Virtual Peaker

SMUD

PowerMinder Device Optimizer

Demand Responsiveness Decreases Cost and Carbon

Learn how SMUD is optimizing hot water heater efficiency without sacrificing customer comfort and value using the Virtual Peaker platform and Shift's real-time control system.

CASE STUDY

SUITES USED

Shift Relay Envision

SMUD®

PowerMinder Device Optimizer

Overview

Sacramento Municipal Utility District (SMUD), based in Sacramento, CA, recently introduced universal time-of-day (TOD) rates to all of its customers. Working with Virtual Peaker, the city-owned electric utility wanted to demonstrate how household energy consumption responds to price signals and keeps customers' utility bills low. At a time when flexible assets are even more important to grid reliability, demand-responsive programs help SMUD meet aggressive operational objectives -- including meeting its net-zero carbon goal by 2030.

SMUD customers who enroll in the new PowerMinder program share control of their heat-pump water heaters (HPWH) and an individualized, demand-responsive algorithm optimizes their device's energy use. Virtual Peaker's proprietary technology learns household consumption patterns and then optimizes power usage in response to TOD pricing, power demand, and customer preferences.

How PowerMinder Works

1. PowerMinder heats your hot water when it's most cost-effective.

2. Hot water is always available when you need it.

3. You always have ultimate control over your device settings.

4. Enjoy watching your energy savings month after month.

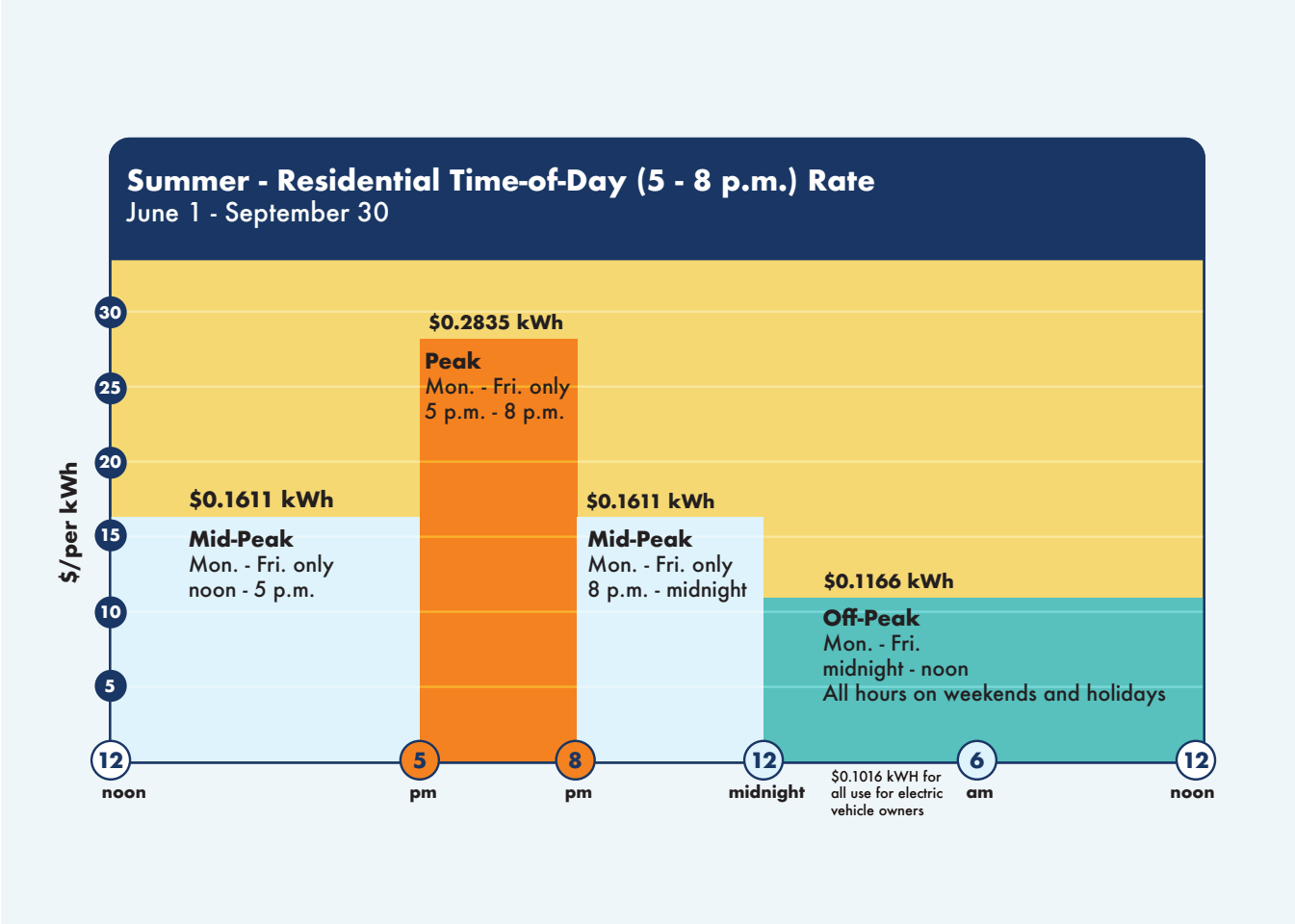
SMUD®

The Objective

SMUD is one of the few utilities in the country to implement universal TOD rates for its customers. This poses operational opportunities but also increases the need to have automated, flexible resources available.

When customers consider their household energy use, water heaters are typically not top of mind. Yet, water heating ranks as the second-highest energy-consuming appliance in the home. At the same time, customers expect hot water to always be available and don't want to sacrifice comfort.

Because customers use hot water at limited hours of the day, and those hours mirror the hours of the day when TOD rates are higher, the challenge lies in the ability to offer utility customers a product or service that helps them defer their hot water heating to less expensive times of the day.



The Program

PowerMinder uses the customer's WiFi-enabled water heaters to send control signals and return device data into the cloud. To recruit participants, SMUD identified customers from a pool who applied for energy efficiency rebates when purchasing eligible devices. Customers chosen for the pilot received a $150 up-front credit for signing up and a $2/month participation bill credit.

Importantly, the demand-responsive control is not just load-shedding, it's load-shifting, meaning water heater tanks are pre-heated. California building codes require that the water heating equipment must be fitted with a mixing valve to ensure hot water drawn from the tank is not too high.

Using the *Relay* Customer Engagement Suite enrollment form, customers provided basic information and then were guided through the manufacturer's device-specific applications to log in and automatically authorize and authenticate device participation. Once complete, the customer application is reviewed and approved by a SMUD employee, and the devices are ready for control.

The Challenge

In order to qualify for the PowerMinder pilot, customers must have one of a small list of smart water heaters. Eligible devices identified include the GE Geospring HPWH, Rheem HPWH, and WiFi-enabled units with EcoNet technology. While that list continues to evolve to include more smart water heaters, it minimizes the available pool of enrolled customers.

For Brett Korven, Project Manager II of Energy R&D at SMUD, education is one critical component to customer engagement throughout the enrollment process.

"Water heaters are a very unique market in that 95% of the time when people are changing out their devices it's kind of in an emergency situation. The biggest obstacle is to get people to either change out their existing water heater toward the end of life (for the device), instead of waiting for a situation where they need to fix it quickly."

With the current number of WiFi-enabled devices minimal, smart water heater technology itself serves as an additional barrier to enrollment. Unfortunately, there are no retrofit modules for existing heat pump water systems, although that could change in the near future.

Water heating ranks as the second-highest energy-consuming appliance in the home

To overcome these obstacles, SMUD looked to contractors who install water heaters as potential sources of education. Since hot water heaters are often replaced as needed, educating contractors affords SMUD the opportunity to reach potential new customers who may have an interest in the program.

Fortunately, there is an impending opportunity for SMUD to scale their program further. In a bid to minimize carbon emissions in the state, the California Energy Commission has worked to ban gas appliances in new homes. Once that law passes, SMUD customers will have one less barrier to enrollment. Between waiting for WiFi-enabled enhancements to smart technology and California legislation, Korven and his team will continue to educate the contractors who work to install new devices.

Control Strategy

Qualified water heaters utilize time-of-day optimization that preheats the tank during the hours just before the peak demand times. These heat pump water heater devices use a mixing valve to ensure safety to the customer by minimizing the risk of scalding temperatures.

"Using Virtual Peakers algorithm we can determine that this person's gonna need X amount of hot water. With that information, we'll overcharge the device and then have them all overcharge in specific hours and so we can shift all the load into a specific time period and then that hot water is available for the customers throughout the day whenever they need it," says Korven. "So they work a little bit like a battery, although not quite as efficient; it's something that we aren't able to do with electric resistance water heaters."

Once enrolled and validated, the devices are then subject to algorithmic learning that is part of the *Shift* DERMS Suite. This learning is applied to each device, which ceases powering to heat water during the most expensive periods of the TOD rate. Qualifying devices are equipped to store pre-heated water, meaning that hot water remains available when customers need it. Through *Shift's* integration with *Relay*, customers can opt-in or out, allowing them to either refrain from participation or to take control of reducing energy costs.

Customer Response

Beyond just owning a qualifying device for the program, for customers, the enrollment is a multi-tiered process. Customers are required to enroll through the SMUD portal, as well as through the EcoNet app. For many customers, devices are often located in interior and sometimes hard to reach utility spaces, complicating the ability to find information stored on the water heater. Additionally, because of where water heaters are often located, some customers have experienced challenges with WiFi-enablement.

In spite of these challenges, Korven and his team developed strategies for helping customers obtain the necessary information for enrollment and to troubleshoot any connectivity issues. In fact since starting, PowerMinder has exceeded enrollment expectations, all while enhancing customer satisfaction.

"The overwhelming response from the customers is that they didn't even know this was happening. That's exactly what we were aiming for," says Korven. He adds, "We've found that the more often we call events or the more engaged customers have to be, the less response we get. It's one of those things where there's definitely a limit."

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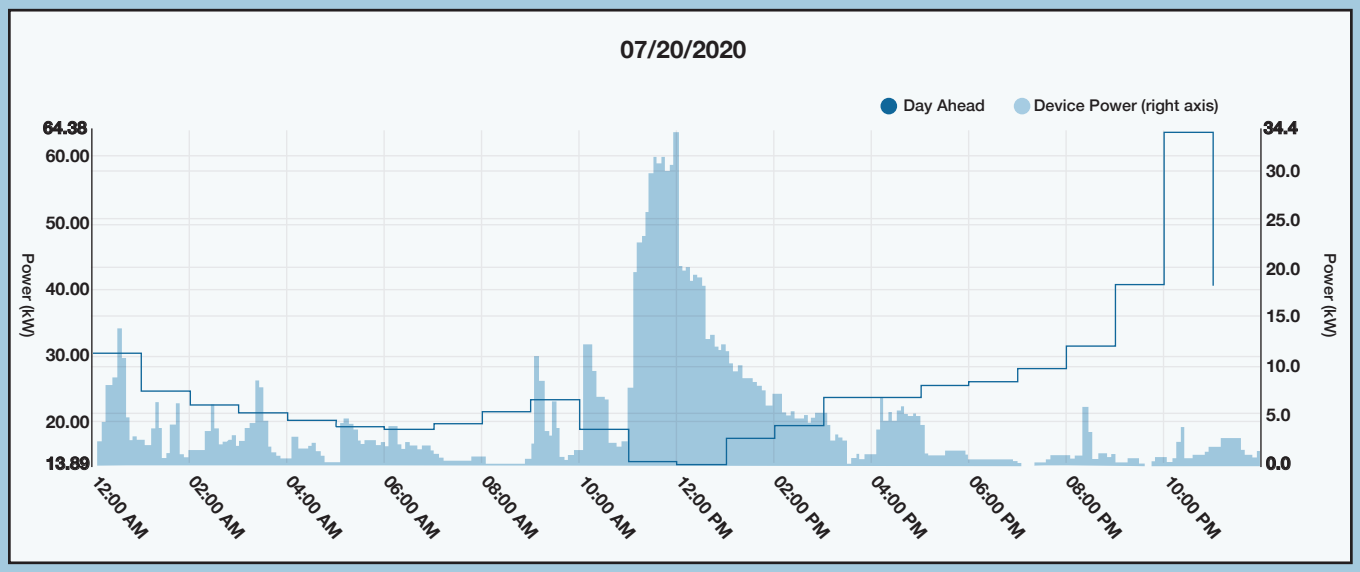

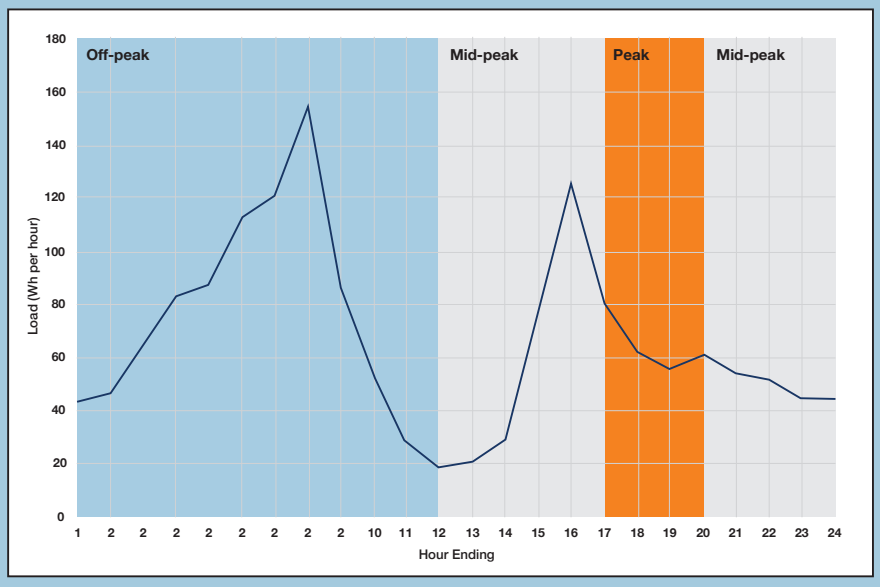

The graph above shows the energy consumption (the peak in the middle) and versus (blue line) showing that most of the device usage is during the lowest price. The graphic to the left shows what the Time-of-Day usage looks like in real-time.

The Conclusion

The future is bright for the PowerMinder Program. In March 2021, SMUD committed to their ambitious Zero Carbon Plan to eliminate carbon emissions from their power plant by 2030 from their originally planned 2040. To do that, Korven and his team are prepared to scale this and other programs to minimize their carbon footprint while balancing customer satisfaction and their commitment to environmentalism.

To get started, SMUD turned to Virtual Peaker to help them realize the scope of their program without sacrificing potential scalability.

"Virtual Peaker had the expertise to jump in there and make it happen. It sped up the time it took for us to get a pilot off the ground up and running, get the results we need, and inform our planning," says Korven.

▸ Learn how one of Virtual Peaker's suites can empower your operations. Reach out to **sales@virtual-peaker.com** and one of our experts will work with you to develop your program.

About Virtual Peaker

Virtual Peaker is a cloud-based distributed energy platform that empowers modern utilities to build the grid of the future and meet global decarbonization goals. The SaaS company's platform suites unify all aspects of DER management, from DERMS to customer engagement and load forecasting. Virtual Peaker is a remote-first company based in the United States.

For more information, visit **www.virtual-peaker.com** and follow the company on LinkedIn and Twitter (@VirtualPeaker).

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