Behavioral Demand Response – 10,000+ Customers Receive Alerts for Needed Energy-Saving During Peak Demand Events

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ABSTRACT

In 2022, Sonoma Clean Power (SCP) launched a behavioral demand response offering for residential customers aimed at reducing strain on the state's electric grid and encouraging mindful energy habits at home. No smart devices or installed equipment are needed to participate, and the approach for reducing energy is left completely up to the household.

Alerts are sent when the grid is experiencing peak conditions. Customers can choose to receive alerts in either English or Spanish and select their preferred communication method: text messages, email, or voice messages for those without cell phones or internet access.

Customers earn $2 per kilowatt-hour saved during an event. They can choose to keep their rewards or donate them to local community partners. There are no penalties for not reducing energy use during an event, only rewards when they do.

An online portal is available to view energy savings for each event. During 2022, approximately 2,000 participants shed 0.5 megawatts (MW) on the peak day.

Participation exceeded 7,200 customers in 2023, of which 36% are low-income qualified. Participation will continue to grow in the coming years and the program seeks to achieve 5 megawatts of peak load shed by 2026.

The program will continue to explore ways to adjust with a goal to increase customer engagement and resulting load shed. Customers are rewarded while learning about how they can save energy and energy costs, how their electricity use behavior impacts the grid, and how we can collectively secure a more reliable and renewable energy future.

Introduction

The summer of 2022 concluded with an unprecedented heat wave in California that caused excessive peak demand, amplified issues around grid reliability, and accelerated the conversation around how the impacts of these events can be mitigated (Milet et al. 2023). Demand-side load management, initially explored as a non-generating solution to balance supply and demand on the grid during peak demand periods, has evolved into a pivotal and indispensable instrument for managing such imbalances. The question that arose is this: Could an electricity provider ask its customers to mobilize and respond during a grid reliability emergency, and if so, how responsive would they be? This would require customer interaction with the electricity provider and a shift in consumer behavior to reduce electricity use during critical peak demand periods.

Peak demand typically coincides with the hottest days when air conditioning (A/C) is crucial and coincides with the hours when electricity users return home to complete familial and household duties. It is during these times that gas power plants frequently serve as backup sources to meet the increased need for energy. This is because they can rapidly ramp up to address the surge in demand. By curbing our electricity consumption and diminishing demand during peak periods, we reduce the need for gas plants and our overall reliance on fossil fuels.

Could we mobilize consumers to collectively reduce energy usage during high-demand events, thereby mitigating California's dependence on gas generators? Sonoma Clean Power's GridSavvy Alerts hopes to answer that question and presents a unique opportunity to learn more about the attitudes and engagement that prompt changed behaviors around electricity use. If effective and repeatable, this tool may be critical to support a reliable and sustainable energy future as the need for electricity to fuel our transportation, homes, and businesses grows.

Agency Background

In 2014, SCP launched as a Community Choice Aggregator, and now provides electricity to approximately 231,000 meters, representing about 86% of all eligible electricity consumers in Sonoma and Mendocino counties. Fueled by a commitment to combat climate change and reduce greenhouse gas emissions, local government officials, in collaboration with community stakeholders, embarked on a journey to establish an innovative model of energy procurement and program implementation. As a Joint Powers Authority, SCP operates as a not-for-profit company, allowing revenue to support programs that are scalable, impactful, and that address issues in the communities we serve. Since its launch, SCP has continued to pursue its overall mission: To turn the tide on the climate crisis, through bold ideas and practical programs.

This is achieved in part by sourcing cleaner, more sustainable energy and offering it to our customers at rates that are competitive with the investor-owned utility's. SCP's mission is furthered by its customer programs that are developed to both support our customers and to meet community needs around energy affordability, decarbonization, and grid reliability.

What is GridSavvy Rewards?

GridSavvy Rewards is Sonoma Clean Power's flagship event-based demand response program that was originally launched in 2018 and relaunched in 2022 in partnership with AutoGrid Systems, Inc. GridSavvy Rewards aims to leverage the combined efforts of our customers in reducing their electricity consumption, effectively addressing grid reliability issues, and mitigating excessive energy costs associated with congestion in the distribution system. To accomplish this, SCP notifies customers through phone, text, or email ahead of anticipated peak demand issues and requests that they curtail electricity use during a specified period, typically lasting from 1-4 hours. An alternative program option allows for SCP's direct control of the participating customer's smart devices to reduce load.

An additional goal of the program is to inform and educate participants about the importance of when they use electricity. The program strives to empower participants to reduce their electricity consumption during peak demand conditions and rewards them for doing so. This reward structure helps demonstrate the valuable impact that a household can make during a peak demand event to support a more reliable electric grid for the good of all Californians.

GridSavvy Rewards is being developed as a critical tool to demonstrate the collaborative impact made when we work collectively toward an outcome. GridSavvy Rewards provides participation through automated demand response (ADR) using integrated and dispatchable smart thermostats and EV chargers as well as a behavioral demand response (BDR) option known as GridSavvy Alerts where no technologies are required to participate, and participating customers choose how they will reduce use in their home when asked to do so in response to a peak demand event.

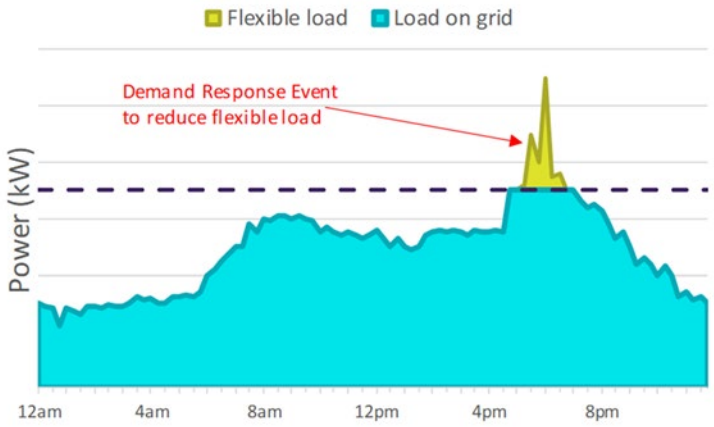

Figure 1-Image illustrates the peak demand period that is mitigated by event-based demand response.

Equity and Accessibility

The BDR program option, GridSavvy Alerts, is a means of participation for customers across socio-economic classes and cultural groups. Unlike other available offerings, the BDR option does not require the installation of technology to participate, allowing customers to enroll without any upfront monetary or time investment. There are also no penalties for not saving energy and participants are encouraged to decide on their own how they will reduce electricity use during critical peak demand periods. SCP provides tips and advice on strategies to reduce use which includes delaying laundry and dishwasher cycles, adjusting thermostat settings, and limiting plug loads during peak demand events.

The launch of GridSavvy Alerts in 2022 extended to all SCP customers and concurrently led to the exclusion of SCP customers from automatic enrollment in the PG&E Emergency Load Reduction Program (ELRP), also launched that year. GridSavvy Alerts was directly promoted via a targeted outreach effort to income qualified customers enrolled in either the California Alternate Rates for Energy (CARE) program or the Family Electric Rate Assistance (FERA) program, both of which offer discounted electricity rates. An additional target group included the top 10% of summer electricity users.

Under the GridSavvy Alerts program option, participants receive notifications via text, email, or voice call when a peak demand event is expected. The variety of notification methods is a crucial feature, as it expands participation to customers who may not use a mobile device or have access to the internet. Additionally, all materials are provided in both English and Spanish. Communicating with customers in their preferred language and communication method is critical to building a program that is equitable to all SCP customers.

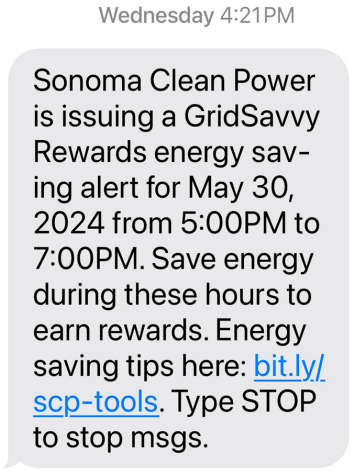

Figure 2-Example of event notification (Alert).

Event-based Demand Response Strategy

To determine when an energy-saving event is needed, the load forecasts from the California Independent System Operator (CAISO) are compared to our local load forecasts, which helps to detect when higher-than-expected demand or limited supply is anticipated. On event days, which take place during the months of May through October, enrolled SCP customers are notified to limit the use of electricity during a specified event window, typically between 5-7pm.

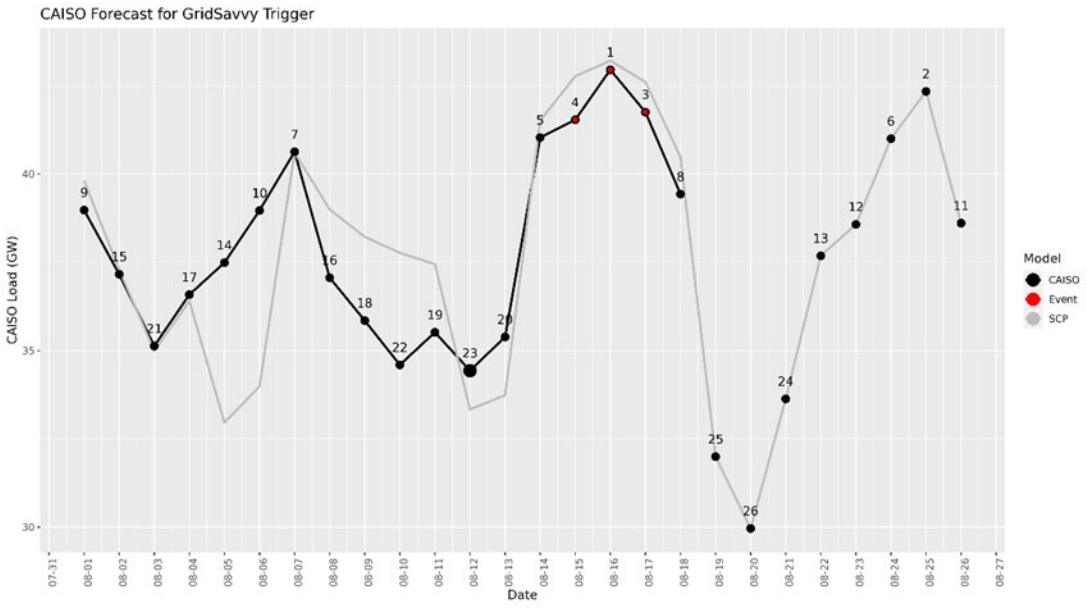

Figure 3 -CAISO forecast expected CAISO load and comparing to local SCP load forecast. Position 1 indicates highest priority critical peak demand event.

SCP also calls a demand response event whenever an Energy Emergency Alert (EEA), commonly known as a Flex Alert, is issued by CAISO. These events can extend over a longer portion of the day and recur consistently across multiple consecutive days due to grid conditions identified by CAISO. By incorporating these CAISO-triggered Flex Alerts, SCP's GridSavvy

Alerts enable participants to contribute to grid reliability when it's most needed, while also amplifying the dissemination of Flex Alerts to our participating customers. GridSavvy Alerts provides participating customers with a greater awareness of critical Flex Alerts via tailored notifications sent directly to their preferred communication method to request that they reduce load and help California keep the lights on when load shifting is most needed to address grid stress.

When possible, notifications for events are sent to participating customers up to 24 hours in advance. Events are issued by SCP using a Distributed Energy Resource Management System (DERMS) platform hosted by AutoGrid called AutoGrid Flex. In a matter of minutes, the AutoGrid Flex platform allows SCP to dispatch all participating customer energy assets (EV chargers, smart thermostats) under the ADR program option as well as seamlessly send alerts to thousands of BDR participants. SCP can review load shed forecasting, adjust notifications, select participant segments, review response rates, and track event performance using the AutoGrid Flex DERMS platform.

Measurement and Verification

The GridSavvy Alerts program option provides SCP customers the ability to participate without installing any technology behind the meter. The only technology requirement is that customers must have a PG&E installed SmartMeter™ to participate which includes over 85% of all SCP customer meters. This means that for most, eligibility for the program is seamless.

The SmartMeter™ measures energy use during the event. This data is ingested into the AutoGrid Flex platform. The Flex platform evaluates historic interval data for all participating SCP customers and determines what use would be expected on a typical, non-event day. This is determined using CAISO's Day Matching, 5-of-10 residential only baselining methodology which averages the highest 5 usage days from the previous 10 days to determine usage of a typical non-event day (Johnstone 2022). The interval data from the scheduled event window is measured against the baseline average to determine the usage reduction during the event. Rewards earned can be issued either through a check or a bill credit at the conclusion of the season and calculated based on $2/kilowatt-hour of load shed during the demand response event. Alternatively, customers have the option to donate their rewards to a local community partner non-profit organization.

Developed as an additional resource to encourage customer engagement, a customer portal tracks events and displays per event performance in response to event alerts. This feedback mechanism provides the customer insight into their event performance, bolsters their understanding of how their actions impact their energy use, and encourages improvement in their response to future events.

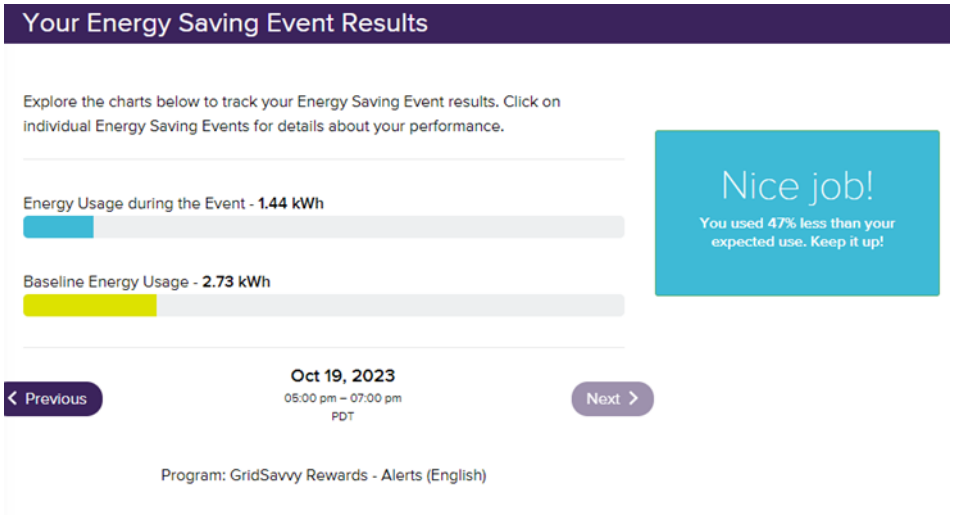

Figure 4-Example of event results displayed in the customer portal.

Annual Results

Year One (2022 Event Season)

Our initial promotion of the Alerts program option featured letters and postcards mailed to all CARE/FERA customers, as well as the top 10% of electricity users. The promotion offered a $25 enrollment incentive, provided as an electronic-gift card. The user-friendly enrollment process developed by SCP was provided in English and Spanish, available both as an online form and a mailed enrollment form, catering to all customers regardless of their access to or familiarity with computer-based applications.

During the 2022 event season, approximately 2,000 people enrolled in GridSavvy Alerts, representing 3.7% of the customer base targeted (~54,000 total) for program promotion. Among these participants, 5% requested communication in Spanish. Additionally, 75% of enrolled customers were eligible for the income-qualified CARE/FERA rates. The load shed reached 500 kW (0.5 MW) on the peak summer day in September 2022 and the season total exceeded 35,000 kWh of qualified shed. The average earned reward for customers who participated in at least 1 event was $38.00.

The 2022 event season included an unprecedented heat wave that spanned from August 31st to September 9th. CAISO called daily Flex Alerts during this time, and GridSavvy Alerts participants were notified directly that the grid was experiencing higher than expected demand and that they could help prevent power outages for any of California's electricity users.

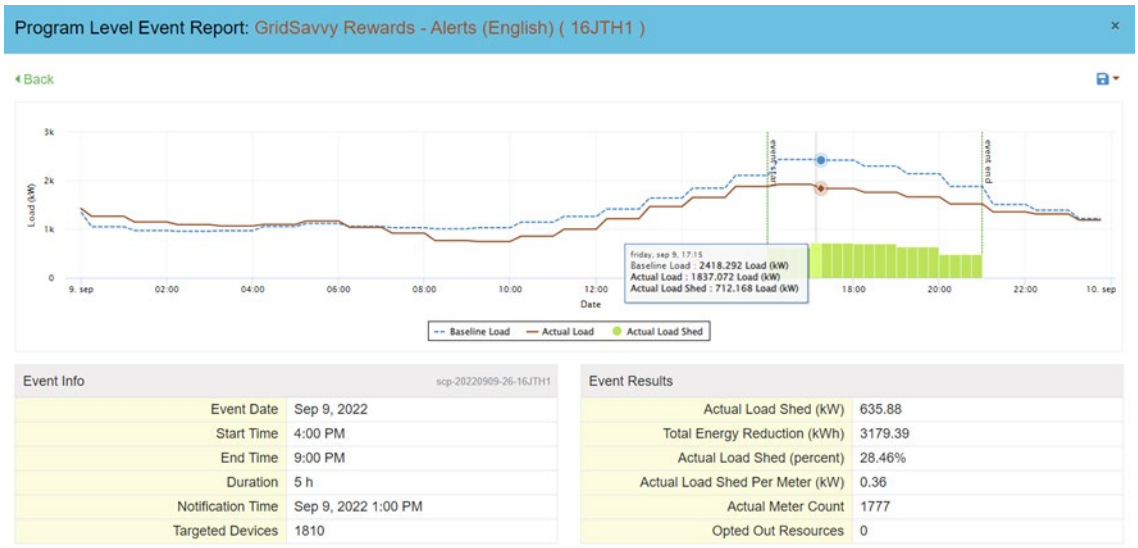

Figure 5-Example of Flex Alert event window and resulting load shed.

In 2022, GridSavvy Alerts stood as an example of what could be accomplished by similar programs once scaled. Although only a small part of a larger effort, programs such as GridSavvy Alerts could 1) reduce the need for natural gas peaker plants and 2) reduce the risk of rolling blackouts during critical grid conditions.

Year Two (2023 Event Season)

2022 represented an example of the importance of programs such as GridSavvy Alerts, and 2023 offered an opportunity to understand the impacts of such a program once scaled. Due to the success of the 2022 event season, SCP cast a broader net for the 2023 season enrollment campaign. The GridSavvy Alerts program option was promoted to the SCP customers who were not enrolled during the 2022 season or registered in a competing program (approximately 5,400 SCP customers were registered in an outside demand response program), resulting in a promotion reaching approximately 145,000 households.

During the 2023 event season, the program experienced a notable enrollment increase, adding approximately 5,600 participants, bringing the total number of participants to over 7,200 representing a 3.8% conversion rate from the promotion. Twenty-six percent of those enrolled during the 2023 event season were enrolled in CARE/FERA rates resulting in a total income-qualified enrollment rate of 34%. Although the 2023 event season did not require events due to CAISO-issued Flex Alerts, participants cumulatively shed approximately 3,000 kW (3.0 MW) during the highest performing day and the average cumulative customer load shed across all events was approximately 2,500 kW (2.5 MW).

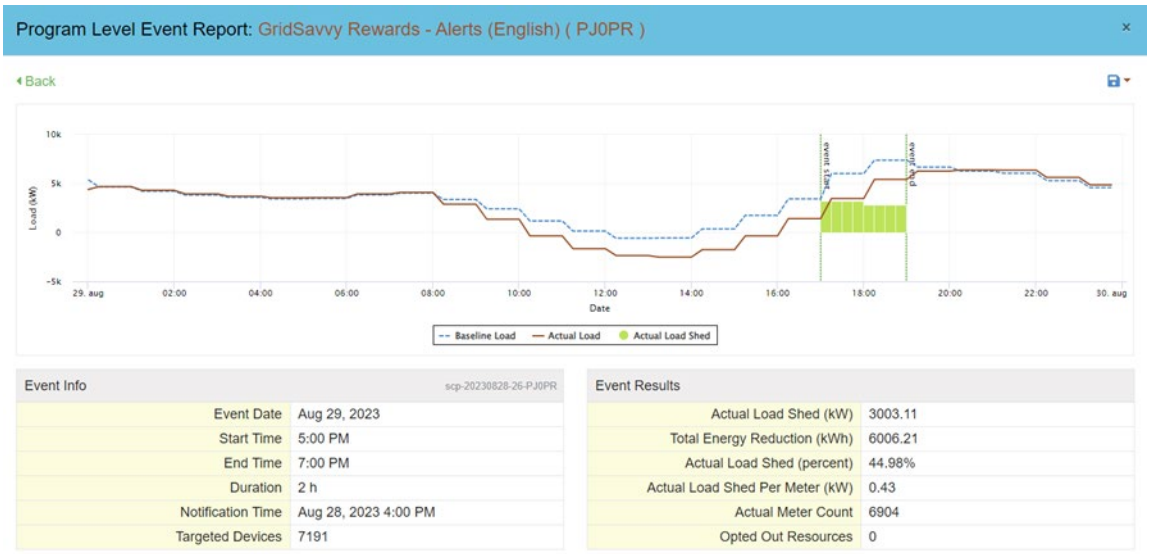

Figure 6-Results from highest performing event during the 2023 event season.

SCP's GridSavvy Alerts program consistently demonstrates cumulative load shed potential, which, upon scaling, could emerge as a potent strategy to mitigate adverse grid scenarios where demand surpasses California's available capacity.

What Can We Expect from Future Years?

In 2024, SCP plans to expand and enhance the GridSavvy Alerts program by leveraging measured performance results for continuous improvement. We aim to enroll an additional 6,000 SCP customers, using the program to explore human behavior and motivation through effective messaging and participant performance analysis.

This expansion will involve targeted outreach campaigns across social media, mailers, emails, and print ads to engage a diverse range of customers, including those traditionally underrepresented in energy efficiency initiatives. We will partner with local businesses, community-based organizations, and educational institutions to provide training and information on demand response and peak demand management. Through these initiatives, participants will gain valuable insights into utilizing tools to curtail electricity consumption effectively, thereby enhancing their engagement with our program.

To evaluate messaging efficacy, SCP will use A/B testing and additional outreach strategies via participants' chosen communication methods, including social media. This approach will help us understand the most effective ways to engage customers and prompt action during critical times. Through the expansion of educational components across social media platforms, printed materials, and instructional videos, coupled with the utilization of performance data analysis, our objective is to enhance engagement levels and optimize our messaging strategies.

SCP is preparing to use market segmentation to target specific customer groups with tailored messaging around event alerts and promotional campaigns. By analyzing collected performance data, we aim to gain insights into customer motivations and effective messaging as we scale the program to a target of 13,000 participants during the 2024 event season.

Creating program segments based on customer demographics, tracking messaging variations, and identifying incentive impacts will support demand-side management improvements. This data-driven approach, instead of traditional surveys, will help us understand customer behaviors and can serve as a model for other programs. GridSavvy Alerts will use performance data to extract valuable insights and enhance overall demand response program effectiveness.

References

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