

Optimizing Operational Performance Utilizing Cloud-Based Solutions for Small to Mid-Sized Utilities

Software platform delivers IOU-level capabilities at a price/performance level optimized for municipal utilities and rural electric coops (RECs); provides tools to enhance system efficiency, optimize operational costs, protect revenue and improve customer service

Introduction

This paper describes the latest development in cloud-based solutions designed to address utility needs across various functions within the utility: The SATEC ExpertPower™ platform – ExpertPower for Utilities™. This software package interfaces with existing AMI Networks to collect data directly from the meter, as well as with network systems like SCADA, GIS, Billing, Outage Management and others. This means that ExpertPower collects data from many different sources in order to identify, prioritize and track utility issues, and notify personnel. Using a standard web browser

as a user interface, this approach leads to reduced total cost of ownership by eliminating the need to add special operational infrastructure or skills beyond what the utility already has in place. In addition to describing the benefits and basic architecture of the ExpertPower for Utilities platform, this paper will provide a number of use-case scenarios to show how this sophisticated tool is being put into effective use. By employing this cloud-based solution that is scalable, reliable and secure, utilities are seeing improvements in operational efficiencies, cost of ownership and revenue protection.

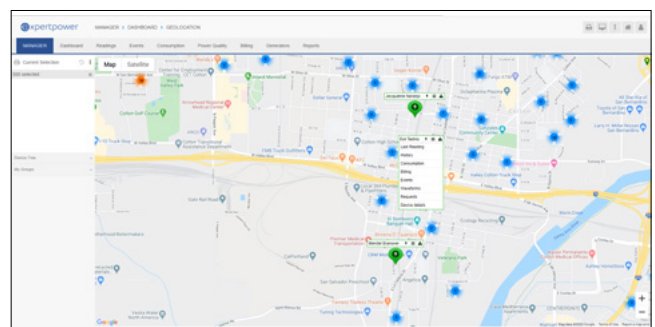


An Economical Solution for MUNI's and RECs

SATEC's ExpertPower platform was initially developed to support the sub-metering market for residential and commercial buildings and focused on billing functions. But it quickly became apparent that adding analytical benefits would help property owners improve customer service and reduce cost. Based on this experience, SATEC evolved the technology to support utilities.

The ExpertPower for Utilities platform resides on Amazon Web Services (AWS). Partnering with Amazon and leveraging their expertise for hosting and networking has directed SATEC's energy toward solving utilities' most pressing needs: reducing system and security instances, increasing the number of features and fixes for each

release, and increasing the time between releases. These benefits, in turn, have improved the utilities' operational resilience and business agility.



Improved Operational Efficiency and Reliability



Understanding how everything works together on a utility's distribution network is the secret to success when it comes to delivering energy to end users. Until the advent of analytical solutions, users had to navigate various systems to gather all the required data in order to determine how equipment was operating. In contrast, ExpertPower has the ability to consolidate data, analyze it, prioritize the

outcomes and deliver this information to the appropriate user in order to address equipment and system issues. Although it's essential to understand how one piece of equipment is operating, the real value of an analytical approach is the ability to provide insight into how all the devices on a network are interacting. This can help to identify issues before they become service disruptions or equipment failures, as well as to discover underutilized assets and those that are being pushed to their maximum capabilities.

Revenue Protection

Losses due to tampering and theft continually plague utilities. Although there have been improvements in this area, SATEC is finding new opportunities to help identify and eliminate this problem. ExpertPower for Utilities was designed to provide more detailed information from multiple sources, enabling utilities to make better decisions relative to losses across their network. Another revenue

challenge to utilities is the prevalence of customers utilizing distributed energy sources like solar or wind. Utilities are tasked with managing the network during normal activity – and more importantly – when demand is high. Understanding from where and how much energy can be pulled has become a key factor in maintaining service while controlling costs.

Customer Service

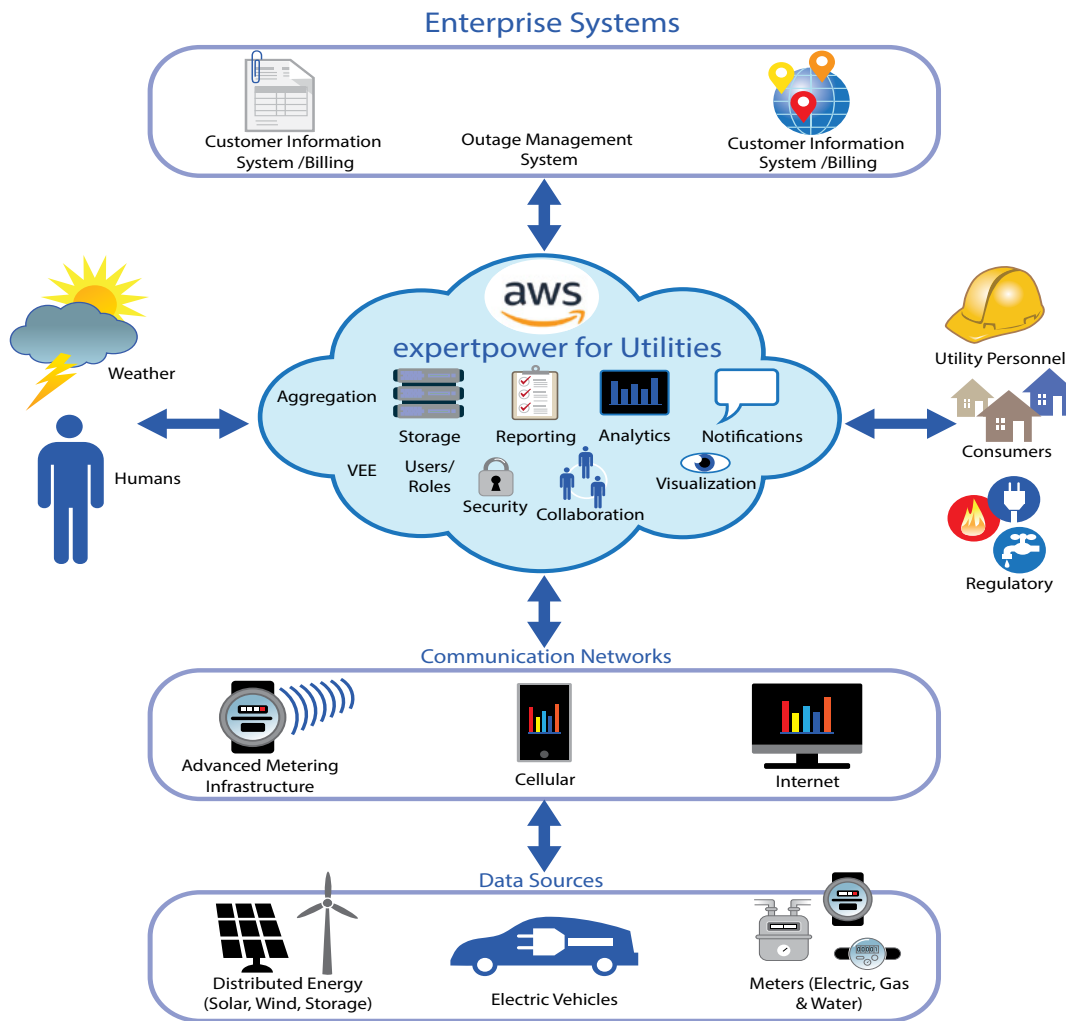
The ability for utilities to have timely access to meter data and software-enabled analysis can lead to superior response times into customer inquiries regarding billing questions and other issues. To be successful, ExpertPower for Utilities considers a broad range of information, such as historical data, market/group trends, weather conditions, etc. This ensures that the entire view of a customer's usage is understood. The insights conferred by this analytical approach to data empowers utilities to maintain the highest quality of service that customers expect.



The ExpertPower for Utilities Infrastructure

SATEC’s ExpertPower software package has been successfully deployed in a range of commercial, industrial and utility applications for over fifteen years. It has proven to be a powerful, scalable solution, whether monitoring a single meter at a sub-station or thousands of meters across

an entire service territory. The specialized Utilities version builds upon this long-time expertise to meet the specific needs of small to mid-size electric utilities. The figure below offers an overview of the system infrastructure.



As a cloud-based system, ExpertPower for Utilities collects and delivers data from as many sources as necessary to meet a utility’s particular needs. Data and information is easily accessible through a simple web browser and can help to solve specific issues. Examples include billing, work-order management,

outage management, SCADA and GIS systems. Additionally, the platform’s operational management tools present data and information the way each user prefers to see it, and according to their priorities. ExpertPower for Utilities is also set-up to send notifications directly to the personnel ultimately responsible for addressing each issue.

Use-Case Scenarios: Operational Efficiency and Reliability

Utility system engineers, field service engineers and operations management can all benefit greatly from the data and analysis provided by the ExpertPower for Utilities.

The following section provides a sampling of specific applications, or use cases, addressing the ability to reliably and efficiently deliver energy to the end user.

Transformer Load Management



In order to determine if a specific transformer is properly sized, meter data from all loads fed by the transformer must be recorded and aggregated. The ExpertPower for Utilities platform collects data to identify problematic events generated during distribution so that the utility can take appropriate action.

Three examples of these load issues are:

Overloading – When the transformer gets close to being overloaded, an event occurs, and a notification is sent via the ExpertPower for Utilities platform. Armed with this information, the utility can decide what to do before a

fuse blows or a transformer is damaged. One fast-growing application where this is helpful is with electric vehicle charging stations. In particular, fast-charging stations pull a tremendous load. If the correct infrastructure is not in place, damage can occur. Many times, the utility is unaware of customers adding charging stations to their home or office, so having ongoing monitoring facilitates making the necessary adjustments before problems occur.

Low Loads – This event is focused on the efficiency of a transformer that may be underutilized in the field. Low-load alerts can help the utility locate assets that could be utilized more efficiently elsewhere, or simply give the utility an awareness of the asset's installation environment.

Change in Loading – It is important for a utility to be aware of added or removed loads on a transformer so that they can make billing and other customer service alterations based on appropriate changes to the account. For instance, changes to metering in the field can occur and a new load may be assigned to an incorrect transformer. In this case, "on paper," the transformer may appear to be overloaded when in reality it's operating correctly. Another example is a work order that was never closed out, leading to incorrect billing. Correctly identifying load changes is therefore essential for customer service.

Distributed Energy Management



The proliferation of distributed energy generation sources (e.g., solar, wind, storage) adds to the complexity of a utility's management of its distribution network. This scenario involves three important elements:

Understanding the distribution network – When the electricity grid was built, the number of inputs to the grid was limited to what the utility was putting in place and, in some instances, to the few other large industrial customers who were supplying energy to the grid. Of course, the quantity of solar inputs that would be added to the grid was unaccounted for. As a result, today's utilities struggle

Distributed Energy Management (Cont.)

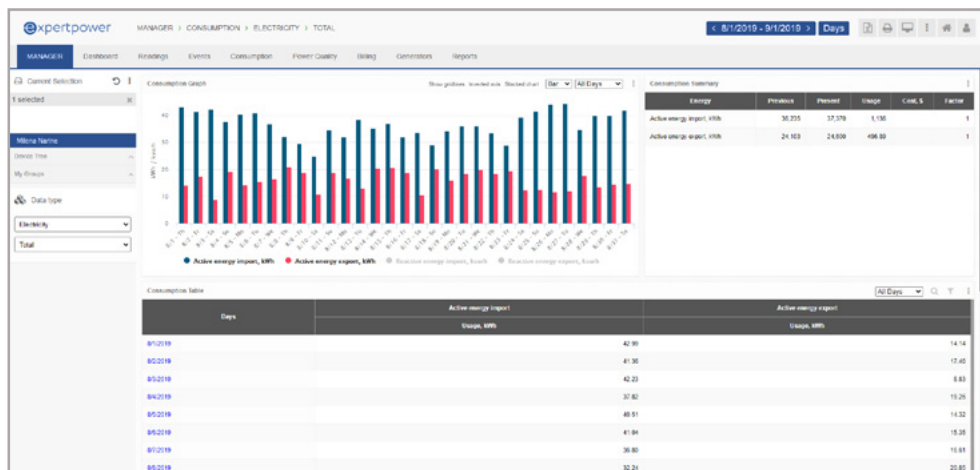
to maintain a reliable grid with reliable energy for every customer. was unaccounted for. As a result, today's utilities struggle to maintain a reliable grid with reliable energy for every customer.

A utility's awareness of what, exactly, is on the distribution network is of paramount importance for maintaining and planning their services. ExpertPower for Utilities provides the insights and tools for understanding distribution.

Regulatory requirements – In some states, such as California, the utility must monitor and report on distributed energy generation. Also, there are many states with renewable energy initiatives that require utilities to report what they are doing with their energy to avoid being financially penalized. The source of these renewables can be generation from the utility or generation by customers.

In this case, ExpertPower can consolidate this information for all reporting needs.

Calculating Load – Identifying coincidental load is a way to monitor all loads connected to a transformer, feeder and/or substation. This identification is important since it gives the utility a snapshot of when and what the heaviest demand is on the network. Similar to demand, which is associated to a single customer, coincidental load aggregates all customers together. The peak coincidental load may not even include the peak demand for a single customer. Having coincidental demand data can help a utility monitor their network in order to see trends that may be pushing to a point where demand exceeds supply. ExpertPower for Utilities enables the utility to perform this calculation on a system-wide basis.



This ExpertPower display is an example of meter data from a utility customer with solar panels

Use-Case Scenarios: Revenue Protection

Tamper Identification – Tamper Validation – There are various methods used to tamper with electric meters – and people bent on stealing from the utility are constantly finding new ways to do this. AML meters offer various indicators, or flags, identifying actions related to the meter. A few examples include: removal, inversion, magnetism and tilt. But sometimes a “tamper” is perfectly justified. For this reason, validating information and data as it is received is key to understanding the intentions behind various tamper alerts.

Voltage Comparison Method – Evidence of tampering can be detected by monitoring the voltage of all meters tied to the same transformer. By analyzing the voltage at each metered load, ExpertPower for Utilities can identify a meter that has a lower voltage than the average, which is an indicator that more load is being used than what is being recorded. This is typically done by bypassing the meter.

Use-Case Scenarios: Customer Service

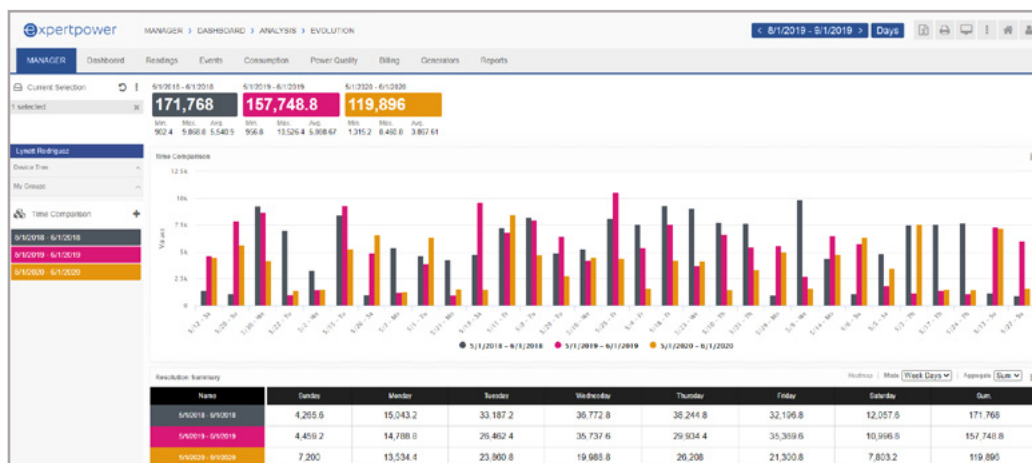
The following use cases are scenarios where the utility is interacting with the customer. Having quick access to the account and the data is necessary for keeping customers happy. Here are a few examples of how ExpertPower for Utilities achieves this interaction:

Determining Weather-related High Bill Complaints – To solve weather-related complaints, ExpertPower for Utilities includes weather data on its charts and graphs, for example: temperatures and weather conditions like Sunny, Rain, etc. By combining average daily temperatures with daily consumption, users can quickly see the cause for their higher bill, when outdoor temperatures go up, so does the use of air conditioning. This information is also helpful for customers that use solar panels. By having access to weather data, users can identify when their solar panels are the most effective based on an abundance of sunshine.

Customer Energy Survey – This scenario involves customer awareness of their overall energy usage and is often conducted as the result of a billing complaint. The survey is driven by the end user’s interest in determining their own usage profile. They are provided data at hourly or 15-minute intervals in order to identify when and where they are using electricity. Upon investigating this usage, they may be able to reduce their overall usage by curtailing certain items. ExpertPower for Utilities collects and presents this data, which is extremely useful when utilizing time-of-use rates.

Rate Investigation: TOU or Not TOU – Many utilities are moving to an opt-in rate structure that allow customers to decide if they want to participate in a time-of-use (TOU) rate plan versus a traditional rate. Time-of-use rates are typically structured with multiple rates: Peak, Off-Peak and Shoulder. Peak is traditionally aligned with the peak load during mid-afternoon to early evening. The contributing factors are high temperatures in the afternoon that drive air conditioning use. It is also the time when people are returning home from work and school and driving up usage by turning on cooking equipment, TVs, appliances, etc. As part of the investigation into using this information,

customers need to see their usage over time in order to determine whether switching to a TOU rate would be financially beneficial. In many instances, the benefits of moving to a TOU rate can be realized by adjusting typical habits, such as delaying laundry, dish washing and other activities, until the peak timeframe has ended. ExpertPower for Utilities provides a TOU calculator that runs existing consumption data through an automated comparison of what a user’s monthly bill would look like with both rates. This also helps the utility to shift loads to off-peak times so that they can continue to deliver reliable energy to all their customers.



Comparing energy usage from different time periods is easily performed using ExpertPower tools

Service Disconnection

There are several remote disconnect scenarios that are facilitated with the operational control capabilities of the ExpertPower for Utilities software platform:

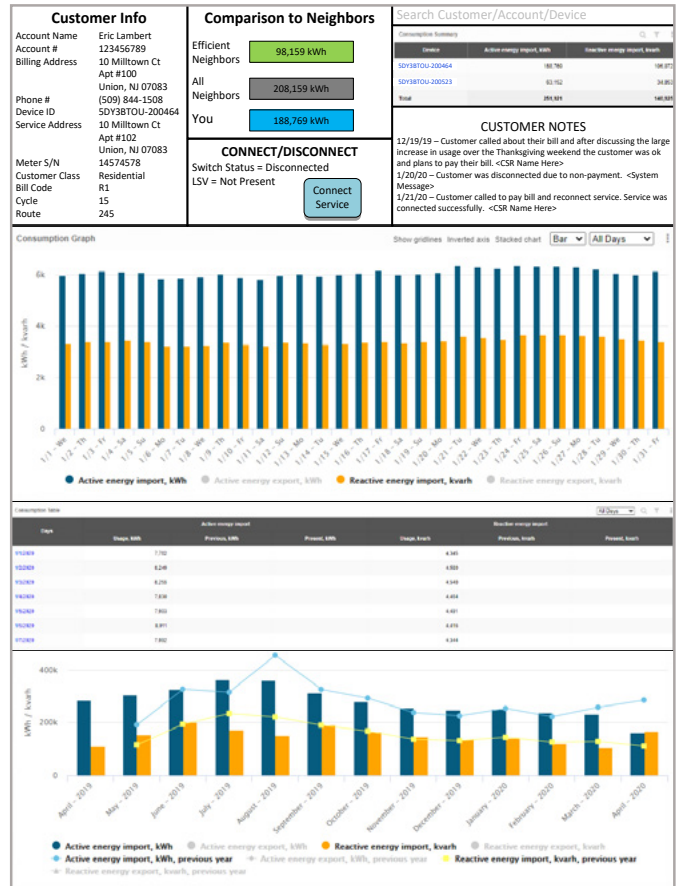
Safety – When a safety issue is identified, the utility should have the ability to disconnect power to an account. Examples of this would be a fire at, or close by, a location.

Service – If power needs to be disconnected during service at a location, the ExpertPower software enables the utility to disconnect it remotely. Typically, the service person simply closes the main breaker; or, in some instances, they can disconnect at the meter.

Non-Payment – If the utility needs to disconnect customers for non-payment, the software’s precise monitoring facilitates disconnection on a meter by meter basis, or a group of meters can be scheduled for disconnect on a certain day and time. ExpertPower also has the capability to restrict disconnects on accounts that are utilizing life-support equipment or during seasonal moratoriums or other contingencies.

Move In/Move Out – Some utilities will disconnect power from a location where a tenant moves out and the new tenant is not moving in immediately. This can be done at the time of the event, or it can be scheduled.

As an added feature, ExpertPower for Utilities can make users aware of load-side voltage on disconnected meters. This helps to identify unsafe situations before bringing power back on at any location.



Sample: ExpertPower for Utilities customer service screen

Conclusion

As this paper describes, SATEC's ExpertPower for Utilities software platform offers significant benefits for utilities and their customers. In addition to the platform providing power performance tools that were previously unattainable for small and mid-sized utilities, this scalable

solution delivers a wide range of capabilities at a price/performance level optimized for municipal utilities and rural electric coops. It also provides important tools for enhancing system efficiency, optimizing operational costs, protecting revenue, and improving customer service.



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About SATEC, Inc

As a global leader with more than three decades of expertise in development of energy management and efficiency technologies, we are committed to empower consumers with flexible, scalable energy intelligence solutions focused on delivering business intelligence that drive energy efficiencies and improve reliability across multiple user applications worldwide while contributing to a sustainable planet.