

Circuit-Level Monitoring and Analytics for a Multifamily Residential Community



Startup
 DCSix
 Technologies
 Cork, Ireland

Host
 Southern
 California
 Edison



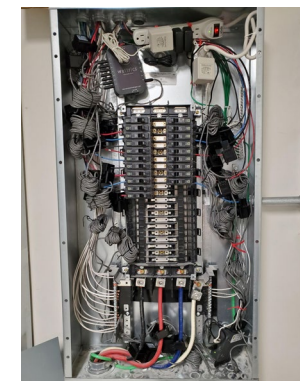
Technology Solution

Electric utilities have a growing need for more reliable and granular information on behind-the-meter (BTM) electricity consumption in buildings to optimize the design and performance of demand-side management programs and to support operational and planning decisions. Meanwhile, customers are increasingly interested in understanding their own energy consumption and available options for reducing energy costs and carbon emissions. Diverse technologies are being marketed as solutions for meeting these needs.

The goal of this project was to assess the capabilities of an energy monitoring and cloud-based analytics platform developed by DCSix Technologies for obtaining reliable visibility and improving customer understanding of BTM usage in a multifamily residential community. Known as Wattrics, this tool can monitor 14 individual circuits within a home using passive clip-on current transducer clamps. Data are stored in a cloud database, analyzed, and made accessible via customizable web dashboards providing visualizations and insights addressing energy usage, costs, and carbon emissions and technological and behavioral interventions. In addition to helping customers reduce bills, this can provide value to utilities by providing greater visibility into and understanding of demand-side energy consumption.

Project Overview

This project involved a collaboration between DCSix, utility host Southern California Edison (SCE), and EPRI along with Linc Housing, property manager for the Willowbrook multifamily residential development. Among other features, Willowbrook includes community



Wattrics devices, which apply current transducer clamps to monitor up to 14 circuits (left), were installed in one of the main electrical cabinets in a community building (right), as well as in five residential units.

solar power and battery storage capacity, is enrolled in OhmConnect’s demand response (DR) network, and is an “Advanced Energy Community” research and demonstration site. Currently, water heating is provided by a gas-fired boiler.

Pilot project objectives included the following:

1. To deploy Wattrics devices and provide residents with access to data dashboards for their own units and the property manager with access to a community-level dashboard,
2. To identify opportunities to improve energy efficiency and reduce costs and carbon emissions, and
3. To understand the potential use cases and value of the Wattrics platform.

Wattrics dashboards aim to communicate energy data in a meaningful way to specific customers/users. Additionally, the Wattrics platform leverages granular

Wattrics dashboards can display energy usage data for each appliance or circuit (left), as well as overall consumption (kWh), demand (kW), and onsite solar generation.

circuit-level visibility with AI-enabled data analytics, creating opportunities to assess how to achieve energy, demand, cost, and carbon savings through efficiency, DR, and other solutions.

At Willowbrook, a total of 25 Wattrics units were deployed across two residential buildings, in the community center, and within five apartments. In evaluating the success of this project, key indicators include demonstration of Wattrics for reliably monitoring residential circuits and identification of additional use cases that may be valuable to customers and utilities.

Results & Learnings

Key milestones were met during the project period. The project team installed Wattrics devices and sensors in the Willowbrook community—with no power shutoffs required—and set up a secure communications network to gain full circuit-level visibility and reliably monitor BTM energy data at 10-second intervals. In addition, data dashboards were developed to visually communicate how and where energy is being used at the community and apartment levels.

Initial analysis of granular data showed that no “low-hanging fruit” are left at Willowbrook since a significant number of efficiency measures and clean energy technologies had already been deployed and are proving effective. In addition, during the compressed pilot period, several logistical issues combined to delay deployment of Wattrics units and limit the ability of residents and property management to interact with the dashboards. Experiences and lessons learned relating to residential installations, international sourcing, network configuration, and wireless access will be applicable to future deployments.

Follow-on work is planned to collect several months of real-world energy usage data as Willowbrook residents and the property manager interact with the Wattrics dashboards. The project team has identified several use cases and opportunities for further analysis as shown in the table on the next page.

Drawing on familiarity gained with the Wattrics platform during this pilot and on early deployment experiences in the European Union, EPRI,

SCE, and the DCSix team also assessed customer value for the following applications:

- **Dairy farms:** This offers the highest potential customer value, reflecting both the size of the market in California and the demonstrated ability of Wattrics to reduce costs at dairy farms by improving the efficiency of the milking process with a combination of active energy management, heat recovery, thermal storage, and solar; and by alerting farmers of malfunctioning pumps and other equipment.
- **Commercial and industrial facilities:** While site-specific potential varies across large energy users such as factories, offices, hotels, retail, etc., Wattrics has demonstrated value in helping building owners reduce energy costs by delivering targeted insights, informing behavioral adjustments, and modeling technology investments.

Implications & Next Steps

The effectiveness of Wattrics at Willowbrook will be evaluated into 2022, but data collected and analyses

performed in this pilot demonstrate potential for helping quantify and validate the value of efficiency measures and clean energy technologies for multifamily communities that have not previously been upgraded.

More broadly, this project has illustrated the value of combining reliable BTM monitoring hardware with a data analytics platform. This combination could benefit customers with ongoing energy management insights while providing data-backed projections of the performance and payback of technology solutions with potential to reduce operating costs and carbon emissions. Utility use cases for customer-deployed circuit-level monitoring also have promise.

Deploying Wattrics for the first time in the United States and in a residential setting has provided the DCSix team with experience applicable for streamlining future installations. At Willowbrook, next steps are to provide dashboard access to property management and residents and to share circuit-level data with EPRI's research database and stakeholders. Once 6 to 9 months of data are available, analyses will be conducted to understand how Wattrics adds value in a residential setting. EPRI and SCE plan to scope a demonstration project focused on how the Wattrics platform can improve energy and water efficiency and reduce carbon emissions at dairy farms in California.

Resources

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Use Cases for Further Analysis at Willowbrook

USE CASE	DESCRIPTION	OPPORTUNITY AT WILLOWBROOK
Visualizing data insights for customers	Use customized dashboards to provide customers with insights on how they consume energy.	Present dashboards conveying unit-specific and community-wide insights and assess impacts on residential energy consumption and responses to behavioral DR and time-of-use (TOU) rates.
Identifying technology solutions at customer and community levels	Leverage BTM data to model the sizing, performance, and payback of efficiency, DR, and electrification measures.	Model and evaluate the cost-effectiveness of options for decarbonizing water heating by using using heat recovered from other building systems, and/or by applying solar output to run a heat pump water heater with thermal storage capacity.
Verifying technology performance	Leverage BTM data to quantify how technology investments are performing in terms of energy use, costs, and emissions.	Collaborate with stakeholders involved in EPRI's "Advanced Energy Community" research project to determine actual load drop from behavioral DR, verify and optimize control strategies for the solar-battery system, assess the efficiency of the DC microgrid, verify opportunity for shifting laundry load off peak, and enhance projections of flexible residential load capacity.
Testing customer segments	Leverage BTM data to better understand how different types of customer interact with utility offerings.	Examine and test how residents actually respond to TOU rates and behavioral DR messaging from the OhmConnect platform.

TESTIMONIAL: DCSix Technologies

Our mission is to support change by enabling people and businesses to make better decisions around their energy use. As demonstrated in this pilot project, we give customers a detailed understanding of energy consumption at their premises and how they can make the greatest reduction to their energy bills and carbon footprint for the lowest overall effort and investment.

TESTIMONIAL: Southern California Edison

Understanding energy use is foundational to achieving an affordable and 100% clean energy system. The 360-degree view provided by DCSix Technologies gives customers the ability to modify behavior and test new technology strategies, and it can help utilities better tailor demand-side management programs to achieve system benefits, for example through load flexibility.

TESTIMONIAL: EPRI

DCSix Technologies has developed a novel and effective solution for collecting behind-the-meter energy data, understanding customer usage, and harnessing the value of granular data with analytics. There is significant potential for this technology to help commercial and industrial users manage costs and model potential technology investments.

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