

Distributed Energy Resource Program Design and Delivery

Arizona Public Service

Challenge: Increased rooftop solar photovoltaics, or PV, caused rapidly changing system load shapes within Arizona Public Service's (APS) territory and required more flexible resources as a backup for intermittent solar generation. APS needed support designing and delivering a suite of innovative programs to provide demand flexibility as a compliment to their robust energy efficiency portfolio.

Approach: Working in conjunction with Arizona Public Service, Tierra developed a new customer program designed to support the deployment of residential load management, demand response and energy storage technologies to help customers shift energy use and manage peak demand, while also providing system peak reduction and other grid operational benefits. To best design and appropriately deploy the program, we partnered with Navigant Consulting to survey more than 1,300 customers to assess customer perceptions of the planned pilot design, price point propensities, and sensitivities to proposed program parameters. The pilot program Tierra and APS developed includes three elements:

- Batteries to reduced system peak, provide feeder congestion relief, and support integration of distributed energy resources.
- Connected heat pump water heaters to reduce system peak and provide load management benefits by shifting water heating demand into the midday peak solar production period.
- Connected residential smart thermostats to provide demand response load reductions during system peak events, with additional features allowing customers to opt for automatic precooling of their home prior to peak demand periods to maximize comfort.

Outcome: APS developed and delivered a multi-million-dollar residential program that facilitates demand response, energy storage and load management (DRESLM) to address flexible resource needs by limiting peak demand and shifting energy use to midday periods of high rooftop PV solar production. This initiative provides DSM benefits and improves integration of distributed solar generation on the grid through the deployment of commercially available load management and load shifting technologies that have not yet been widely used in Arizona's Demand Side Management (DSM) programs. By including each of the three program elements described above, the DRESLM program provided valuable information on the relative performance, cost, and use cases for these technologies, while helping APS meet increased demand response compliance goals.

Project Highlights:

- The **Cool Rewards** program enrolled over 57,000 connected thermostats that deliver ~80 MW of demand response
- **Reserve Rewards** pilot installed 221 grid-interactive heat pump water heaters that deliver ~2,000 kWh annual in energy savings
- **Storage Rewards** pilot installed 36 batteries to deliver ~45 kW in capacity across the 5 hour on-peak window



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