

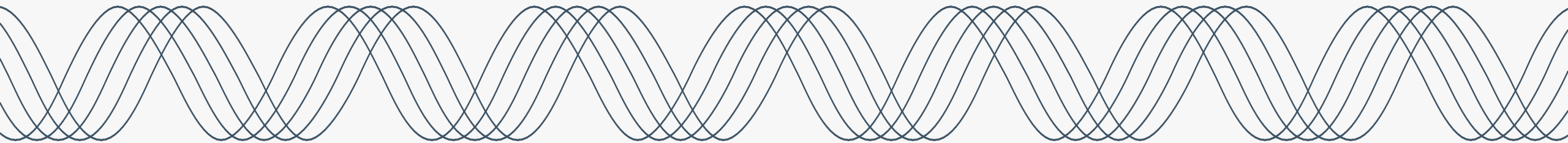


Portland General Electric Price Based Demand Flexibility Work

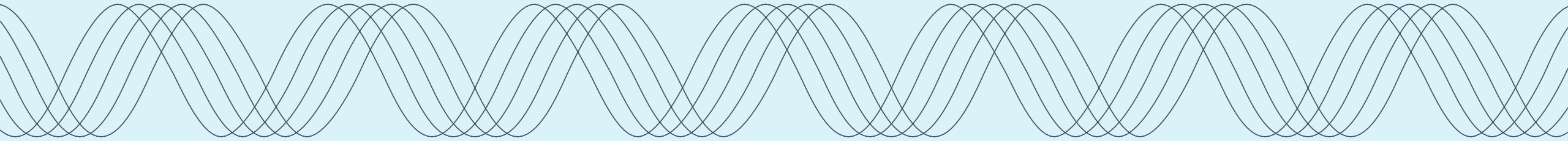
Jason R. Salmi Klotz, Sr. Manager Distribution Resource Planning, Strategy & Engagement

March 27th, 2024

ESIG 2024 Spring Technical Conference, Tucson, AZ



PGE has been exploring the connection between customer value propositions, program participation, event participation, dynamic rates and direct load control through a series of efforts over the course of the last 4 years



Smart Grid Test Bed Overview

SGTB Goals (Phase 1)

- Increase customer awareness of DR and Grid Operations
- Determine how to effectively engage customers
- Learn how to recruit and retain customers' participation in DR programs



ROSEWAY SUBSTATION



DELAWARE SUBSTATION



ISLAND SUBSTATION

Residential SGTB Engagement Activities

- SGTB Launch and PTR Autoenrollment (July 2019)
- CVP 1 Monetary Incentives (Oct-Dec 2019)
- CVP 2 Giving Back (Jan-Feb 2020)
- CVP 3 Carbon (Jul-Sep 2020)

SGTB Key Performance Indicator Goals

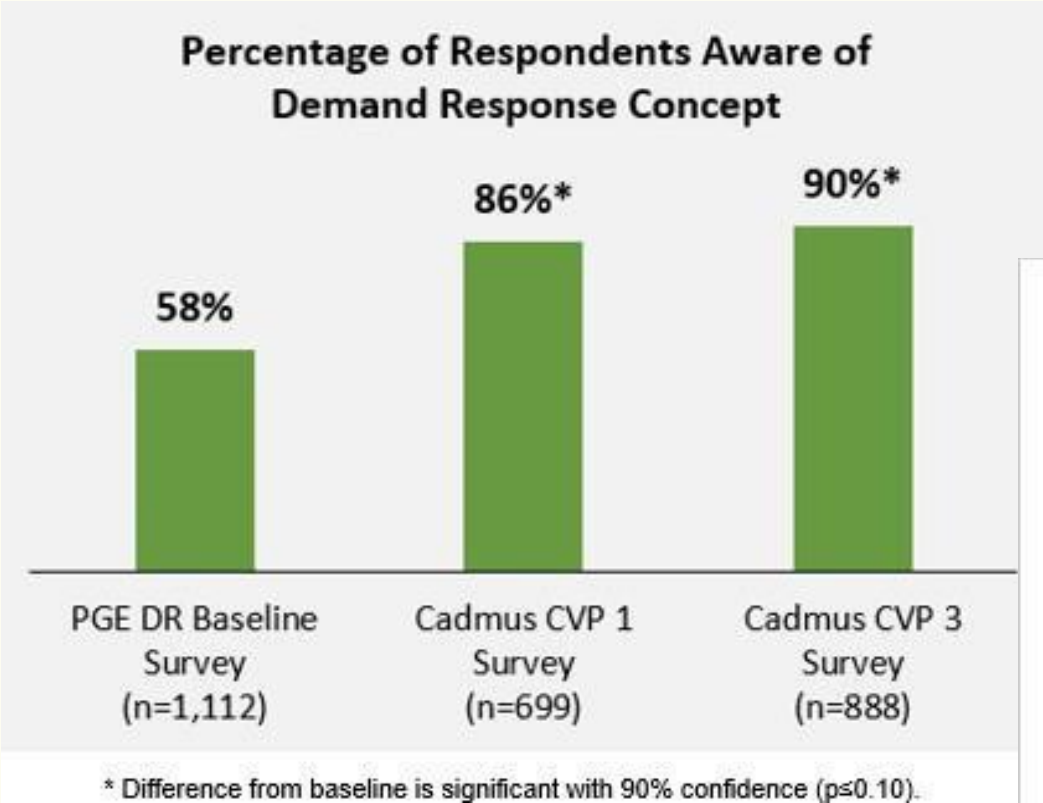
Achieved Goals

- PTR Event Participation (94% and 97% earned in summer; 62% earned in winter)
- PTR Event Demand Savings (0.06-0.08 kW)
- PTR Retention (approx. 95%)
- DR Awareness (86-90%)
- CVP 1: Smart Thermostat DLC Migration (3.6%)
- CVP 2: Giving Back Enrollment (2.3%)

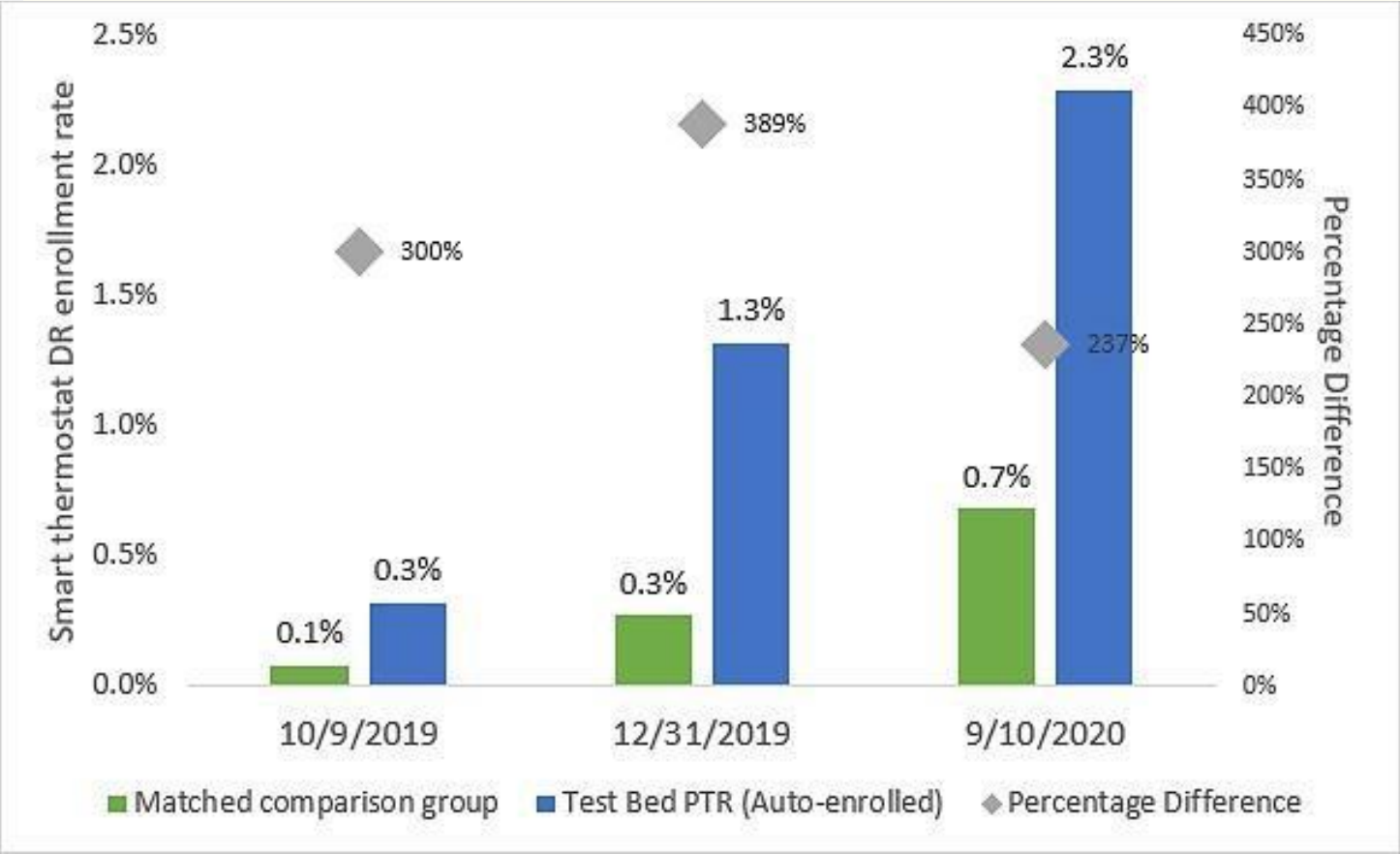
Partially Achieved or In Progress

- Grid Operations Awareness (2 of 5 topics increased)
- CVP 2 Awareness (29% open rate, 1% click rate)
- CVP 3 Awareness (43% recall, 55% reason for participation)

Awareness of DR among SGTB customers has increased over baseline



Auto-enrolling residential customers in PTR and encouraging them to migrate to smart thermostats tripled smart thermostat DR enrollments rates.



A close-up, low-angle shot of solar panels on a roof, with the sun reflecting off the glass surfaces. The sky is blue with white clouds.

SGTB Phase II

APPLYING CUSTOMER LEARNINGS FROM PHASE I TO GRID
PLANNING & OPERATIONS CHALLENGES

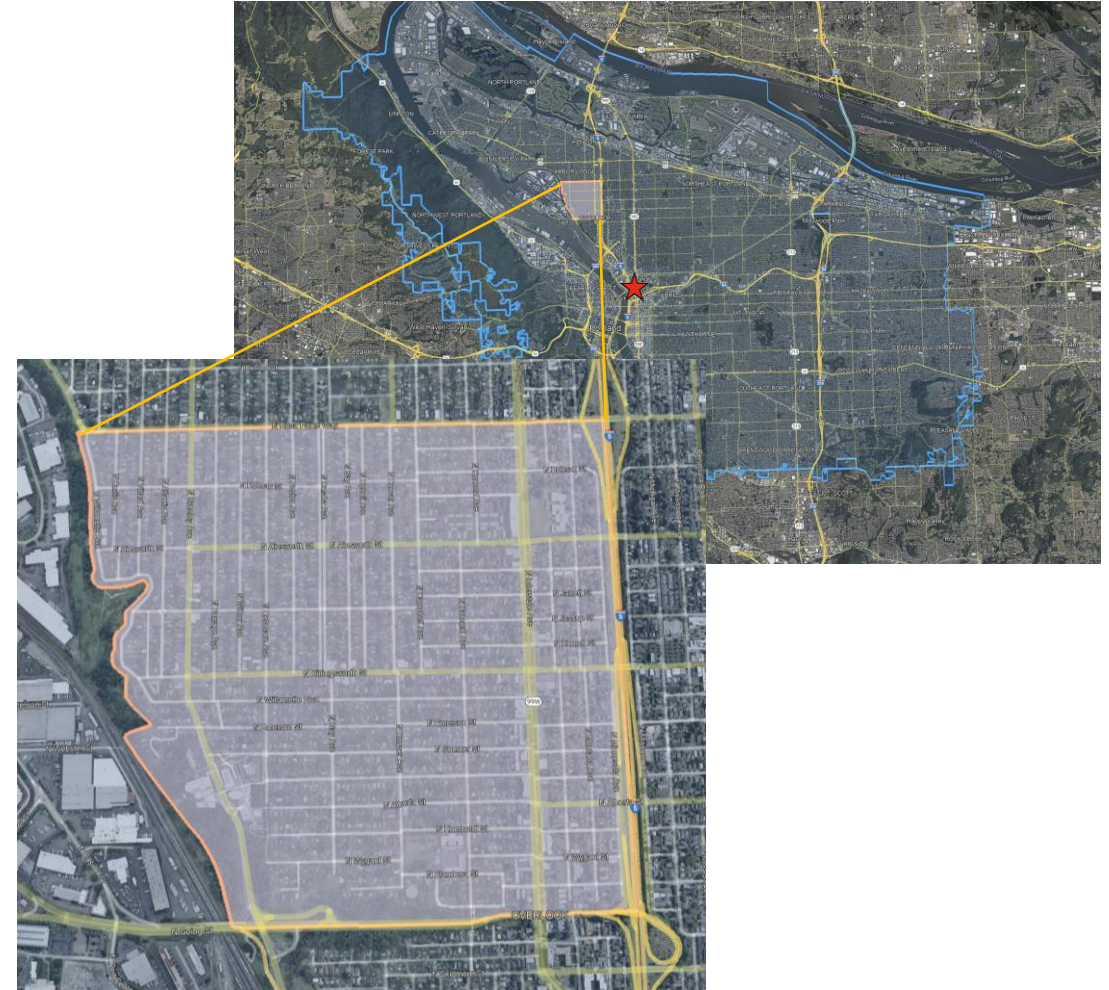
Smart Grid Test Bed Collaboration (SALMON) Study Area

Project Goal:

- Build a 1.4 MW flex load resource in the study area consisting of EE, connected devices, solar, storage, and EVs
- Demonstrate bulk services (energy, capacity and frequency response) and distribution services (capacity relief, power quality, and VVO/CVR)

Additional Project Learning:

- Program Design
- Customer Engagement
- New Partnership Models
- ADMS/DERMS Assessment
- DER/EE Value and Co-Benefits
- Building on Regional Sharing



Implementation Approach



Providing Additional Incentives

for prioritized measures in the project area to increase participation and enable efficiency projects to be “no- or low- cost” to all customers. Free Home Energy Score as entry point.



Streamlining the installation process by using select contractors (trade allies) who participate in commissioning training for all grid-connected devices.



Offering free retrofits and replacements to **low-income and BIPOC households** including weatherization, maintenance and safety repairs, deep energy retrofits, and water heater replacements



Customers will also receive enrollment and ongoing incentives to automate their smart devices, such as thermostats, water heaters, electric vehicle chargers and batteries, to work in concert with PGE as it operates the grid.



Small to medium businesses will be served through direct outreach where a single point person shares details on eligible improvements and incentives specific to their site.



Customer Journey Learnings from Phase I were used to inform a successful customer journey within Phase II particularly among low- income customers – Generally a sector customer who meets significant challenges participating in dynamic rates and DSM/DER programs



A clean future initiative



Distribution Grid Modeling

Two feeders that serve the community are modeled:

- Delaware-Denver
- Peninsula Park-Ockley Green

Feeder modeling:

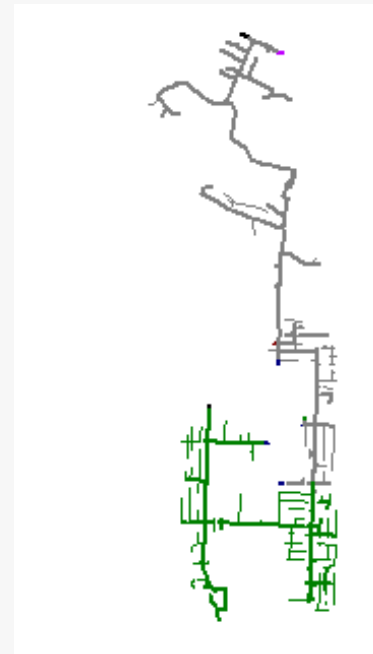
- Original models were in CYME
- Converted to OpenDSS and validated by comparing OpenDSS power flow results with that of CYME
- Used advanced metering infrastructure (AMI) data to create load profiles

4539 total loads in feeder model (Delaware-Denver and Peninsula Park-Ockley Green)

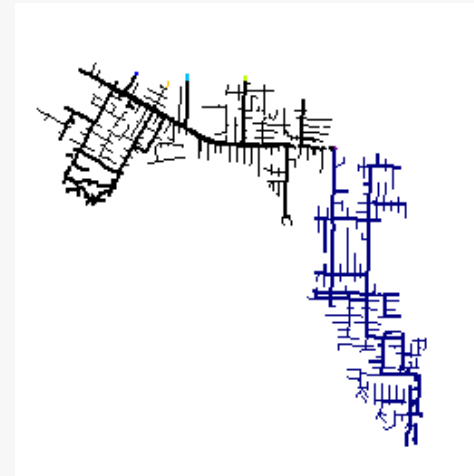
- 2056 nodes using default AMI profile
- 2483 nodes populated with 4164 building models
 - 1756 multi-family, 2408 single-family
 - HPC limit reached at 4094 buildings; need to work with NREL's HPC groups to add remaining 70 buildings (1.7% of total)

Simulation set up:

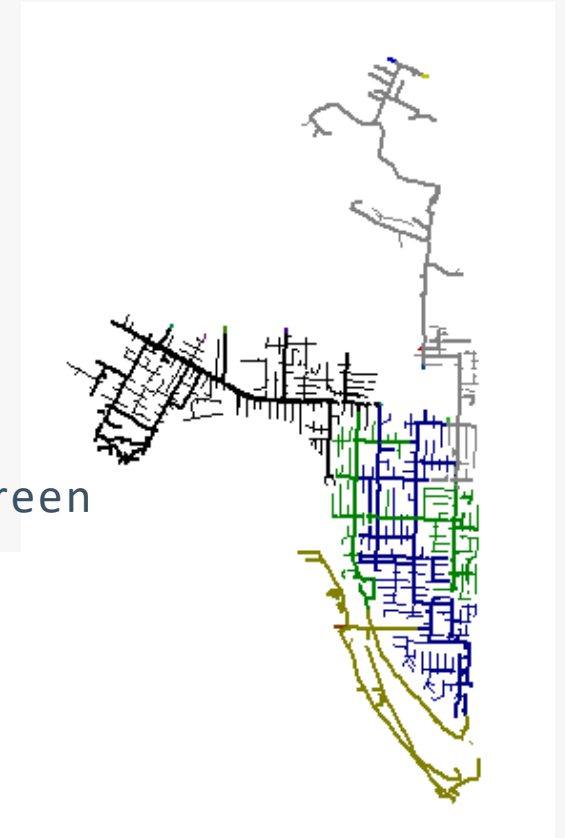
- 15-min resolution
- First week for each month



Peninsula Park-Ockley Green

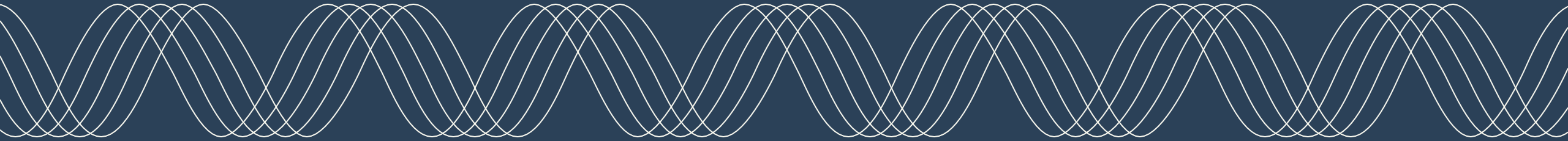


Delaware-Denver



Substation service area

Energy Trust – Deployment and Measure Coordination Partnership



SALMON Program Offer Priorities

Here PGE is exploring the braiding of energy efficiency and flexible load offering with dynamic rates and DER deployment and operations. The lessons learned from this activity are being shared with the Northwest Power and Conservation Council and are also informing the Northwest Energy Efficiency Alliance's new regional demand response market transformation work, of which PGE is an anchor tenant .

1. Offer all available Energy Trust Efficiency and Solar incentives
 - Right-size additional incentives to increase participation on priority measures
2. Prioritize Flex Load Equipment
 - Smart Thermostats for everybody!
 - Heat Pump Water Heaters
 - Smart Solar Inverter, Smart Battery Storage, and EVSE
3. Low Barriers to Participation
 - No pre-requisites: customers can pursue efficiency, flex load, or solar only projects
 - Community Energy Project serves all Low Income and BIPOC participants
4. Monthly payments for participation in Demand Response Program

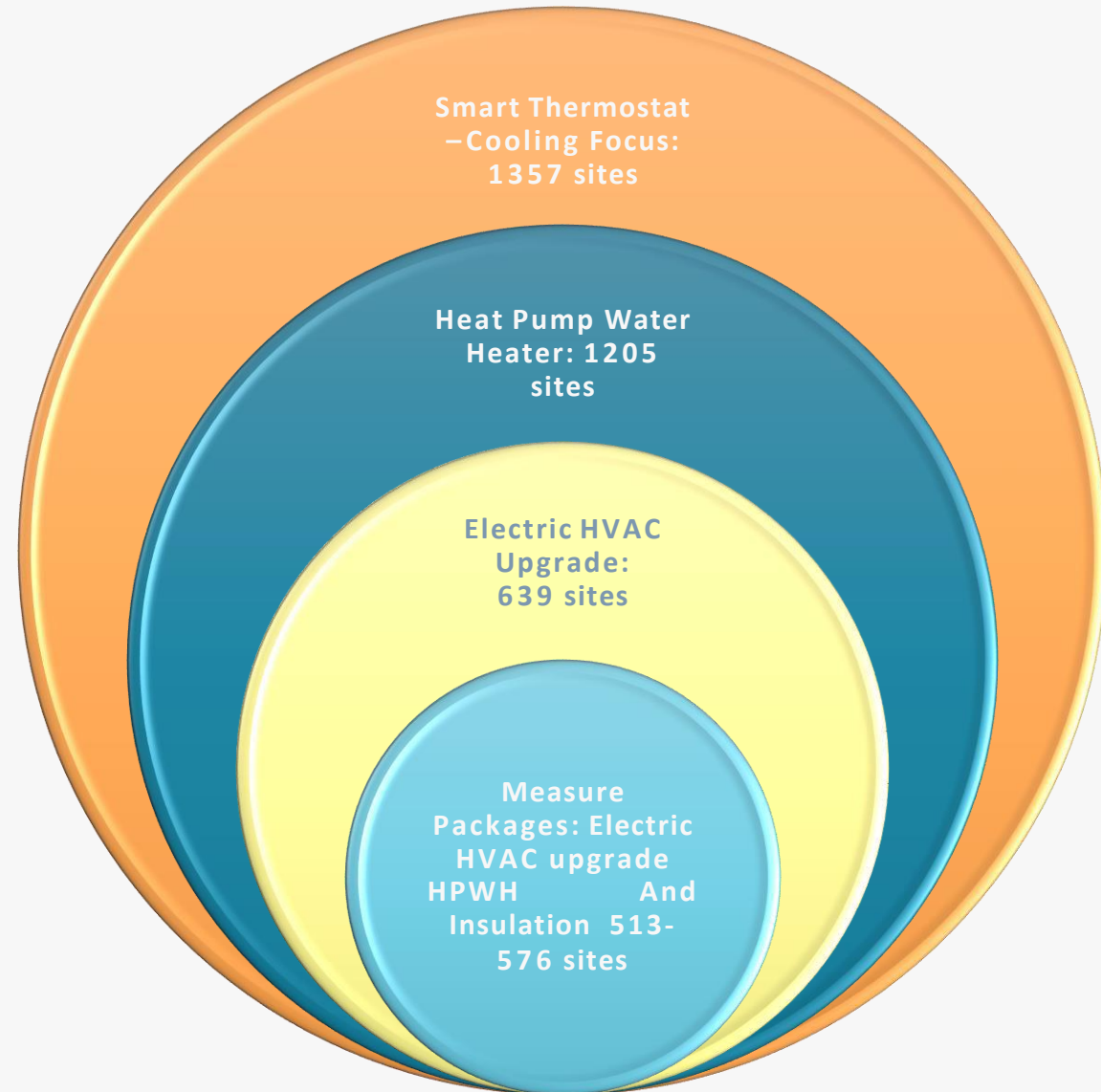


Residential Market Potential

Here we note the potential in the residential market for each prioritized measure group.

This data is based on the residential market analysis of existing equipment, age of homes, and previous participation in Energy Trust programming.

Prioritized Measure Groups



Go-To Market Overview

Homeowner Engagement

Energy Trust On-Line Home Energy Assessment

Free Home Energy Score Audits

Dedicated website and branding

Select Contractor Program

Efficiency/Flexibility Programming

Additional Incentives

HVAC Upgrades with Smart Thermostats

Weatherization

Water Heating Upgrades with Controls

Generation, Storage, and EVs

Solar PV Systems

Smart Inverters

Smart Batteries

Electric Vehicle Charging

Commercial Offering

Small Business Incentives

Multi-Family Offers

Schools/Community Centers

Adidas Storage Project (PGE)



EV Charging Study



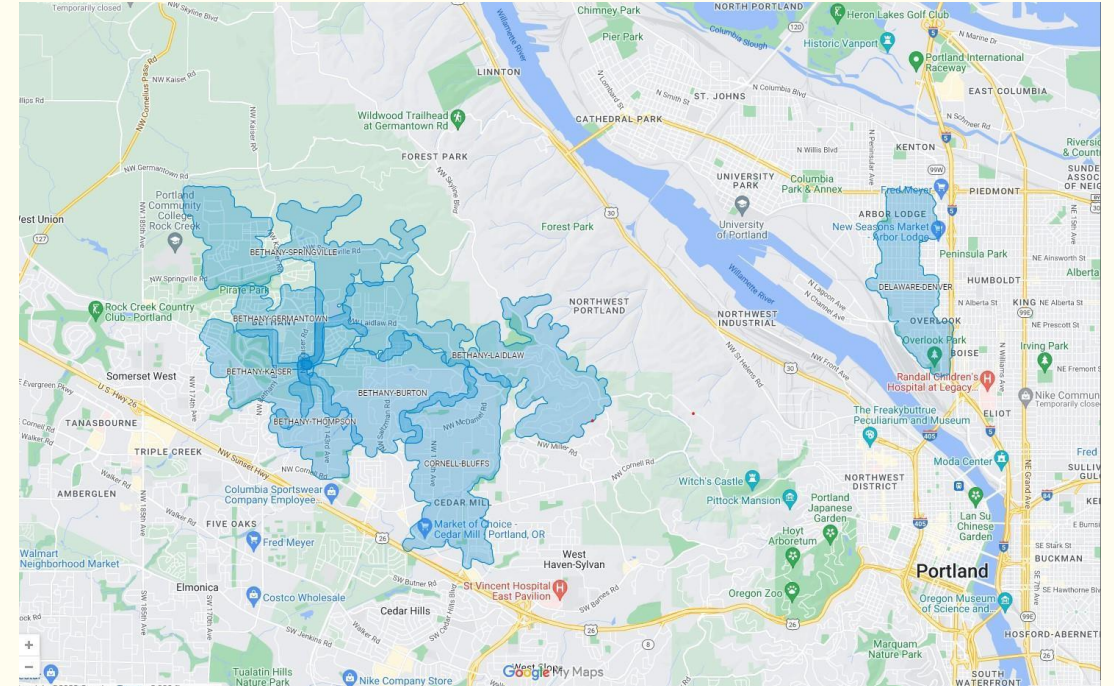
EV Charging Study: Overview

Approved use cases:

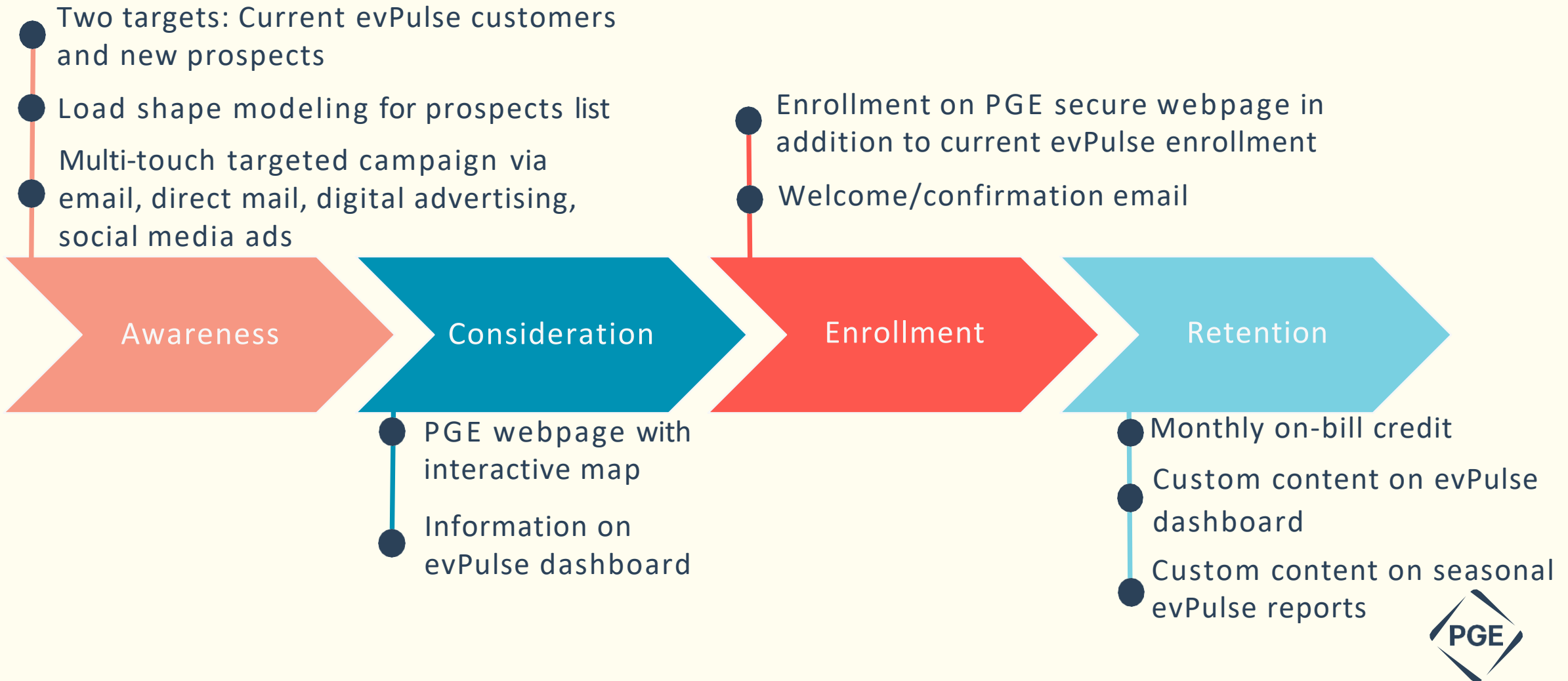
- Substation Transformer Loading
- Time-of-Use (TOU) Optimization
- Voltage Support
- Wholesale/Generation Following
- Net Metering Over-Production Curtailment

Incentive structure

- \$20/mo. bill credit
- No enrollment incentive
(customers will have already received one for joining PGE Smart Charging/evPulse)



EV Charging Study: Marketing

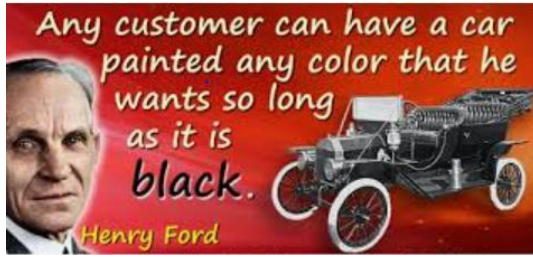




Residential Time of Day

Providing our customers choice and control

Project Kick-off: February 10, 2021



TOU: Choice & Customer Value

- Research shows that our customers prefer choice and want more control in how they manage energy costs
- TOU empowers our customers who want to use energy more efficiently, save money, and support a sustainable energy future
- Even if a customer remains on our existing rate, PGE has given them an option and confidence they are on the right plan for them
- Providing this choice reinforces PGE's position as a good energy partner and helps us demonstrate value to our customers



New 3-Tier Rate Design

- Revenue neutrality based on 5-year residential load profile
- Mid-peak price pegged to 9.9 cents/kwh is slightly lower than the standard rate

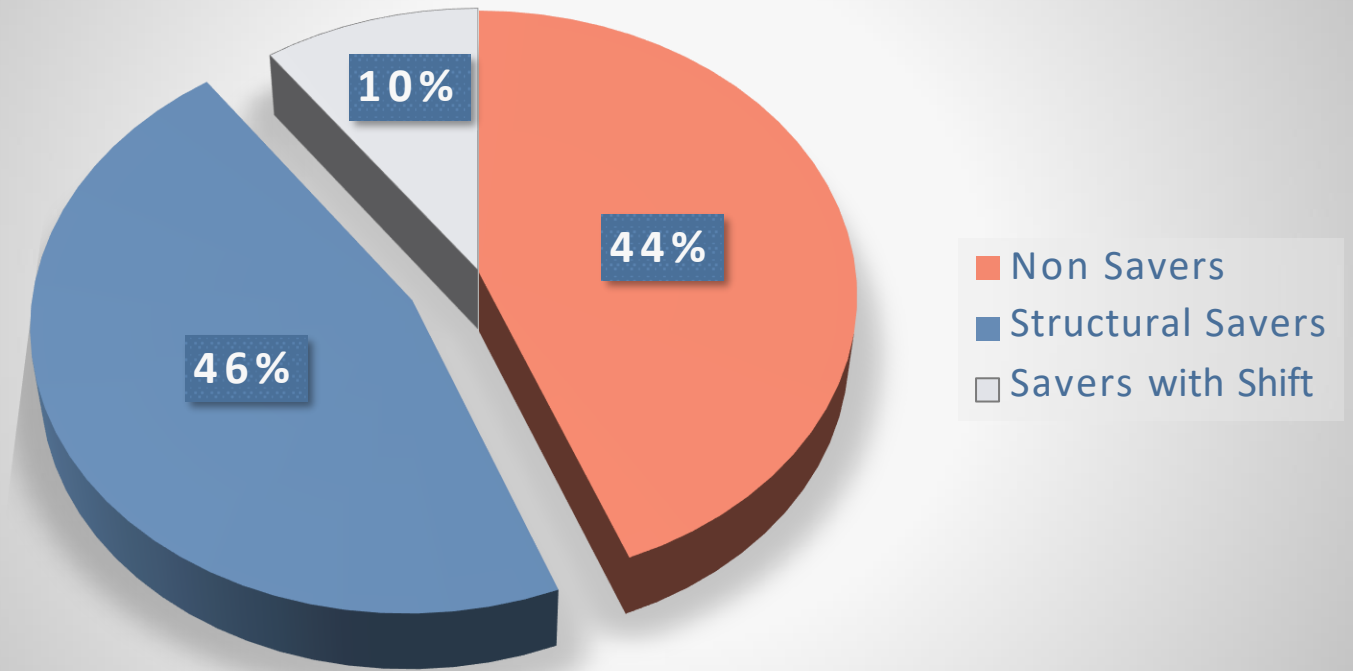


No seasonal change

Flex 2.0 – Rate Design	
Tiers	Pricing
Off Peak Includes holidays/weekends	7.651¢/kWh
	9pm - 7am
Mid Peak	9.900¢/kWh
	7am - 5pm
On Peak (Mon-Fri)	26.490¢/kWh
	5pm - 9pm

Potential & Target Customers – 30MW by 2030 or 224,000 customers

772K Residential Customers



432K Serviceable Addressable Market (56%)
Structural Savers + Savers with Shift

355K Serviceable Obtainable Market (46%)
Structural Savers Only

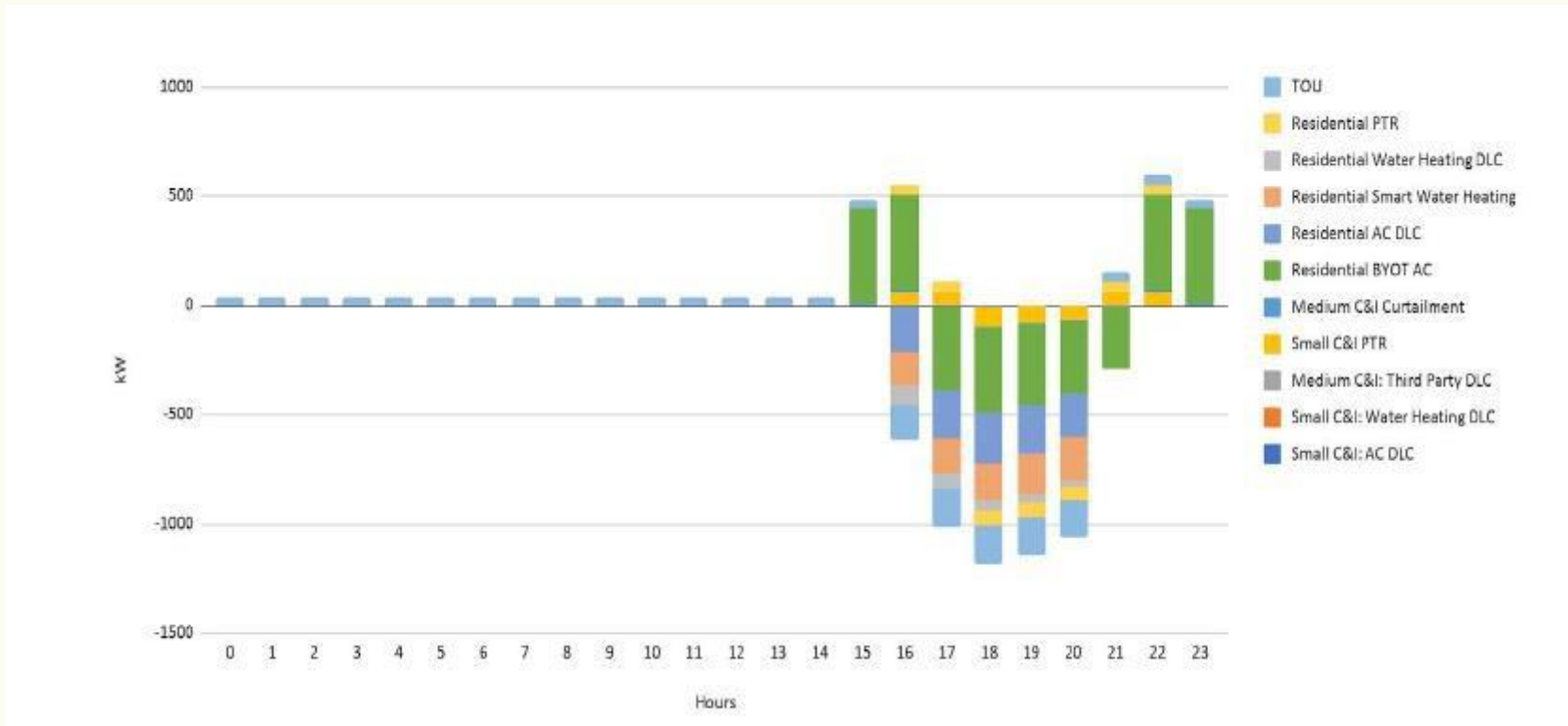
We will use micro-segmentation to identify the appropriate Serviceable Obtainable Market to help inform marketing.



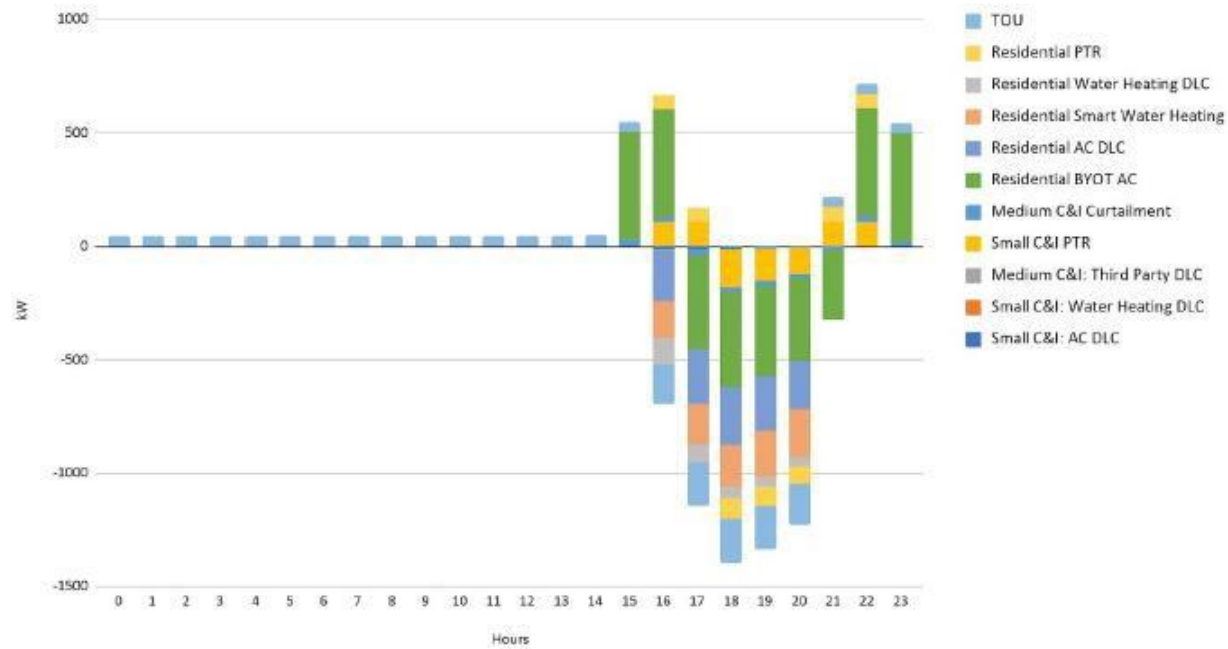


Local Resource and Operational Impacts of Rate + DLC

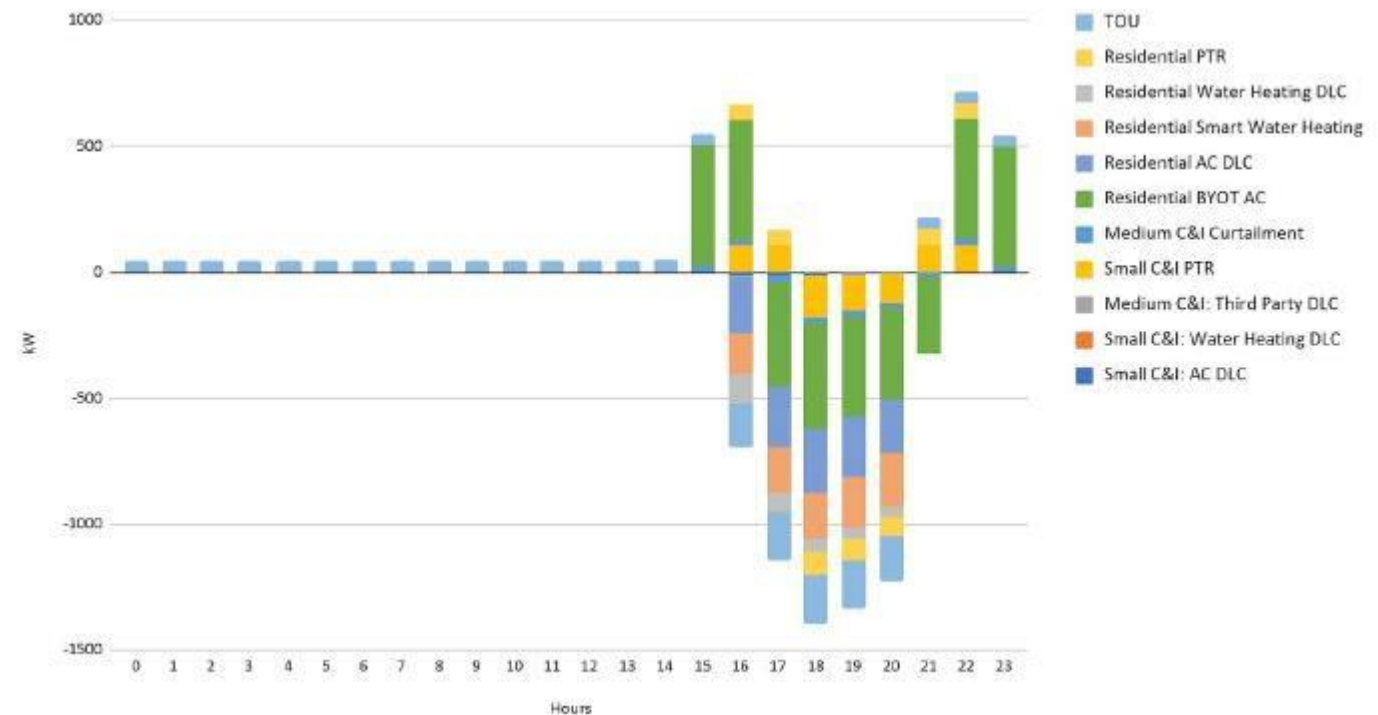
SGTB Island Substation TOU/DLC Stacked Benefits



TOU Rate at 10% residential participation. (On Peak 23.9cents/kWh, 4-9), (Mid 14cents/kWh 7AM -4PM), (Off peak 5.5cents/kWh 9PM -7AM), A/C, Space heating, SM Wtr heat, clothes dryer/washer, dishwasher) Summer Impacts.



TOU + DLC Values
and Impacts grow
through 2030 and
2035



Modeled Impacts of TOU plus DLC for Fleet and residential EV load in 2034 .



Peak 2034 COM Power Flow Before Mitigation



Peak 2034 COM Power Flow After Mitigation

Loading Level %	Color
0 - 80%	Blue
80 - 90%	Green
90 - 95%	Yellow
95 - 105%	Orange
105 - 150%	Red
150 - 999999%	Dark Red



Peak 2034 RESI Power Flow Before Mitigation



Peak 2034 RESI Power Flow After Mitigation

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kind of energy