SMUD®

Integrated DER Management Enables SMUD® to Meet Aggressive Clean Energy Goals

aspentech | Case Study

AspenTech OSI Integra DERMS™ equips SMUD with the industry's most sophisticated solution, capable of assessing and managing the impact of DERs on its distribution grid network.

CHALLENGE

- Servicing a 900-square mile area with 649,557 residential and business customer accounts*
- An unprecedented proliferation of DERs in SMUD's service area, including more than 20,000 solar PV systems producing more than 280 MWs, more than 6,500 EVs, 129 energy storage units, 16 MW of commercial demand response customers and 83,000 residential demand response customers

SOLUTION

- **AspenTech OSI Integra DERMS** that seamlessly integrates with SMUD's Advanced Distribution Management System (ADMS), both of which are supplied by AspenTech

VALUE CREATED

- Equips SMUD with the industry's most sophisticated solution, assessing and managing the impact of DERs on the distribution network
- Enables SMUD to deliver improved customer satisfaction while meeting California's clean energy goals

Overview

As the nation's sixth-largest community-owned, not-for-profit, electric service provider, Sacramento Municipal Utility District (SMUD) has been providing low-cost, reliable electricity for more than 70 years to Sacramento County and small adjoining portions of Placer and Yolo Counties. SMUD is a recognized industry leader and award winner for innovative energy efficiency programs, renewable power technologies and sustainable solutions for a healthier environment. Today, SMUD's power mix is about 50 percent non-carbon emitting. Through its Zero Carbon Plan (the most aggressive clean-energy plan of any large U.S. utility), SMUD is committed to removing all carbon emissions from its power supply by 2030..

Unprecedented Proliferation of DERs

Serving nearly 650,000 residential and business customers with a service area population of 1.5 million*, SMUD manages the considerable challenges from supporting a 900-square mile service territory that's experiencing tremendous growth, while meeting California's nation-leading clean energy standards and maintaining a highly reliable, responsive and affordable electric service for its customers. When Distributed Energy Resources (DERs)—solar and wind power, electric vehicles (EVs) and energy storage—are added to the mix, SMUD's challenges get more complex..

SMUD has recently seen an unprecedented proliferation of DERs in its service area, generating questions such as:

- How do we know what and how much DER generation or load is connected in real-time?
- What operational impact will DERs have on normal distribution operations?
- Where and when should we use available DERs?
- How do we optimize DERs usage to solve network violations?
- How do we optimize DERs usage to maximize economic opportunities?
- How does DERs growth affect utilities long-term planning?

*SMUD 2021 Annual Report

- How should we plan capital expenditures? Where should we limit interconnection permits?
- How can DERs support new business models and customer engagement?

SMUD is facing these challenges by providing monitoring, visibility, forecasting and control of DERs, in conjuntion with ADMS. The number of DERs in SMUD's service territory include:

- More than 20,000 solar PV systems producing more than 280 MWs
- More than 6,500 EV charging stations
- 129 energy storage units
- 16 MW of commercial demand response customers
- 83,000 residential demand response customers

Regulatory Considerations

California's commitment to reducing greenhouse gas emissions and deploying DERs presents both challenges and opportunities for the state's utilities. The California Energy Commission (CEC) has set aggressive goals for utilities; the state RPS was increased to require that 60% of electricity must come from renewable sources by 2030. The CEC also set a statewide requirement for home builders to install solar panels on all new residential homes beginning in 2020, with the intention to reduce residential energy demands by more than 50 percent. The CEC is actively pursuing further regulations to stimulate DER adoption from EVs to microgrids.

The California Public Utilities Commission (CPUC) has also been active in establishing goals, programs and requirements for utilities, including energy storage mandates and distributed resource plans.

Through regulation, the CPUC aims to protect consumers and safeguard the environment, ultimately ensuring Californians' access to safe and reliable utility infrastructure and services.

In the past few years, the CPUC enacted policies to meet the state's goals for greenhouse gas emission reduction and the integration of renewable energy to augment and refine a "DERs Action Plan." This is expected to provide a long-term vision, near-term actions and establish a committee responsible for sustained coordination of DERs activities.

California's DERs Action Plan: Aligning Vision and Action

Market Interaction

Although SMUD manages the entire power grid in Sacramento County, it's connected to the North American electric transmission network. This enables SMUD to purchase and sell power from the California Independent System Operator (CAISO). In the future, there will be opportunities to sell DERs generation back to CAISO as a service to support the Energy Imbalance Market.

Customer Engagement

SMUD constantly seeks innovative ways to provide new services and programs for customers, for instance, encouraging and incentivizing customers to enroll DERs in programs such as My Energy Optimizer Plus and PowerMinders. Demand response and managed EV charging programs can help meet DERs growth goals and improve customer satisfaction, while providing cost-saving (Infrastructure Upgrade Deferral) opportunities for SMUD. In an era where energy efficiency measures and other factors continue to reduce total electricity consumption, DERs programs provide SMUD with an excellent opportunity to offer affordable, valuable new services to customers.

As residential customers increasingly adopt smart home devices such as thermostats and appliances, more opportunities become available to optimize the efficiency of the entire grid. Traditionally, electricity usage in the home has not been visible to utilities, but advances in communications, connectivity and cyber security allows utilities an opportunity to play a greater role in helping customers manage their electricity usage through services such as Time-of-Day Rates and demand response programs.

Distribution Operations

SMUD's power grid infrastructure, like that of most utilities, was not originally designed or built to accommodate the widespread adoption of DERs. The proliferation of DERs has the potential to negatively impact grid operations and customer service, particularly when the level of electricity coming in from DERs, such as solar power, exceeds a utility's ability to handle that extra or unexpected electricity coming on and off the grid.

A large or unexpected amount of power coming from DERs increases the complexity of keeping the power grid stable, making an operator's job more difficult. Without real-time DERs connectivity in the distribution network model, problems in electricity service, performance and reliability are certain.

DERs challenges will be faced throughout the power grid. High and low levels of power coming from DERs may cause equipment to exceed operating parameters and fail. Any equipment failure can result in large-scale outages and brownouts.

Industrial-Grade, Secure DER Management Software

To address the numerous challenges and opportunities posed by increasing levels of DERs, SMUD has partnered with AspenTech to deploy a state-of-the art Distributed Energy Resource Management system (DERMS) that seamlessly integrates with SMUD's Advanced Distribution Management System (ADMS)—also supplied by AspenTech.

In the past, SMUD operators ability to respond to grid constraints were limited. In recent years, however, SMUD has invested to update its infrastructure to better accommodate DER adoption. SMUD strived to give operators a way to leverage DERs to address network violations and improve planning of DER management.

By implementing a DERMS, SMUD operators have the visibility they need in real-time to know how much DER generation and load is connected as well as the positive and negative impact that DERs will have on normal distribution operations..

AspenTech OSI Integra DERMS enables real-time monitoring, management and optimal dispatch of DERs, including renewable generation, energy storage, electric vehicle chargers and backup generators. The Virtual Power Plant functionality enables aggregation of DERs and allows for participation in the energy markets, which in turn offers demand flexibility and reliability.

Key functionality enabled through AspenTech OSI Integra DERMS includes:

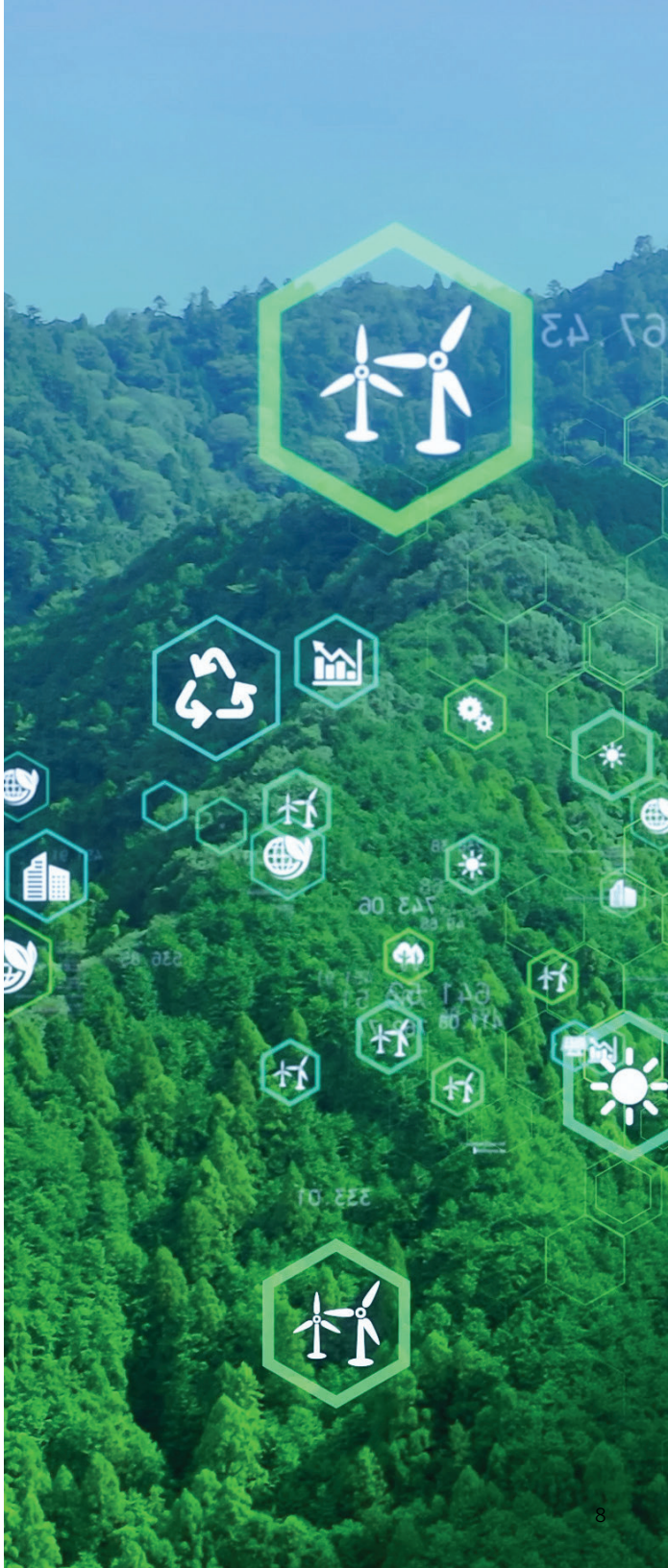
- DER modeling and visualization
- DER monitoring and control
- DER forecasting and estimation
- DER scheduling and network optimization
- DER-enabled ADMS applications
- DER virtual power plants for market participation

Conclusion

SMUD's adoption of OSI's Integra DERMS ensures that it will be equipped with the industry's most sophisticated solution, capable of assessing and managing the impact of DERs on the network.

SMUD will be able to determine the optimal DER grouping combination and dispatch strategies to mitigate network issues, improve grid reliability and provide optimal network benefits such as load relief, loss reduction, emissions reductions, voltage support, reliability improvement and customer program enablement.

This technology helps SMUD deliver improved customer satisfaction, meet California's clean energy goals, capitalize on new revenue opportunities and provide customer programs to support further DERs adoption.



About Aspen Technology

Aspen Technology, Inc. (NASDAQ: AZPN) is a global software leader helping industries at the forefront of the world's dual challenge meet the increasing demand for resources from a rapidly growing population in a profitable and sustainable manner. AspenTech solutions address complex environments where it is critical to optimize the asset design, operation and maintenance life-cycle. Through our unique combination of deep domain expertise and innovation, customers in asset-intensive industries can run their assets safer, greener, longer and faster to improve their operational excellence.

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