PACIFIC DATA INTEGRATORS

Modern Demand Forecasting

The Rise of Distributed Energy Resources

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The utility industry is undergoing massive change as Distributed Energy Resources (DER), such as solar panels and batteries, spread across the continent. Solar panels installed 10.6 gigawatts of solar PV capacity in 2017, bringing the total installed capacity to 53.3 GW in the United States. That's enough to power over ten million homes. The cost of solar has also plummeted 70% since 2010[1], making this an attractive option for more and more consumers.

While individuals may be excited by this shift, it is causing an enormous headache for utilities. DER cripples the accuracy of traditional forecasting analytics, making it difficult to know how to set rates.

Demand forecasting used to be simple: you could determine the energy demand of a region by looking at the geography, time of day, and historical load curve. This told a utility how much energy would be needed on an hour-by-hour basis.

These analytics are of paramount importance, as they allow utilities to adjust their rates (cost/kWh) in order to protect their profits from the ups and downs in electrical consumption that occur across any given day, month, and year.

Now, with the popularization of DER, individuals are beginning to generate their own electricity. They store their own electricity. And, even more confounding, they sometimes send their excess electricity back into the power grid. These new variables are not accounted for with traditional demand forecasting analytics. As such, the data that utilities gather from their traditional analytics is no longer accurate.

Variables Before DER	**Variables After DER**
• Geographical Location	• Geographical Location
• Time of Day	• Time of Day
• Season	• Season
• Historical Load Curve	• Historical Load Curve
	• Number of Individuals Generating Power
	• kWh Generated by Individuals
	• kWh Stored by Individuals
	• kWh Added to Electrical Grid by Individuals

The number of variables affecting load forecasting has grown since the rise of DER.

This means that for the first time, utilities are unable to predict their customers' demand for electricity and are unsure of how to set their rates.

In short, the rise of distributed generation has forever broken the traditional method of demand forecast analytics. While some utilities are holding tight to a crumbling system, the forward-thinking companies are on the lookout for what will replace it.

This brings us to Pacific Data Integrators' (PDI) Next-Generation Analytics Methodology, with modern demand forecasting.

PDI saw the difficulties clients were facing due to DER and struck out to design a new methodology that would solve this growing challenge. The Next-Gen Analytics approach completely revamps the methodologies previously used for demand forecasting to give utilities the ability to predict long-term changes they will see due to the new energy paradigm.

PDI considers all the traditional factors of energy consumption, plus modern factors that are a part of today's evolving energy market. The new methodology factors in the market landscape, demographics,

and current energy policy, as well as the confounding variables that have sprung from distributed generation. These include solar, batteries, and energy being added to the grid from individuals.

By taking in this array of information, PDI's Next-Gen Analytics Methodology truly encompasses the modern energy ecosystem and is able to give utilities the ability to accurately predict energy demand. The platform also includes scenario-based load uncertainty analysis, as an extra level of predictive analytics.

For instance, if a client's load profile is altered by calculating in solar distributed generation, the platform will provide several different rate structures that allow utilities to produce a level of revenue similar to what they received before the rise of solar power.

The demand for power is changing, but utilities can offset the lower demand and protect their revenue with accurate Next-Gen Analytics. This shift in the energy ecosystem does not have to result in a reduction in utilities' profit margins.

How it Works

By incorporating myriad data points and developing specific customer load profiles, PDI ensures their Next-Gen Analytics are robust and agile. Clients are able to interact with a user-friendly analytic interface, which integrates with several backend databases to create modern demand forecasting analytics. The databases manage data sources such as hourly loads, revenue allocation, marginal costs, and customer characteristics.

PDI's methodology begins by creating a baseline customer demand forecast. This baseline forecast leverages highly-granular data, including:

- Geospatial Data: Weather zone, distribution planning area, baseline territories, customer meter, substation, feeder, bank, and division
- Aggregate Data: Rate and customer class, time of use, and total system/bundled

Next is developing hourly energy and peak demand forecasts that incorporate the energy economy, various demographics, and weather patterns. This includes the creation of customer aggregated hourly profiles that are broken down by customer demographics, premise demographics, transformer, substation, and service agreement.

PDI's team also creates specialized profiles for customers who fall outside of the traditional energy consumer model. Photovoltaic (PV) profiles are developed by using participants in the Net Energy Metering (NEM) program. PDI calculates PV production and customer consumption in order to create hourly load profile estimates that are specifically designed for PV customers.

PDI also creates hourly load profiles for customers with electric vehicles (EV) and for energy efficient (EE) customers. Customer EV profiles are calculated based on demographics, geographic location, and customer class, while EE customer profiles are developed to show the expected change over time of customer energy demand due to the adoption of EE technology.

1 - DER Statistical Research by the Solar Energy Industries Association