

Morgan Smith, Itron

Poster Title: Seeing is Believing: Visualizing Customer and Utility Impacts of Emerging Technologies

Abstract: The electric grid is in the midst of a dramatic shift, facing new volatile pressures. These pressures arise from a variety of technological shifts, including increasing behind-the-meter (BTM) distributed energy resources (DERs). Now more than ever, utilities seek to shift load from low-generation/high-consumption time periods to high-generation/low-consumption time periods. In the residential sector, utilities are working to incentivize this shift by implementing residential time-of-use (TOU) rates. Beginning in 2019, California is implementing a mandated default TOU rate for all residential customers. To better plan for the electric grid of the future it is imperative to understand how new rate structures and the adoption of BTM DERs might impact the annual energy costs and load shapes of utilities and their residential customers.

As part of a smart home pilot, we developed an interactive dashboard to illustrate how both customer and utility costs, as well as underlying load profiles, shift as emerging technologies and TOU rates are implemented. Customer costs are measured by their electric bills while utility costs are measured by Locational Marginal Prices (LMP). The dashboard allows the user to visualize the various impacts from a variety of potential tariff and technology shifts including changing from a tiered to a TOU rate, adopting alternative electric vehicle charging schedules, implementing solar photovoltaics (PV), and adopting advanced energy storage (AES).

The dashboard helps the user visualize how a potential problem can be turned into a win-win situation with appropriate rates and smart controls. For example, wide spread adoption of electric vehicles may lead to an increase in peak demand, increasing costs to both the consumers and the utility. If smart EV chargers are applied, the increased load shifts to early morning (midnight to 6am). This results in drastically lower costs to the utility. The timing of EV charging, however, does not impact the customer's bill on a tiered rate. Combining a smart charger with a TOU rate leads to significant customer bill savings, leading to the win-win situation that utilities are searching for in the future. Adding an AES system, the utility is able to increase savings by shifting load from hours with high LMP to cheaper hours during the day. Customers on a TOU rate are also able to realize cost savings from an AES system.

The rate analysis dashboard will be displayed as a live demo allowing the user to visualize the expected impact of combining different rate structures and a variety of emerging technologies. The dashboard will illustrate select residential and technology load shapes, presenting the dramatic shift in load that is possible under alternative technologies and price signals. One of the strongest forces available to alter existing and future pressures on the grid are price signals. The dashboard presents calculations of residential bills and utility costs under these alternative scenarios. Visualizing how costs and load profiles change under a variety of rate structures and technology combinations will help utilities plan strategically for the grid of the future.