

Orchestrating Programs and Rates for a Customer Centric Path to Clean

Tom Hines
ESIG Workshop
June 13, 2023

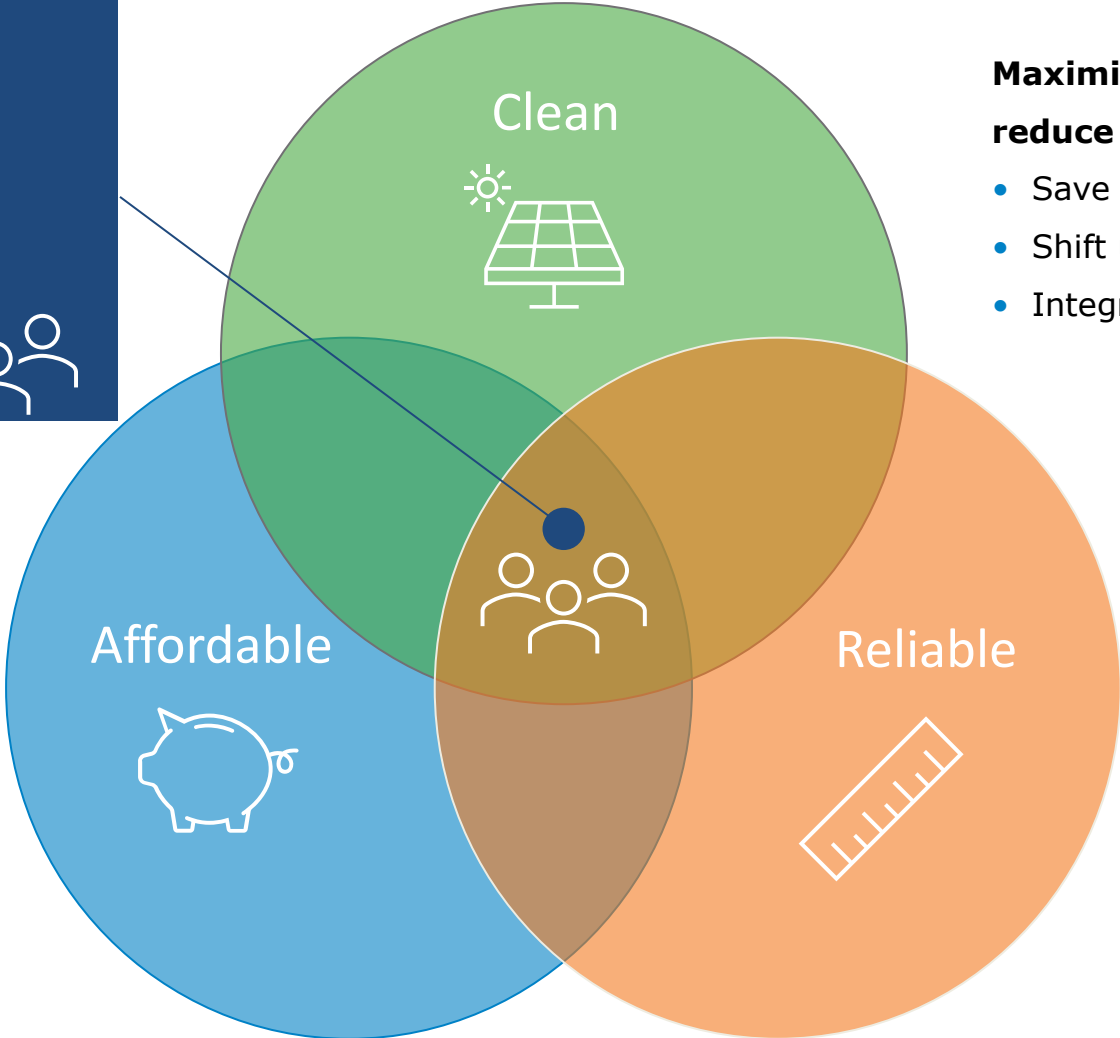


Customer-Focused Demand Management (DM) provides multiple benefits

CUSTOMER FOCUSED

Offer frictionless access to valuable DSM services

- Awareness
- Ease of participation
- Participation value
- Access to all

Maximize renewable resources and reduce emissions

- Save energy/reduce peak demand
- Shift use to align with clean energy
- Integrate solar

Help customers save with effective programs

- Help manage TOU rates
- Reduce DER tech costs
- Incentives for DR participation

Deliver reliable flexibility to assist system operations

- Flatten system load shapes
- Integrate intermittent renewables
- Manage peak demand

Approaches to Drive Customer Load Flexibility



Awareness/Behavior

Manual voluntary customer actions encouraged by messages of clean/reliable/affordable



Direct Dispatch

Modern Rates Benefit Customers

- ~70% of APS customers have opted for TOU rates
 - Lower energy costs for shifting load off-peak
- Price signals help encourage investments in DER
- Customer bill savings and environmental benefits for DSM, shifting, EVs & storage
- Helps align affordable & clean energy goals
- APS designs DSM/DR programs to coordinate with TOU rates

Hour Beginning	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12 AM												
1 AM												
2 AM												
3 AM												
4 AM												
5 AM												
6 AM												
7 AM												
8 AM												
9 AM												
10 AM	Super Off-Peak	Super Off-Peak	Super Off-Peak	Super Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Super Off-Peak	Super Off-Peak
11 AM	Super Off-Peak	Super Off-Peak	Super Off-Peak	Super Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Super Off-Peak	Super Off-Peak
12 PM	Super Off-Peak	Super Off-Peak	Super Off-Peak	Super Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Super Off-Peak	Super Off-Peak
1 PM	Super Off-Peak	Super Off-Peak	Super Off-Peak	Super Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Super Off-Peak	Super Off-Peak
2 PM	Super Off-Peak	Super Off-Peak	Super Off-Peak	Super Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Off-Peak	Super Off-Peak	Super Off-Peak
3 PM												
4 PM	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak
5 PM	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak
6 PM	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak	On-Peak
7 PM												
8 PM												
9 PM												
10 PM												
11 PM												

APS Rate Periods

- Super Off-Peak
- Off-Peak
- On-Peak

TOU Rate Plan Coach

Front page – TOU rate plans

400 North 5th Street,
Phoenix, AZ 85004

Home Energy Report
July 21, 2021
Account number ****0001

Find money-saving tips, tools and programs and products and services for purchase at:
aps.com/save

Your energy use at a glance

Fair **Good** Great

A closer look at your energy use
Jun 20, 2021 – Jul 21, 2021

Efficiency Zone up to 3,030 kWh

You	4,191 kWh
Similar Homes	5,352 kWh

✘ Your electricity use was not in the Efficiency Zone.

✔ You used 22% less electricity than similar homes.

Who are you being compared to?
Similar Homes includes homes in your area that have a similar square footage and heating/cooling type. The Efficiency Zone represents the similar homes that used the least energy this billing period.

Celebrate Earth Month

Get a free Google Nest Thermostat with instant rebates

Help the planet and your energy bill by getting a free Google Nest Thermostat with our Earth Month offer. Here's how it works:

- Visit the APS Marketplace, and add the thermostat to your cart.
- Select "Join the Cool Rewards program."
- Instant rebates cover the \$129 thermostat. You pay taxes and shipping.

➔ Get your free thermostat at myaps.store/freetstat.

Offer good while supplies last. 4/8-5/14/2021.

Tips to help you manage your usage

Use a plug-in power meter to find the biggest energy users in your home

Talk with your household members about your energy savings plan

Turn over ➔

Back page – TOU Rate Plan

Your average daily use during off- and on-peak hours

Save with lower-cost off-peak hours, before 3 p.m. and after 8 p.m., Monday-Friday. On weekends, save with off-peak hours all day.

Weekdays

Weekends

The shorter your orange bars, the more you can save on your bill. If your orange bars are high, look for more opportunities to save.

3 easy ways to save this winter

Set your thermostat to 68°F when at home and 60°F when away on winter vacation.

Weatherstrip windows and doors to keep warm air in and cold air out.

Go online to see your energy patterns and where you can use less.

➔ Find more tips at aps.com/save.

Frequently asked questions

What's a kWh?
A kilowatt hour (kWh) is a way to measure electricity use. A 100-watt lightbulb uses 1 kWh every 10 hours.

How does my home compare to similar homes?
Similar Homes includes homes in your area that have a similar square footage and heating type. The Efficiency Zone represents the similar homes that used the least energy this billing period. You can view your home information at aps.com/energyreports.

Want a more accurate home energy report?
For a more accurate look at your energy use and more personalized tips, please update your home profile at: aps.opower.com/es/v/homeprofile

Why am I receiving these reports?
You've been selected to participate in our Home Energy Reports program, which provides personalized insights and recommendations to help you save energy.

How do I stop receiving reports?
Email us at ape@aps.com. You can also call us for assistance at (802) 371-3659 (in Metro Phoenix) or (855) 250-1668 (Outside Phoenix).

Printed on 100% post-consumer recycled paper using water-based inks.

We're here to help you save money

➔ Visit us at aps.com/energyreports

Find more energy saving programs

➔ aps.com/save

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Customers are Responding to Rates

Graph displays HVAC usage load shapes taken from smart thermostat telemetry data from various OEM devices on 6/5/23. This was a TOU day with no DR event being called.

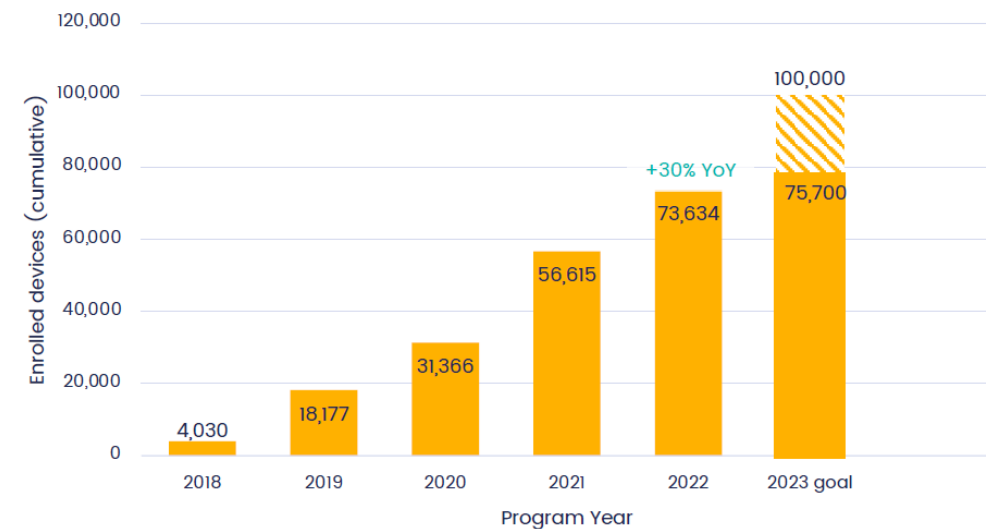


APS Has One of the Largest Aggregated DER Device Programs in the Nation

- **Cool Rewards Smart T-Stat DR**
 - Nearly 80K thermostats enrolled
 - Forecasting over 120 MWs in 2023
- **Residential Battery Pilot**
 - ~4 MWs currently online in pilot
- **Peak Solutions C&I DR**
 - Forecasting up to 50 MWs in 2023
- **Connected Water Heating Control Pilot**
 - Water heating timed around TOU rates
 - Daily load shifting with MF households

Rapid Cool Rewards Growth Continues

30% YoY enrollment growth in 2022



Rate Enabled Demand Management | Multi-Family Homes

Connected Water Heating Controls Pilot

- Wi-Fi connected retrofit controls for electric water heaters
- Allow water heating to be timed around TOU rates
- Customer bill savings with TOU/demand rates
- Reduce peak demand, integrate carbon free midday solar
- **Equity effort to provide DER benefits for renters**
- Future potential = voltage and fast frequency response



DR/TOU Integration Principles

- Assume all DR participants are on TOU rates
- Build DR designs that work around TOU rate periods to provide further flexibility
 - Weekends
 - Addressing TOU snapback
 - Non-peak operational needs
- Clear customer communication is key – Example: APS 'Cool Rewards Promise'



Thank you for being a part of the APS Cool Rewards community! As temperatures continue to rise, we want to remind you what to expect this season.

Help your community

Between June 1 - September 30 when summer conservation events will be held to help maintain

Stay comfortable

Efforts during conservation events are minimal, by a few degrees during the event and will result of an event.

Your choice

Remember, if the temperature in your home feels can opt out of a conservation event by simply ad

Enjoy saving

As a thank you for your participation, look for a thermostat at the end of the summer.

FAQs

If you have any questions or would like to unenroll, please email us at aps@energyhub.com

Cool Rewards Promise

As your partner, we promise:

- Conservation events are held during times of high energy use and you will be notified in advance.
- Conservation events are designed to help preserve your comfort.
- You are always in control of your thermostat and can adjust it at any time.

Refer a friend

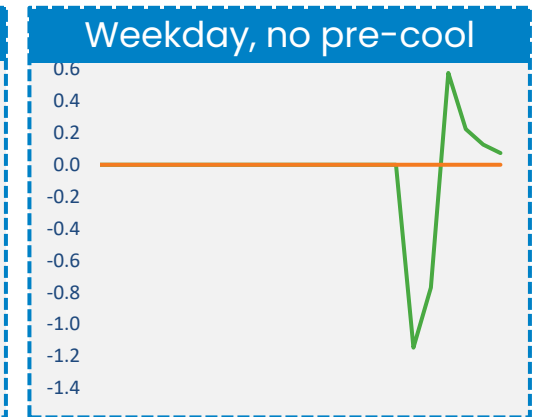
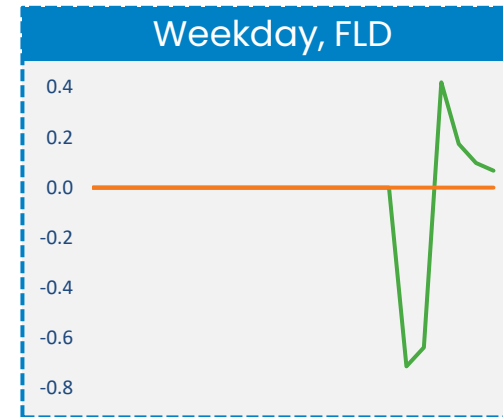
Take your impact to the next level! Help your friends earn \$50 by inviting them to join Cool Rewards. Share this link to get them started:

enrollmythermostat.com/apscoolrewards

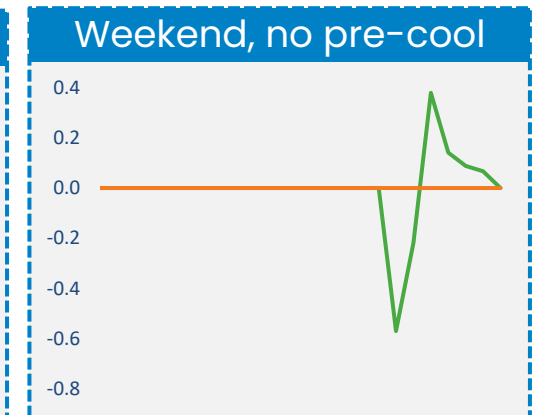
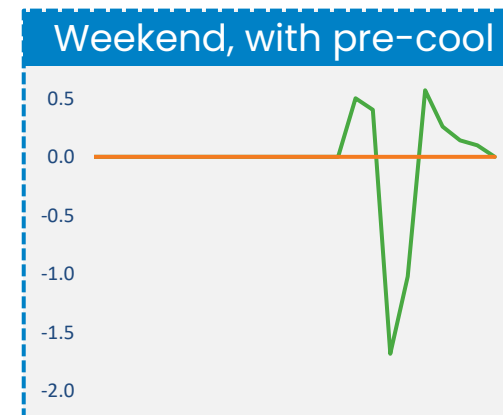
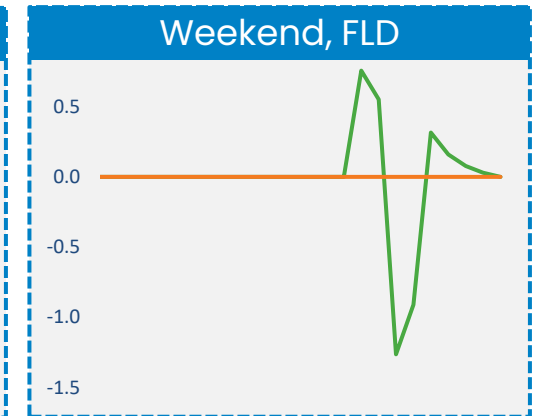
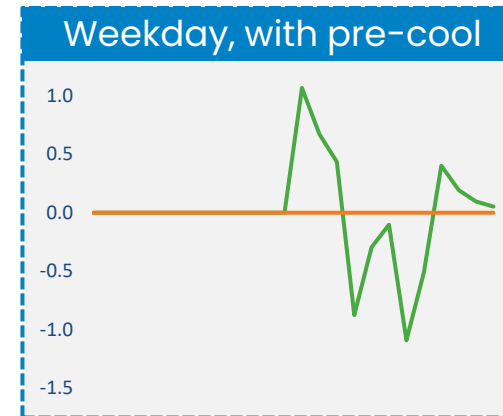
Multiple load curves to meet multiple needs

Cool Rewards Smart Thermostat Demand Response Events

- Thermostat Capabilities
- Customer Comfort
- TOU Rates Interaction
- Resource Value
- Decarbonization Value

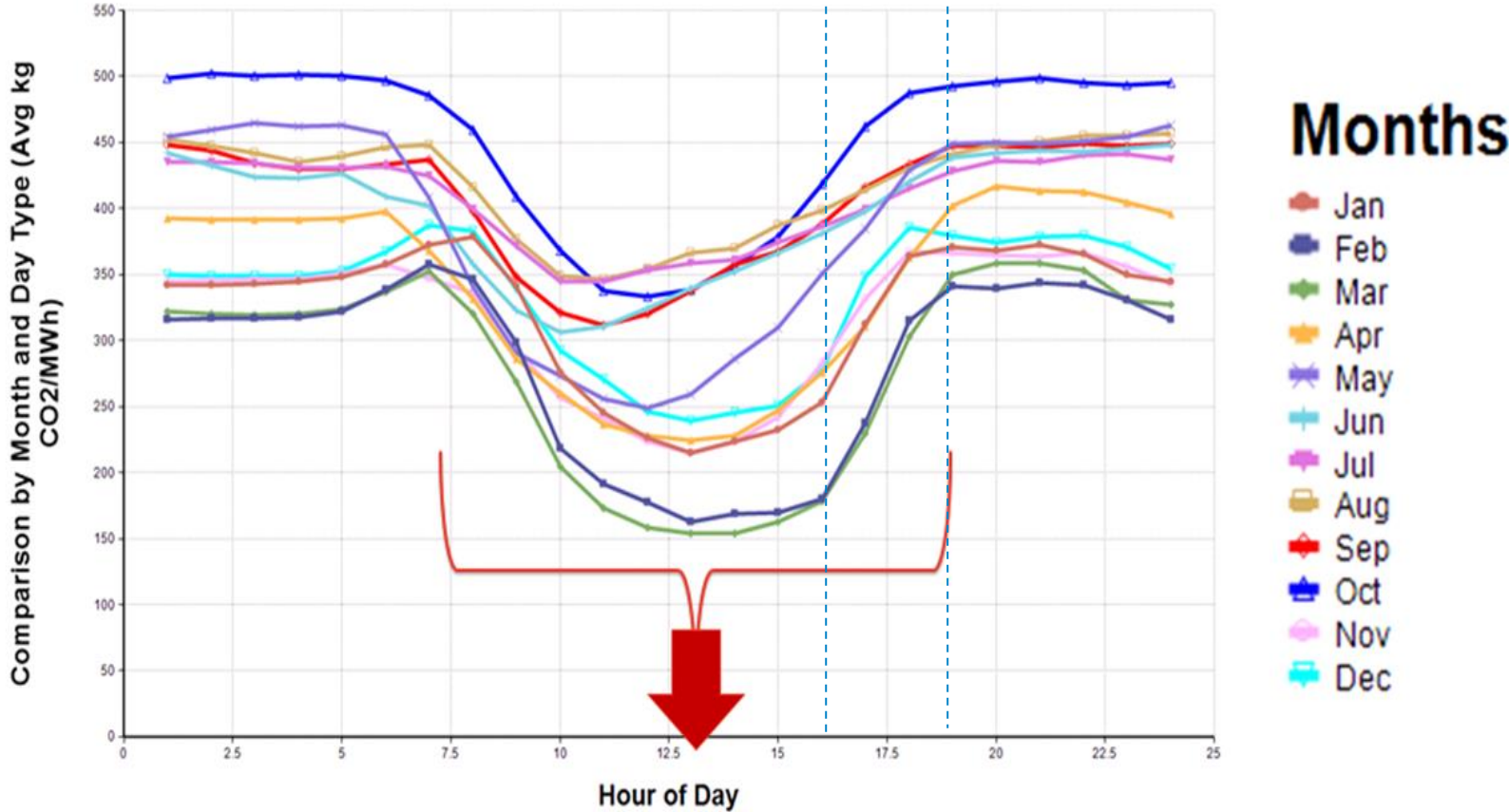


FLD = Firm Load Dispatch



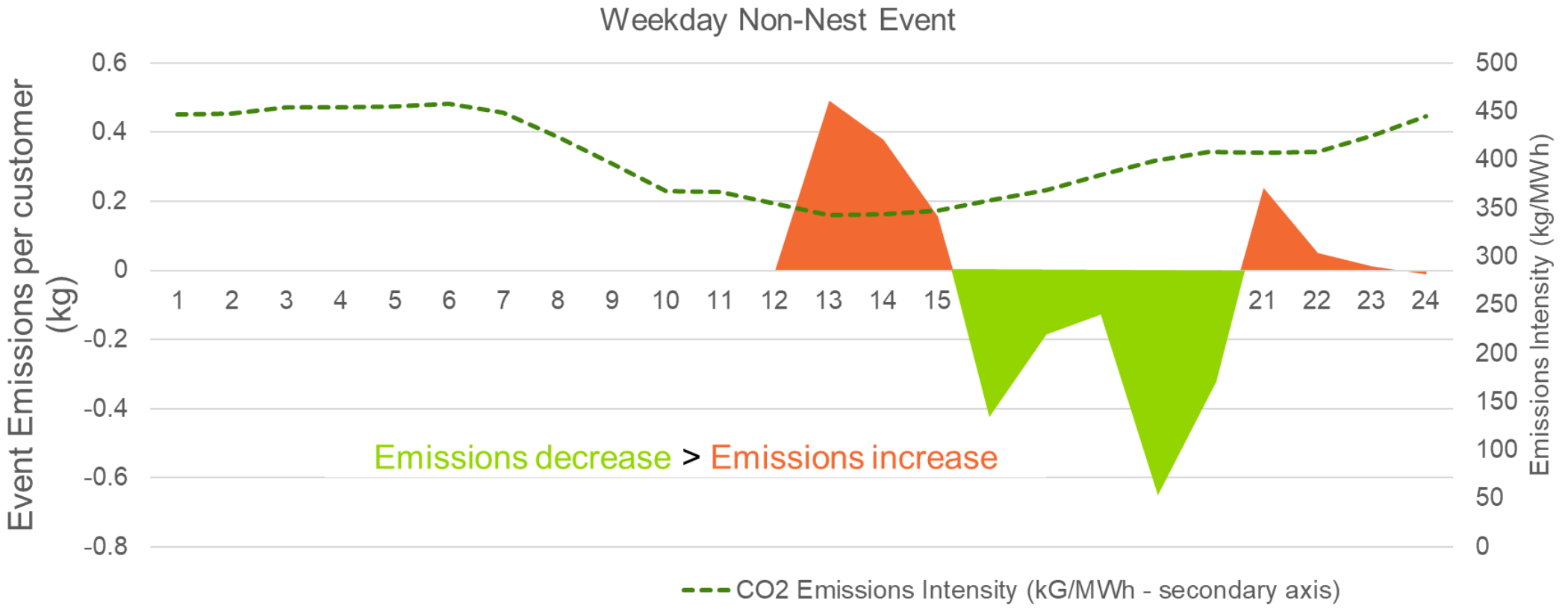
Forecasted carbon intensity by time period

Average emissions intensity is lower in the mid-day for all months in 2024.



Cool Rewards Smart T-Stat DR Helps Achieve APS's Clean Energy Commitment

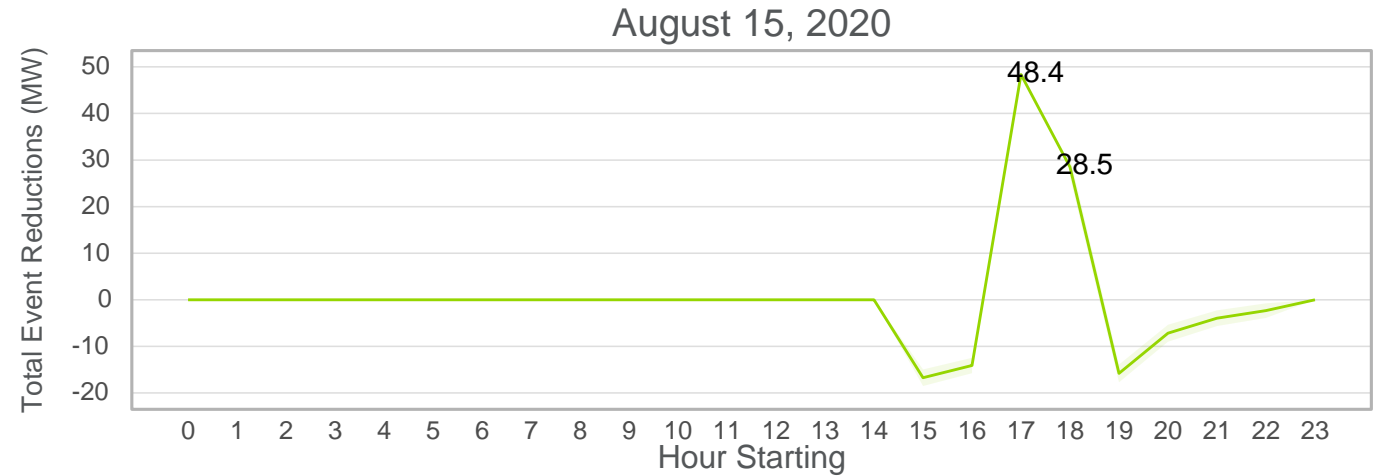
With pre-cooling, consumption is shifted to the mid-day when emissions intensity is lowest, resulting in a net reduction of -0.31 kg CO_2 per customer = $\sim 40,000 \text{ lbs/event}$



Cool Rewards Reliable Load Reductions

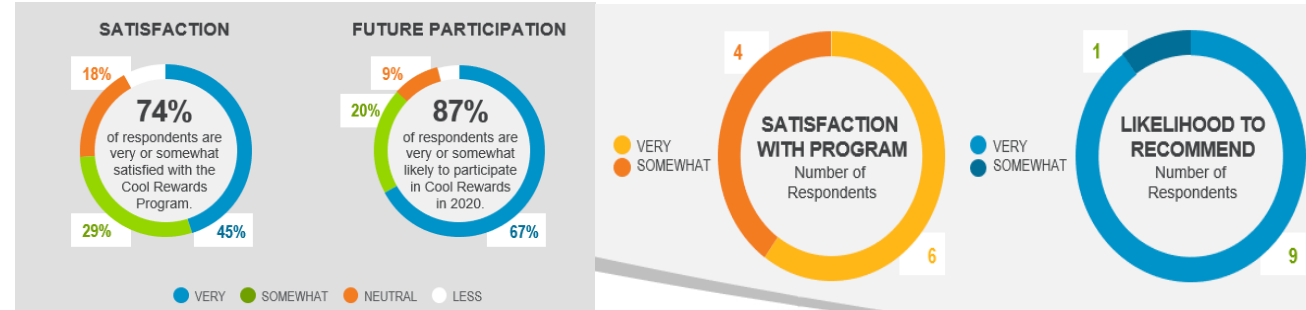
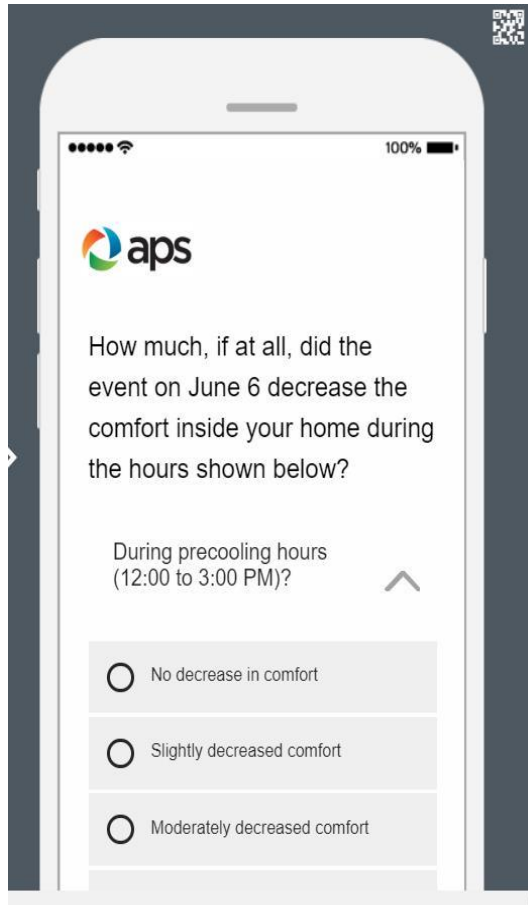


- *The reductions presented here reflect actual impacts observed at the generator from four events held over five days in August 2020.*



Event Date	Average per Device Reductions Over the Event Period	Total Average Event Period Reductions	Total Peak Hour Reductions
14-Aug-20	1.25 kW	29.9 MW	37.9 MW
15-Aug-20	1.61 kW	38.6 MW	48.4 MW
17-Aug-20	1.19 kW	28.7 MW	35.8 MW
18-Aug-20	1.17 kW	28.2 MW	34.9 MW

Customer-Focused | Participant Surveys



Participant surveys for all programs help deliver positive customer outcomes and ensure satisfaction. Priorities include:

- Minimizing comfort impacts of DR events
- Ensuring customers understand the program objectives and benefits to them
- Reducing barriers to participation with easy and intuitive customer interfaces

Key Elements of TOU/DR Integration

- Focus on customer interaction and engagement
 - Awareness, integrated messages, reasons for participation
- Carefully design DR program strategies
 - Understand impact of DR events on TOU rate plans
 - Avoid double compensation for the same grid services
- Support customer adoption of enabling technologies (DR and rate optimized)
- Assist in proper tech setup and configuration for DR and TOU rates
- Use device telemetry and AMI data to accurately evaluate hourly load shapes



Challenges of a Combined TOU/DR Approach

- Baselines based on TOU response appear to reduce DR impacts
- Need to ensure we are not double compensating for the same service
- Protecting TOU rate impacts limits flex of when DR events are called
- Potential customer confusion in messaging between TOU and DR
- Higher potential for customer fatigue from DR events



Advantages of a Combined TOU/DR Approach

- TOU provides economic signal to encourage customer DER investments
- Enables better customer paybacks from bundled EE/DER packages
- Can drive increased participant value from DR events
- With proper messaging and tools, TOU can help support DR response



Lessons Learned

Customers

Thank You!

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