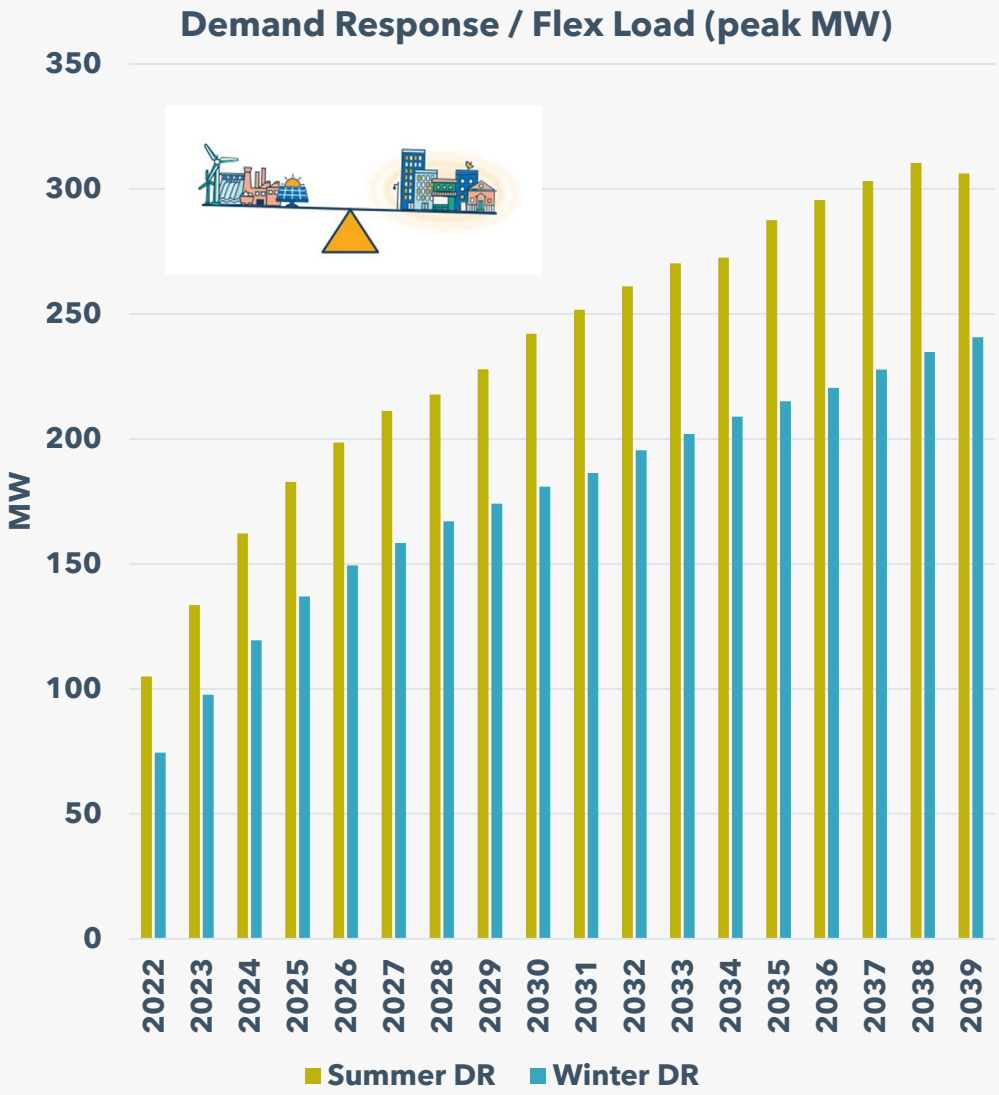


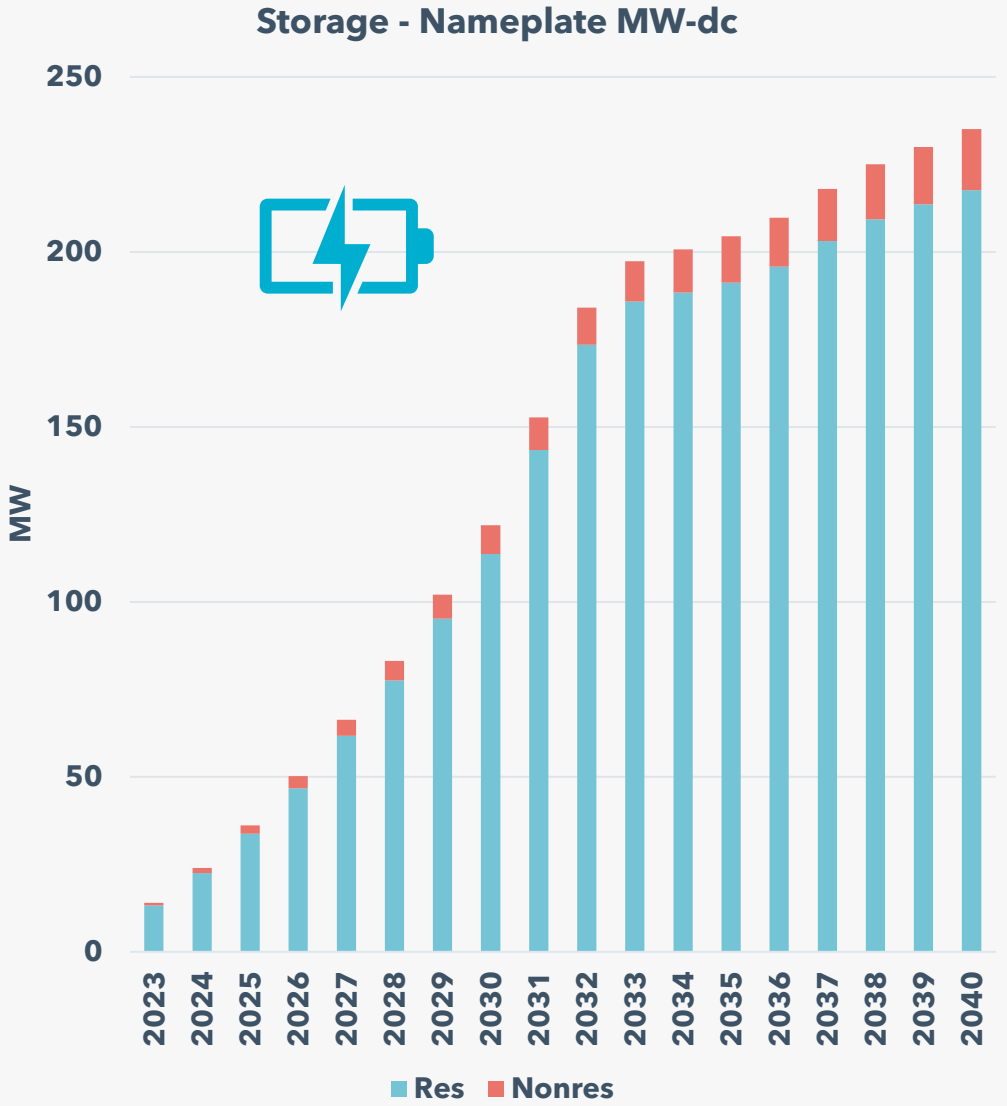




Data source: AdopDER June 2023 vintage (included in PGE 2023 IRP)

# Long-term Flexible Load / Capacity Potential from dispatchable DERs



# Evolution of the DER Forecast for this iteration of DSP

**DER Forecast Update | APRIL (2024)**

- **Solar PV:** calibrating previous forecasts to actual adoption, & improving MWh projections based on more granular system information (e.g., tilt & azimuth)
- **Transportation Electrification:** utilize more real-world charging data (e.g., PGE's Residential Smart Charge program) & incorporate EPRI's EVs2Scale telematics data

**Methodology changes | JULY (2024)**

- Evolve to site-level forecast curves for DER & Load Feeds into CYME's integrated distribution platform
- Include distribution-connected Qualified Facilities & more granular large customer load additions (1+ MW)
- Increase granularity for CBRE forecasts for IRP Update & CEP

# Community Based Renewable Energy – input needed

## In LC80, Staff recommended PGE take the following actions with respect to CBREs:

- Ground truth CBRE potential with AdopDER bottom-up forecast
- Increase granularity of CBRE Forecast (develop additional CBRE resources/technologies)
- Assess bundling EE & DR with larger-scale resources included in first CBRE study

## Explore connections between community needs assessment & CBIs – Energy Burden Assessment

# CBRE Potential – Resource Overview

## Standalone Community-scale solar

Reviewed Oregon Community Solar cost data

## Solar + storage microgrid

- Leveraged AdopDER resource potential for Community Resilience Microgrids
- Analyzed PGE reliability & outage data at feeder level
- Identified 144 feeders within criteria zones (PSPS, critical customers, # outages, etc.)
- Sized solar & storage microgrids for 72-hour duration outages
- Leverages existing installed DER on the network

## In-conduit hydropower

- Discussed individual project potential with Energy Trust
- Reviewed Oak Ridge National Lab study, “An Assessment of Hydropower Potential at National Conduits” October 2022

# Locational DER forecasting examples

# Assessing Forecast Accuracy & Precision

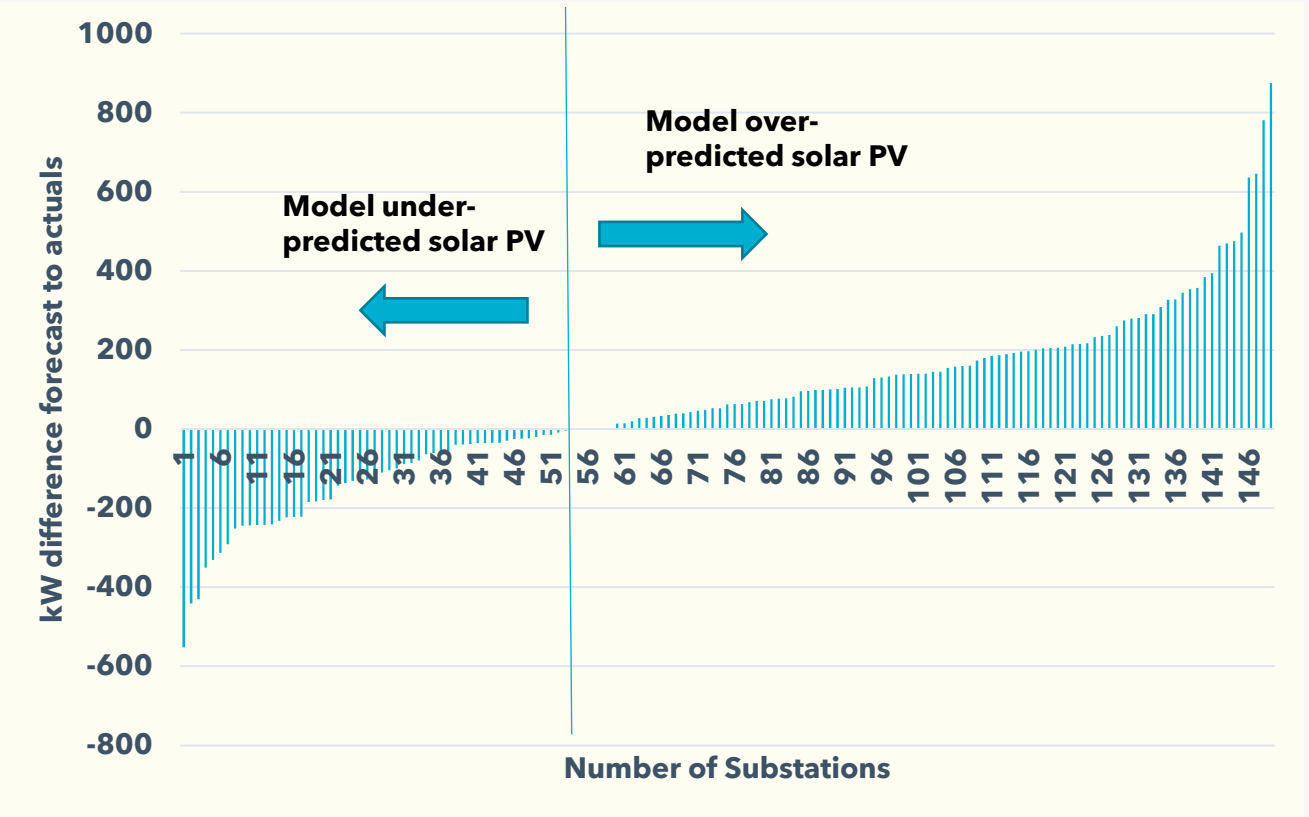
Increasing forecast granularity from system-level to specific geographies – comes with tradeoff of expected accuracy

Chart to the right shows the difference in kW from the forecasted 2023 incremental solar PV additions to actual installs for each substation (n=149)

Overall, 2023 incremental forecasted solar adoption was 18% lower than actuals, but within the low case sensitivity range

At the locational level, the substation level forecast to actuals difference ranged from -550 kW to +875 kW, with an average of +64 kW over-forecasted per substation

We are actively investigating potential sources for forecast improvement



# Electric Vehicles

AdopDER assigns EV purchase decision based on several factors such as

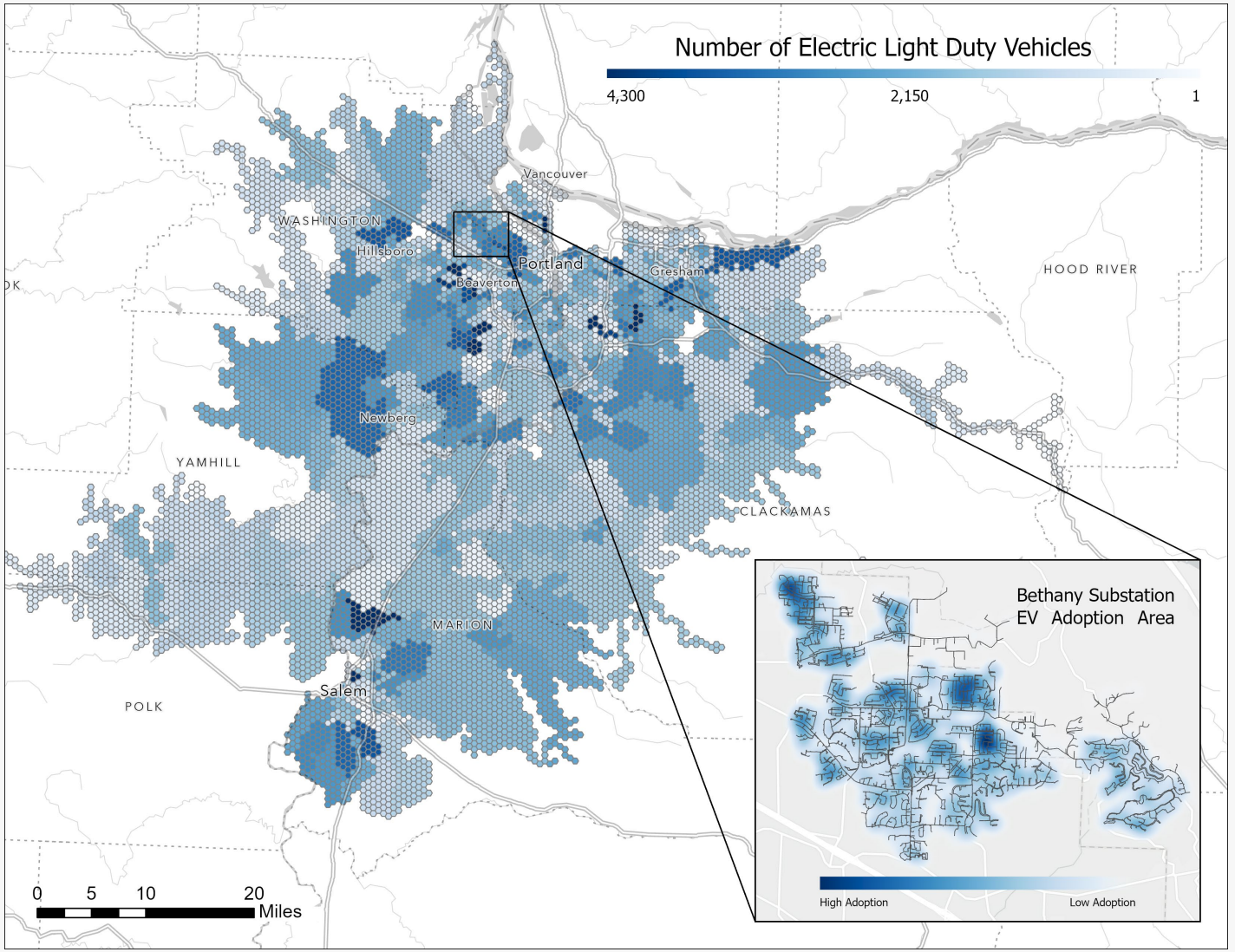
***Income***

***# of EVs in census tract***

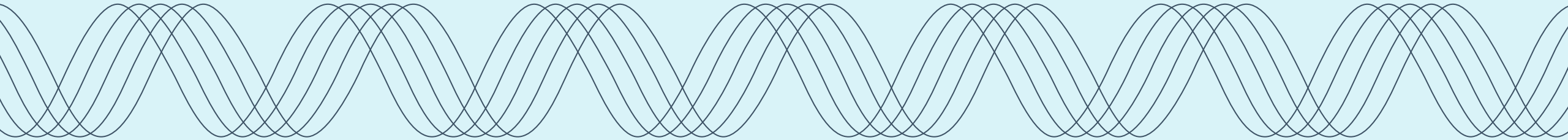
***home ownership***

Actual EV adoption tracked by matching DMV registration extracts to PGE customer database at SPID level

Results in address match rate of ~ 95% & remainder are allocated by zip code level apportionment process



# In Process DER Forecasting Updates & Planned Work



# Customer Behavior for Co-adoption of EVs

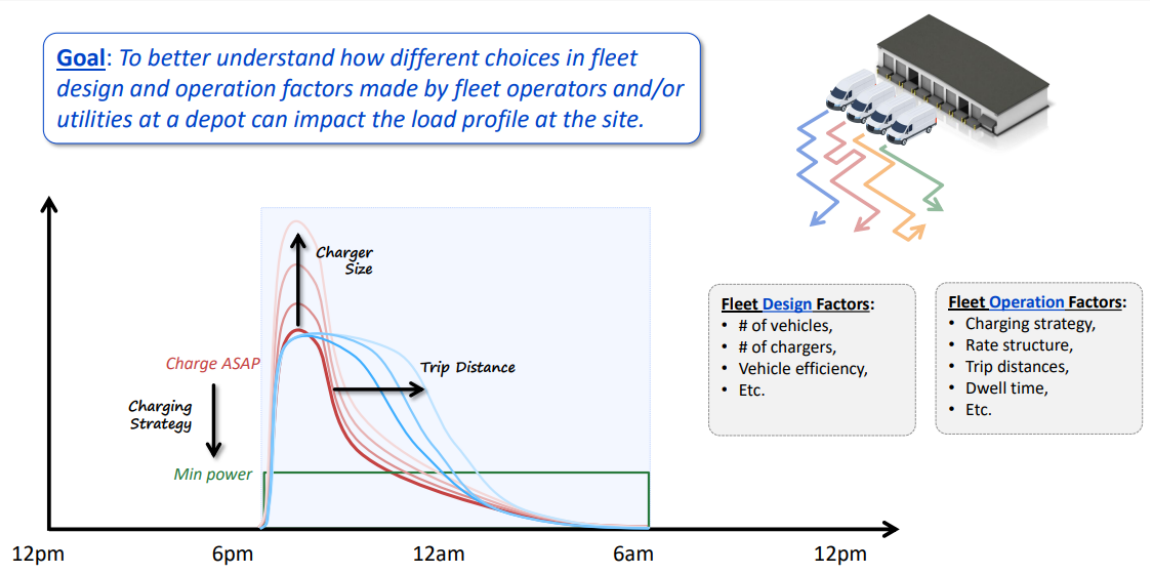
| | |
|---|---|
| PGE working with EPRI & NREL conducting analysis of customer behavior related to co-adoption of DERs, including combinations of the following: | Solar PV |
| | Battery-electric storage systems |
| | Electric vehicles |

| | |
|---|---|
| Two-Part Methodology | - Conduct customer surveys to inform discrete choice analysis of customer types & propensities (so-called "stated preferences" approach)<br>- Compare to actual adoption behavior (so-called "revealed preferences") |
| | - Increase granularity "PGE agents" in dGen, maintained by NREL, allowing for better characterization of PGE customers compared to Oregon statewide aggregates |

# Incorporating EPRI's EVs2Scale and other learnings

PGE has been participating in EPRI's Fleet charging study & EVs2Scale Initiative

Will incorporate medium- & heavy-duty fleet vehicle locational energy demand & load profile analysis into future updates



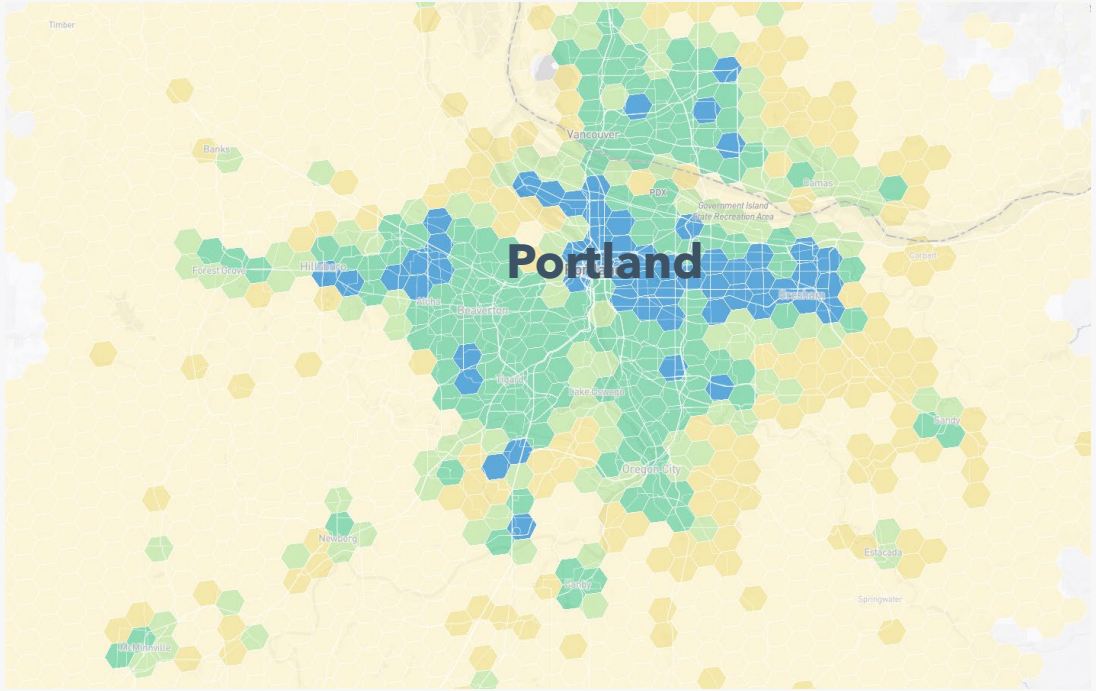
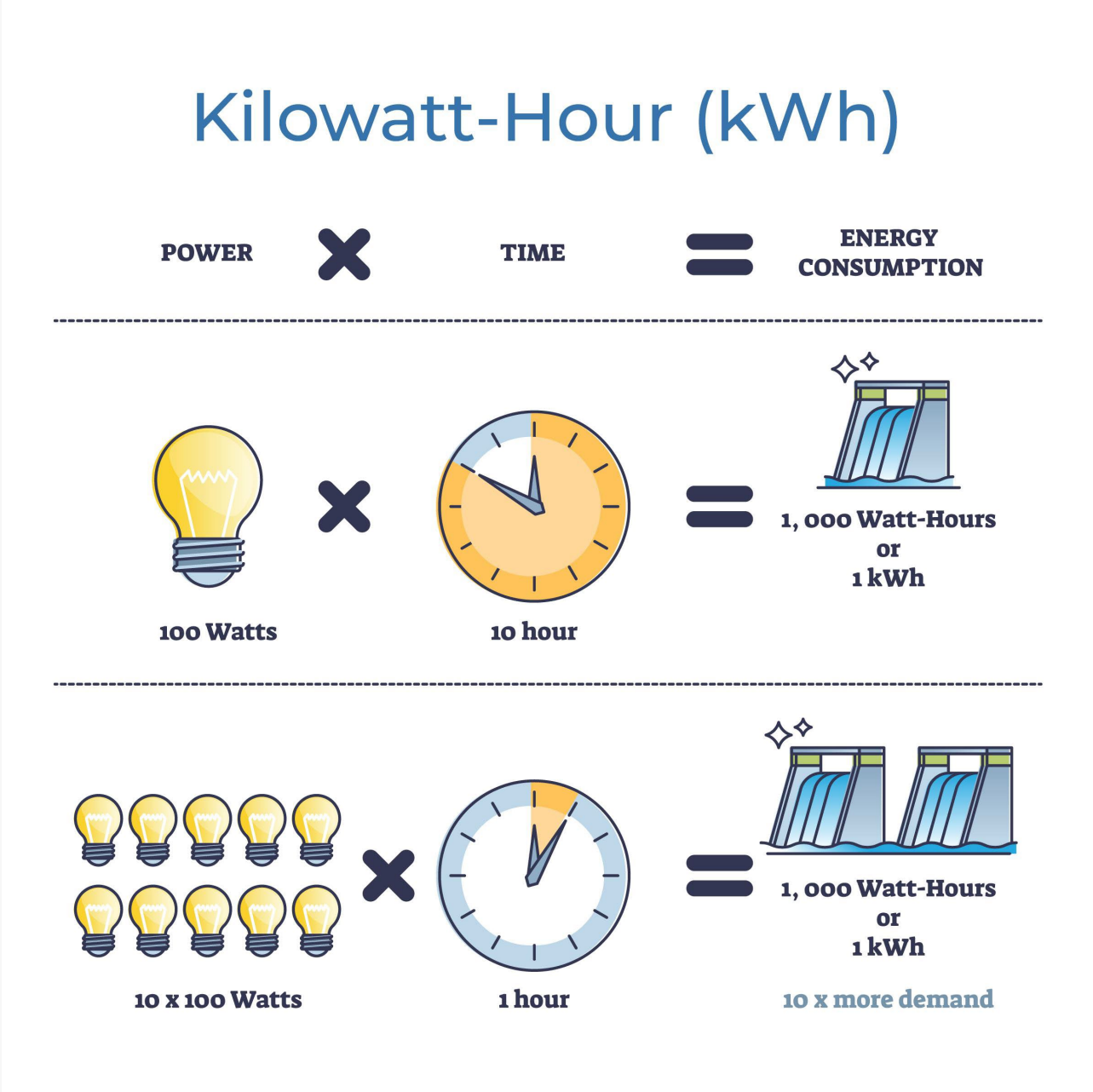




Image sources: EPRI

# Questions/ Comments

# Energy Unit

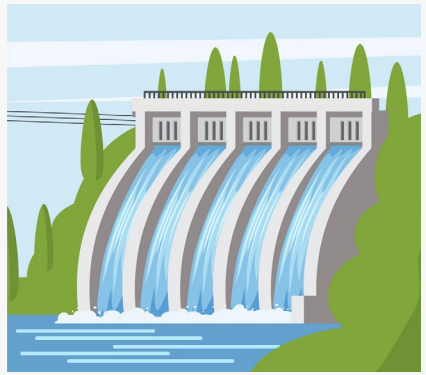
A **kilowatt-hour (kWh)** electricity consumption over 1 hr.



# Capacity Units

**Megawatts (MW)**
energy output of a power plant

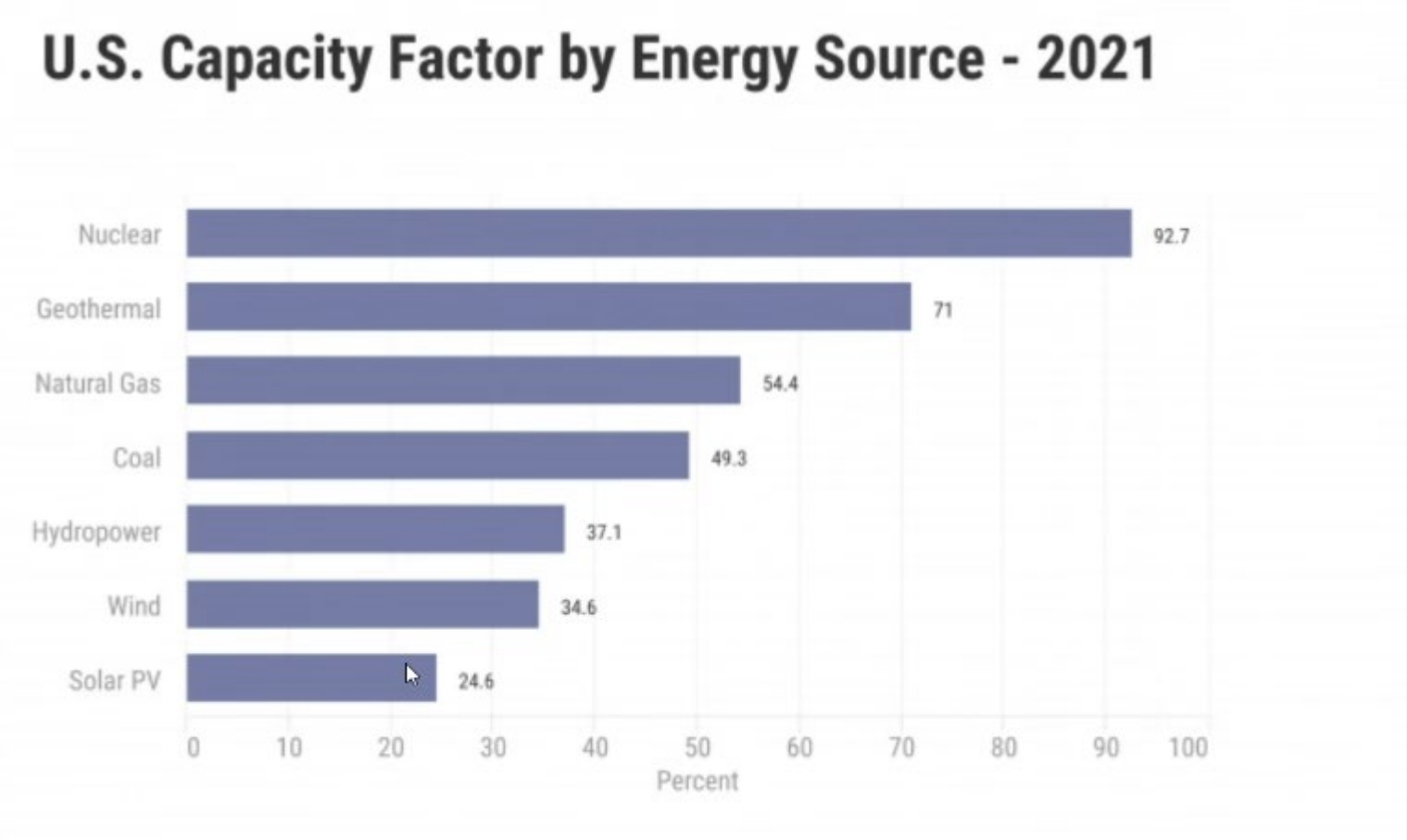
**600 MW**




**198,000 homes**

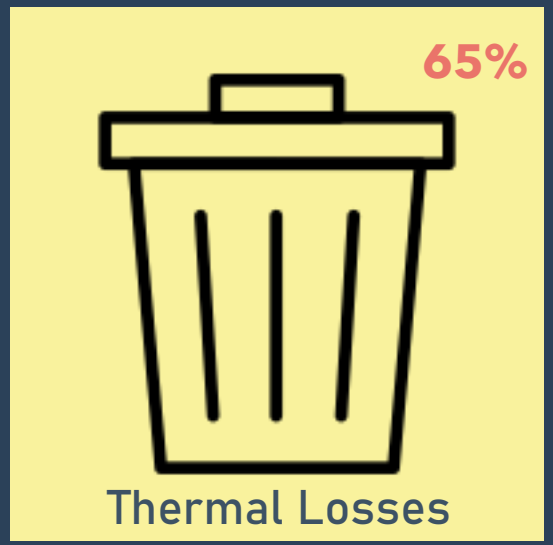
# Capacity Factor

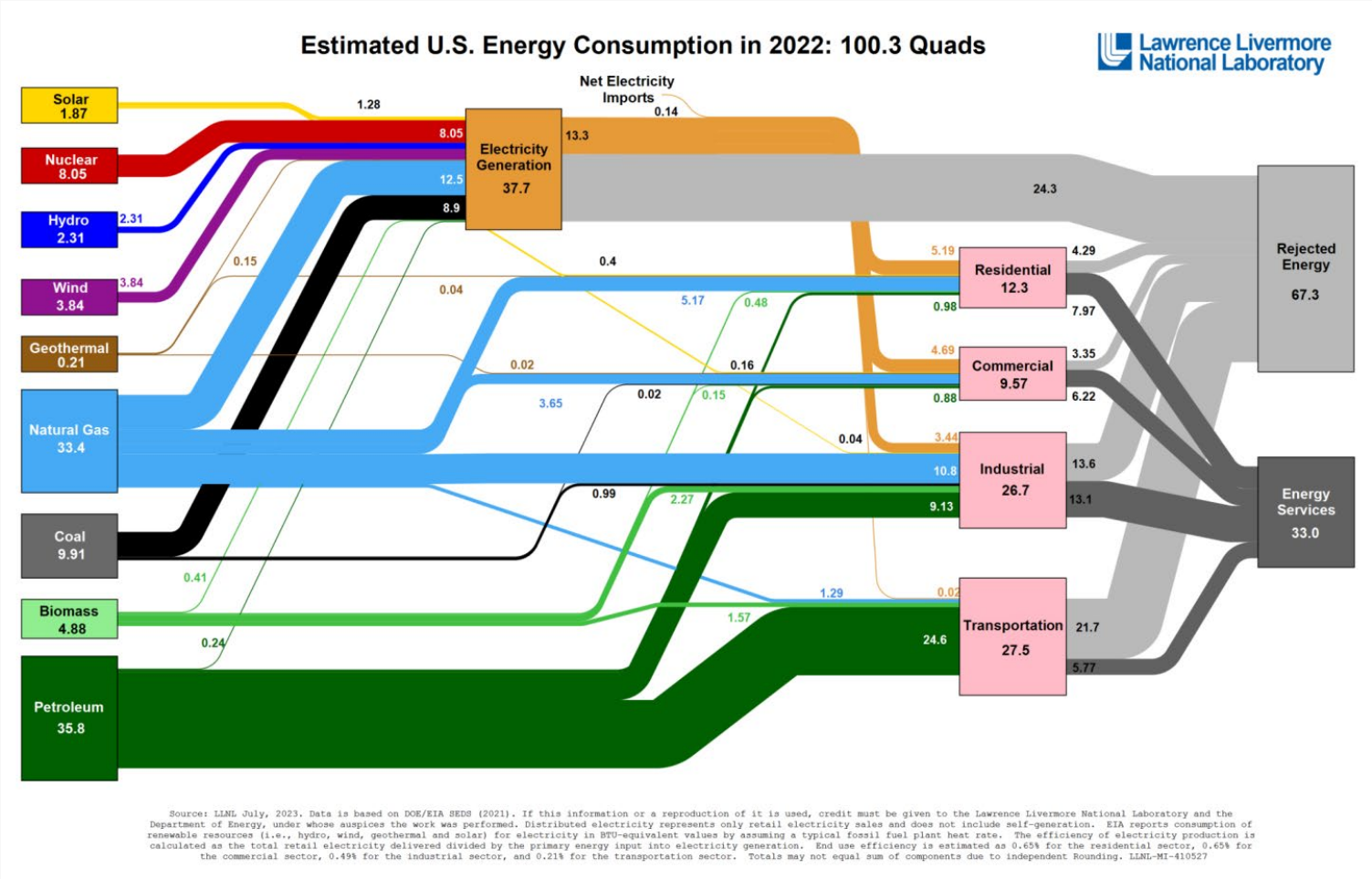
- Go the IRP and get the definition
- Can I get the amount of resource/energy from that generation unit whenever I want
- Consistency of delivery



# Energy Usage in the United States

- Electricity Generation: **37.7 Quads**
- Rejected Energy on Electricity generation **24.3 Quads**



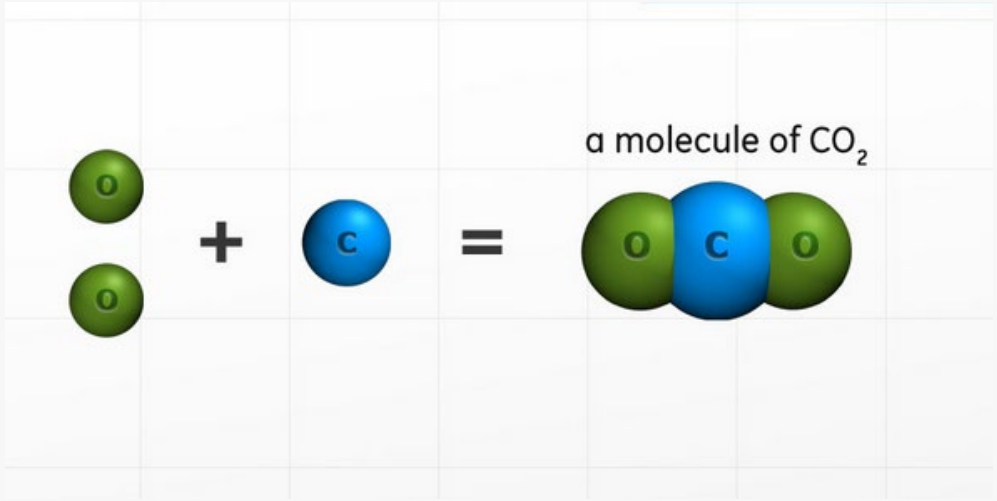



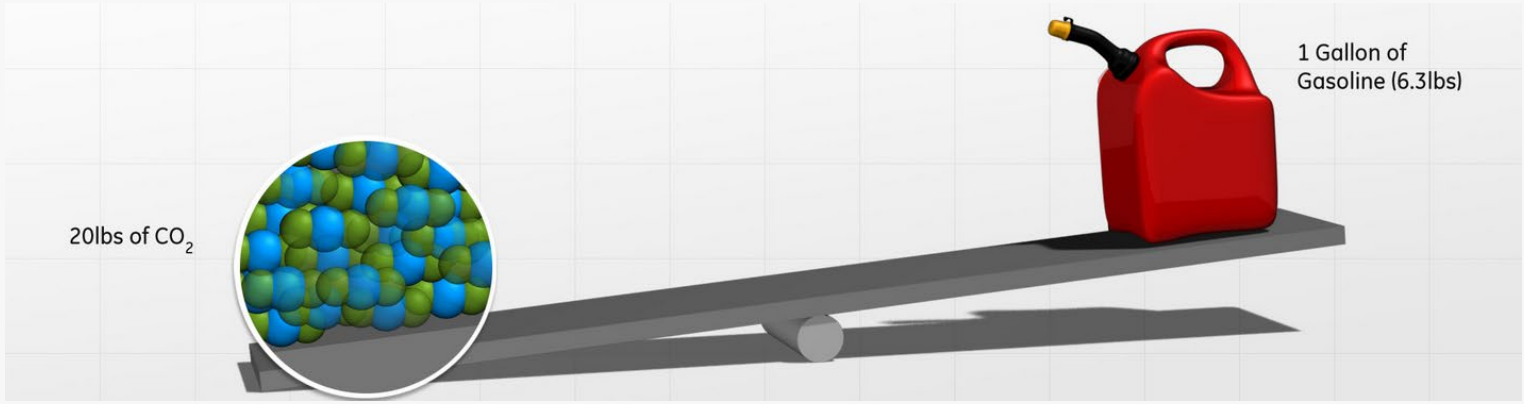
# The Math Behind CO2

**When gasoline is burned**, carbon and hydrogen atoms are separated from one another. The hydrogen atoms combine with oxygen to form water ($H_2O$). The carbon atoms combine with oxygen to form $CO_2$ – a major greenhouse gas.

Carbon has an atomic weight of 12. Oxygen has an atomic weight of 16. This means that every molecule of $CO_2$ has an atomic weight of 44 – 3.7 times the weight of a single carbon atom.

Gasoline is about 87% carbon, which means there is 6.3 lbs/gallon x 0.87 = 5.5 lbs of carbon in a single gallon of gasoline. When burned, this creates 5.5 lbs x 3.7 = 20 lbs of $CO_2$.



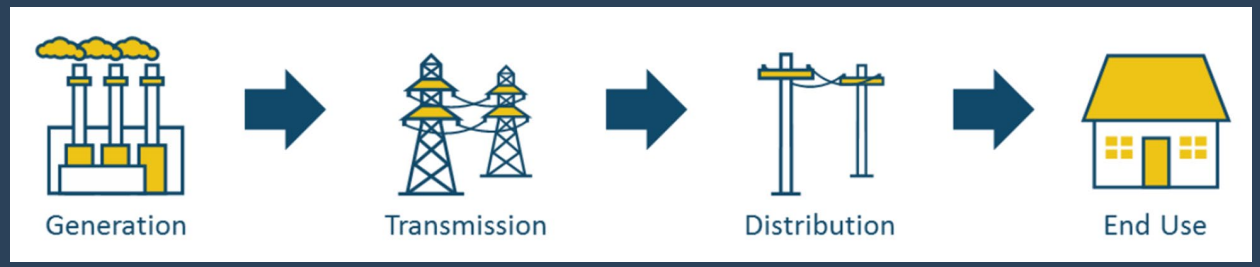
# The Electric Grid is Evolving

**Electricity**

**Supply** | **Demand**

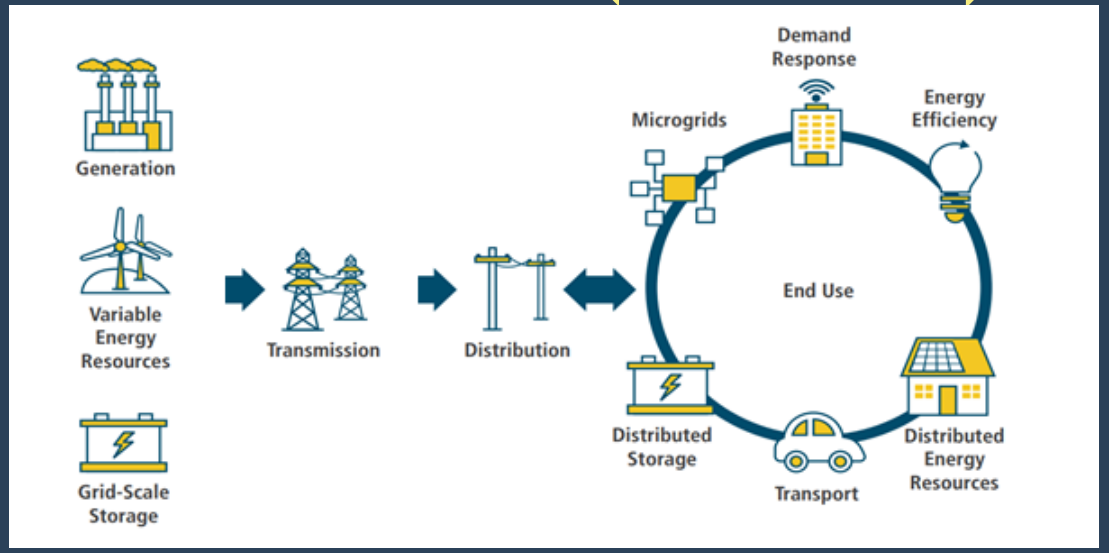
**reliability**

**One way flow of power**




**FROM:** one-way power flow - large generation facilities to end users/customers

**Two-way flow of power**




**TO:** two-way power flow – end users/customers can also generate power and/or interact with the electric grid

# Types of energy needed to meet demand every day

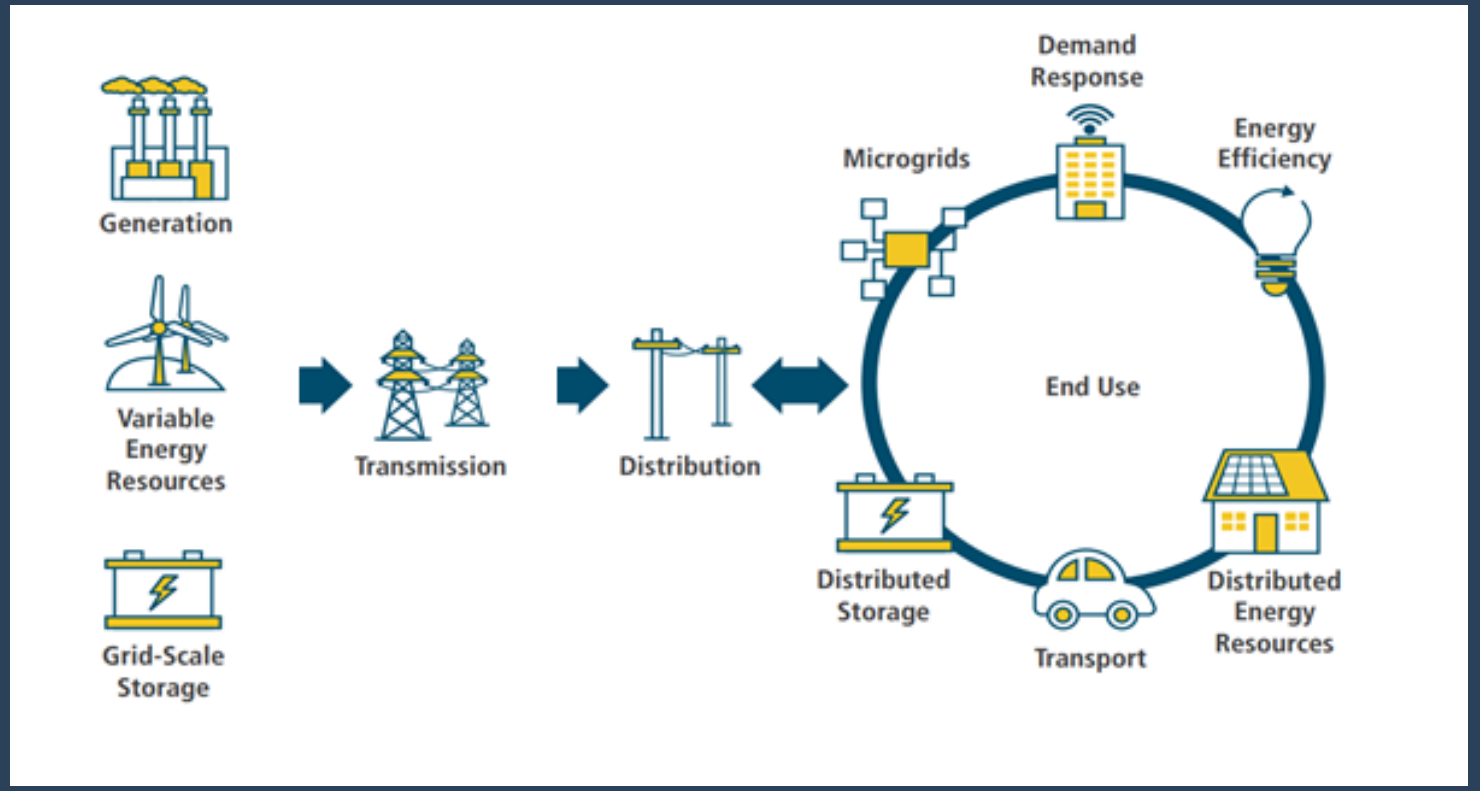
**Electricity**

**Supply** **Demand**

**reliability**

**Utility-scale resources**

**Distributed resources**



# Distributed Energy Resources (DER) examples:

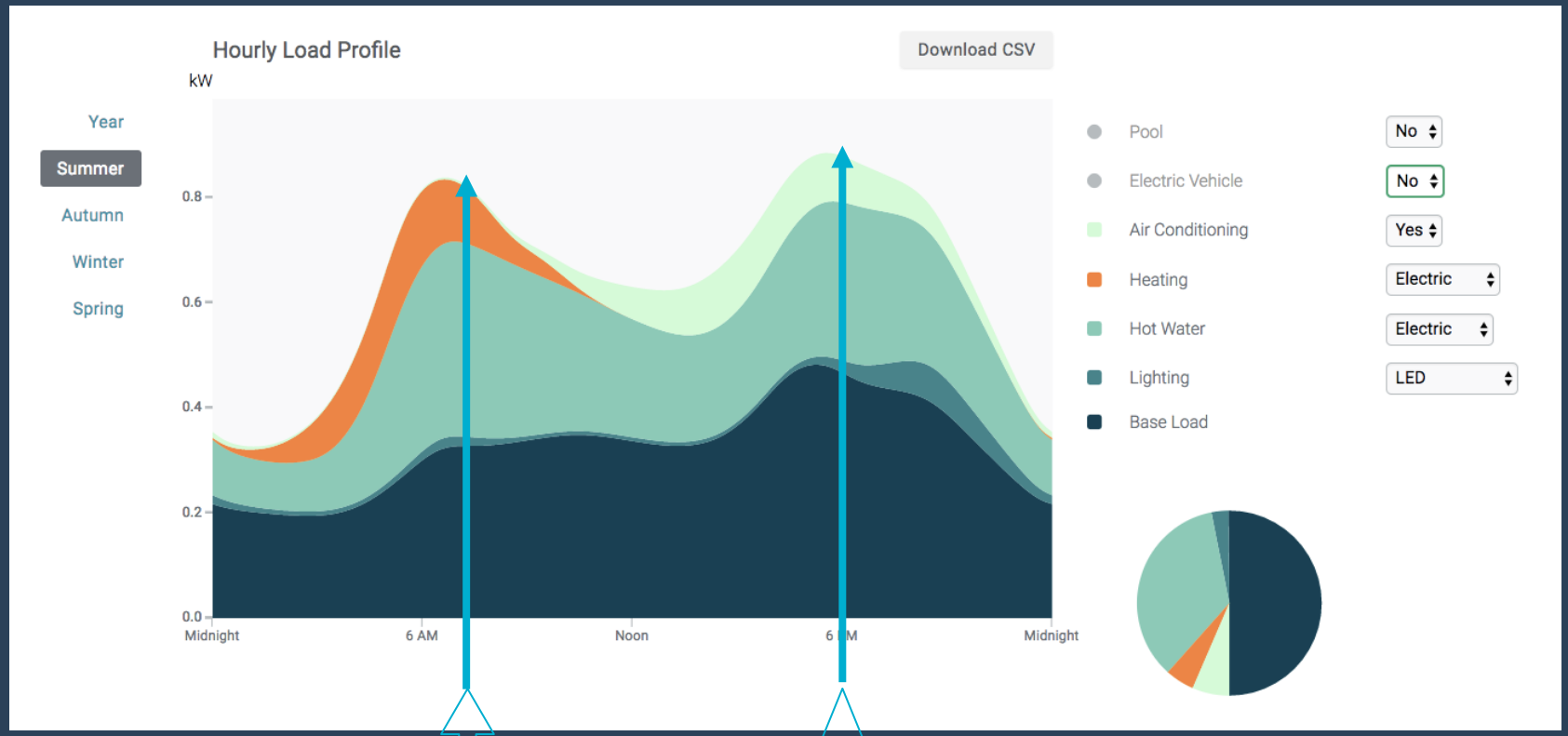





# Electric Utility Operations

To ensure reliability, utilities must be capable of meeting customers' electricity demand at every second

Illustrative Example of demand for electricity on a summer day in Palo Alto, CA



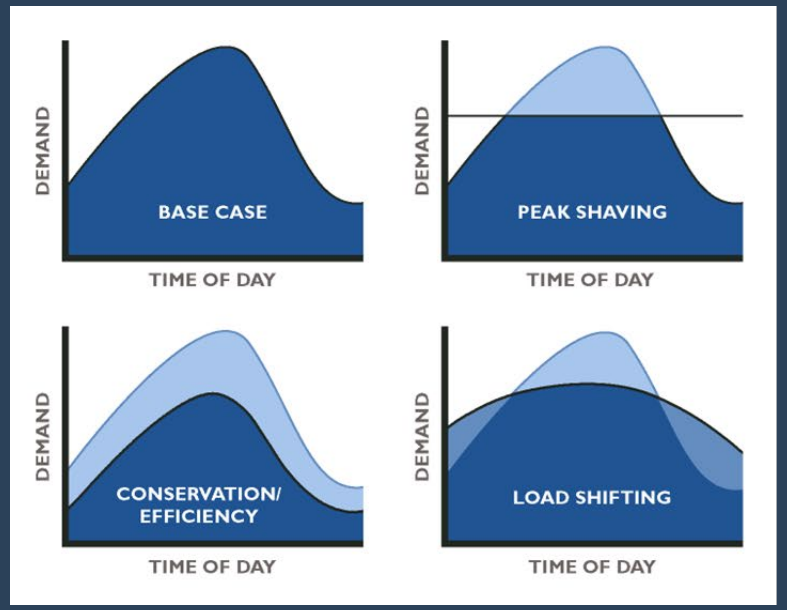

Source: Aurora Solar

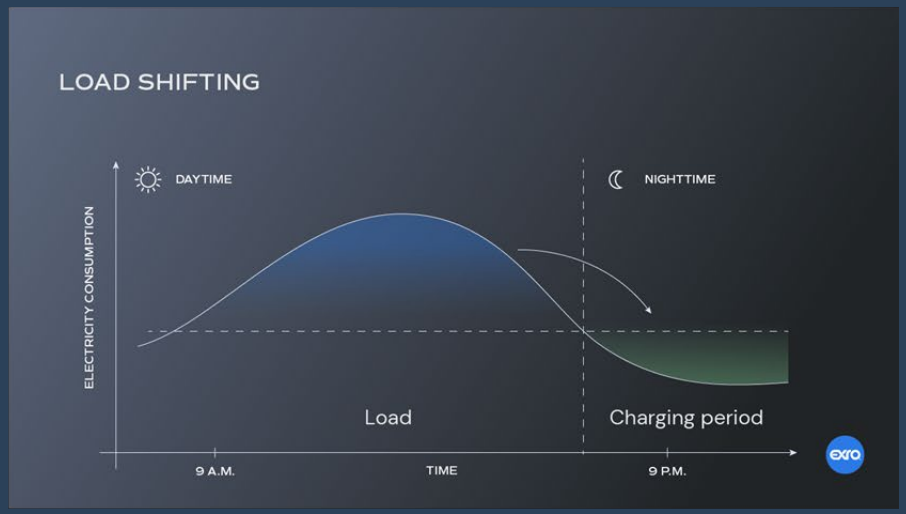
# Electric Utility System Planning

The system must be built to support the forecasted highest possible demand

Increased energy demand requires additional:

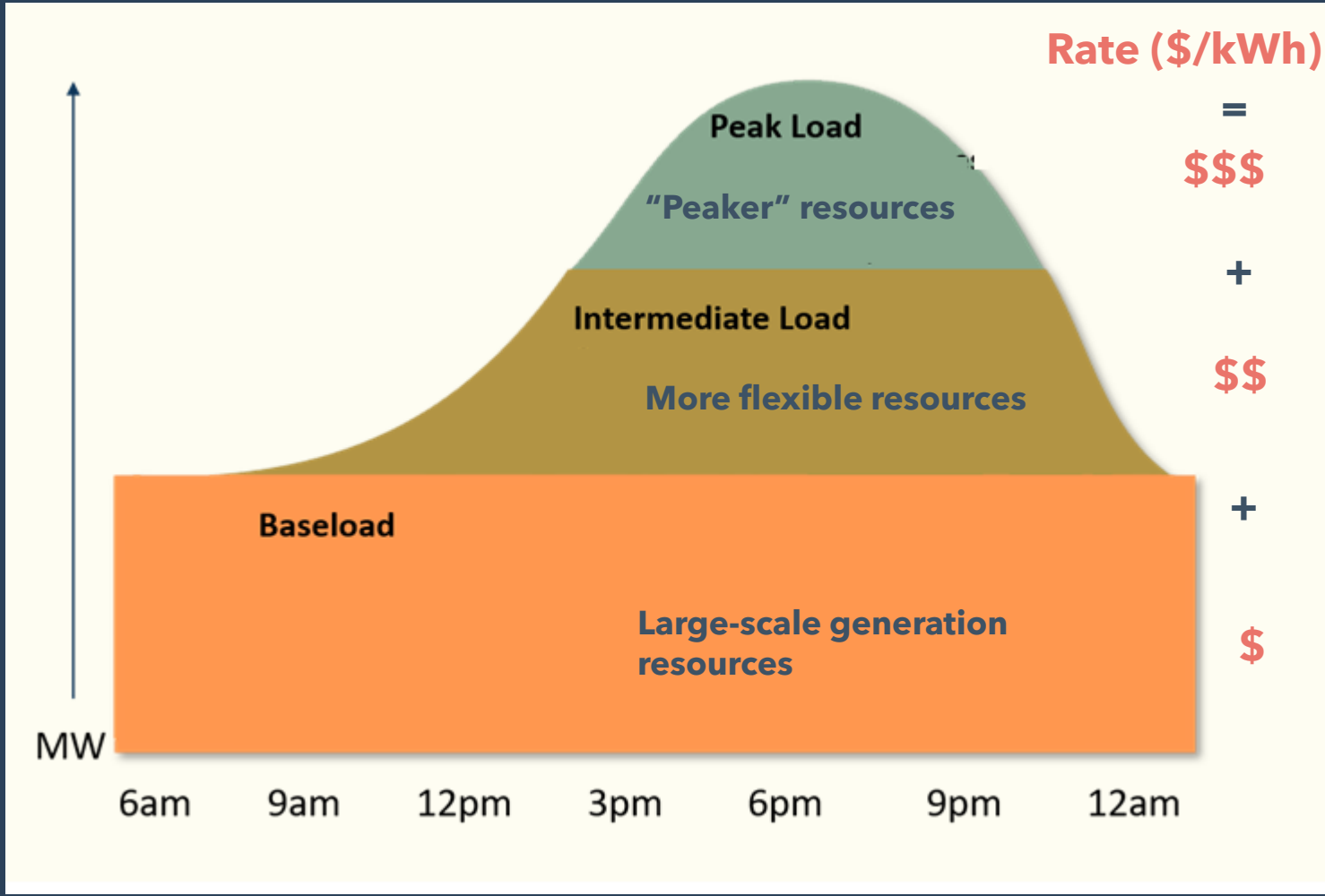
1. Physical Infrastructure | generation facilities and grid capacity
2. **Energy Efficiency and Demand Response |** encourage a change in the use of electricity



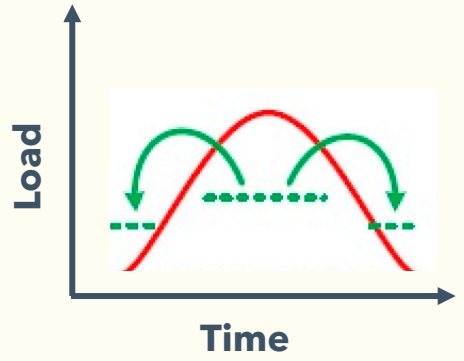
# Scheduling energy resources to serve load

Resources used only when loads are highest (a few times per year) can have high price impacts




## Demand Side Management

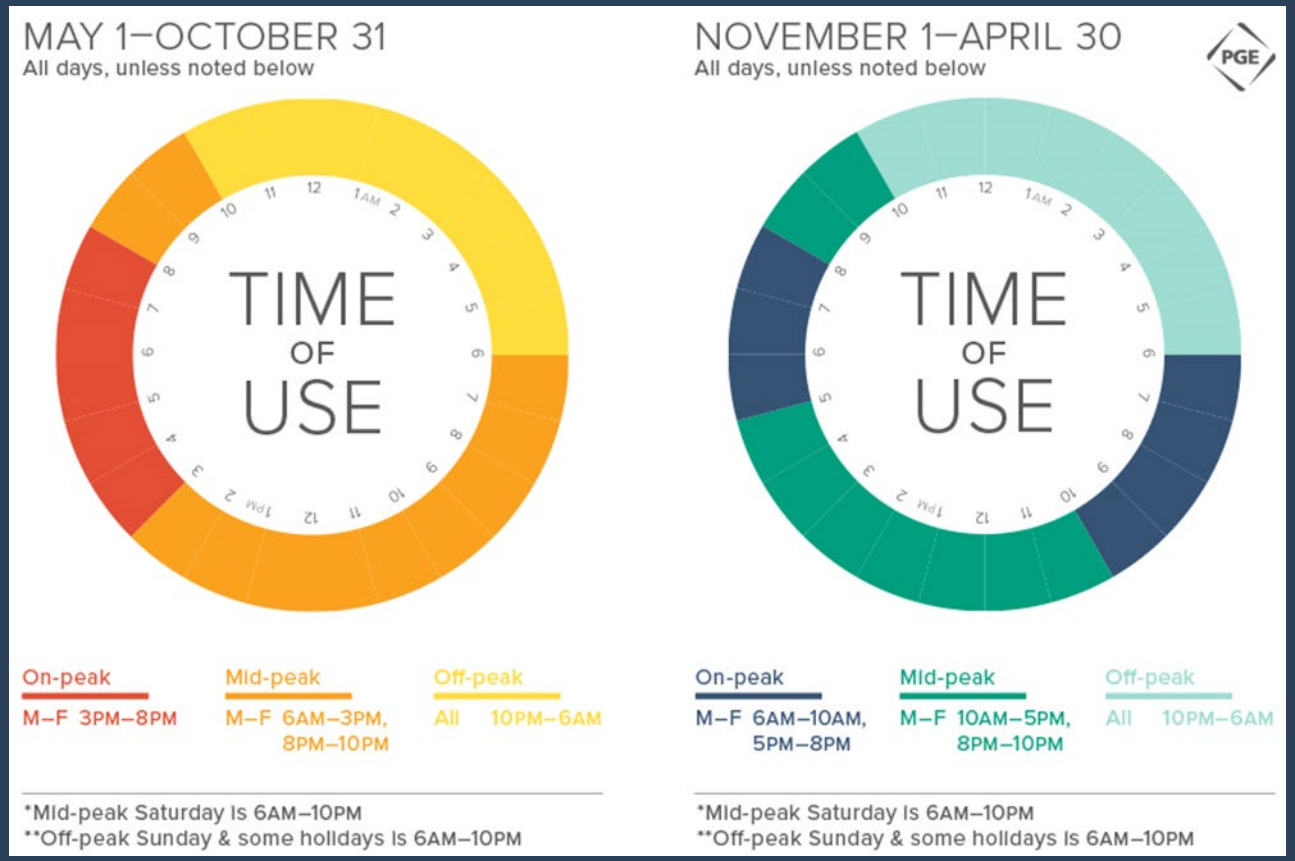
- Encourage a change in the use of electricity
- Move load from peak to off-peak
- Save customers money
- During extreme weather events can reduce the chance of brownouts and blackouts

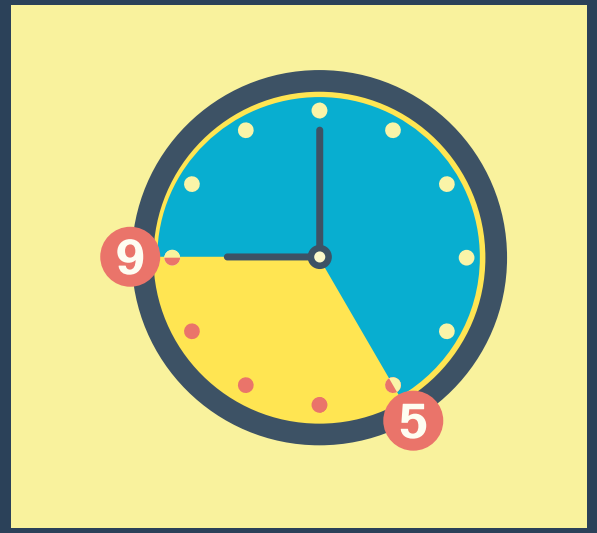


# Smart Devices enable load flexibility




# Utility product & programs can encourage a change on the use of electricity




**FACT:**
The national average customer participation on Flex Load Programs is 12%;
at PGE it is 22%.

# Demand Response (DR) Event Example
# Aug 4, 2021, from 5- 8 pm (3hrs)

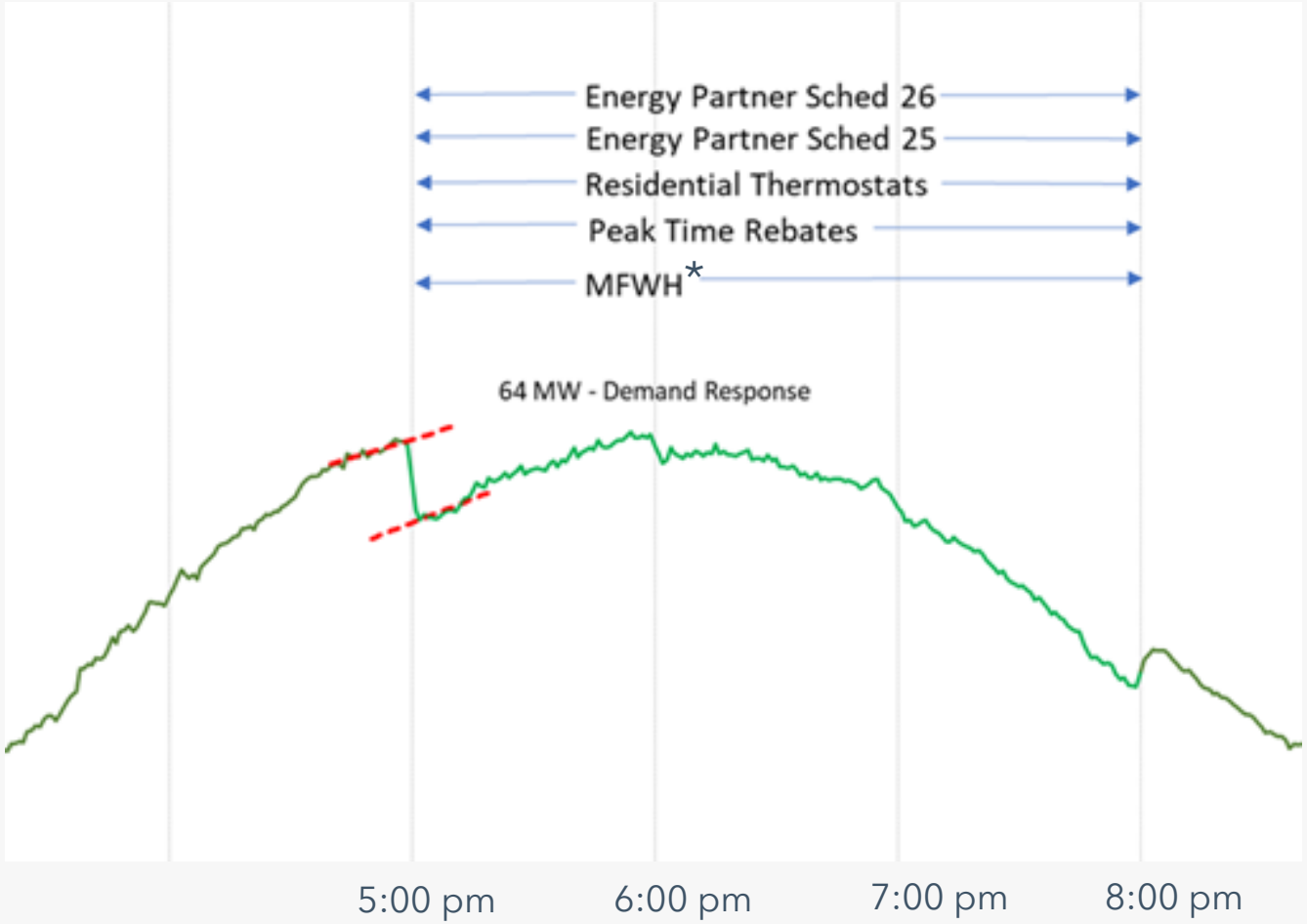
## Summer 2021

11 Events

- 4 events in June
- 2 events in July
- 4 events in Aug
- 1 event in Sept

Range: ~25 MW ~69 MW

"All call" events consistently delivered 66 to 71 MW




* MFWH: Multi-family water heater