ELECTRIC POWER RESEARCH INSTITUTE

RECURVE

Startup
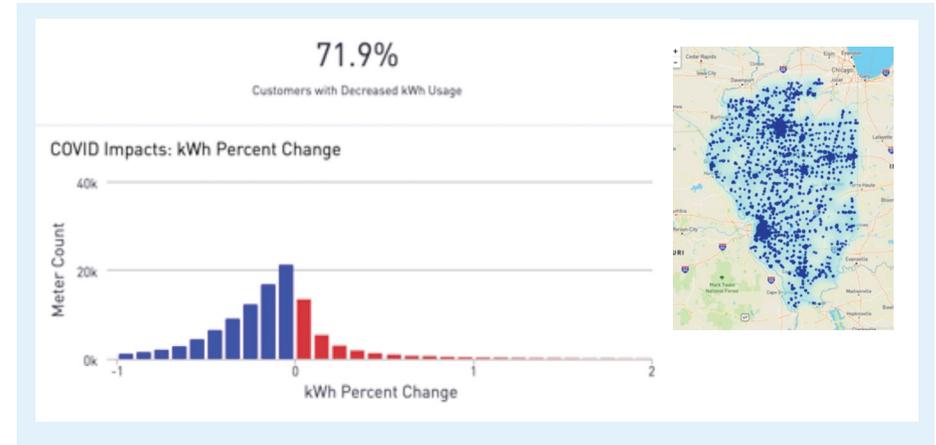Recurve

Ameren

Host
Ameren

Technology Solution

Utility energy efficiency programs face continuing challenges in engaging and acquiring business customers. These challenges have been exacerbated as businesses struggle with the realities of COVID-19 and focus on survival. Meanwhile, utilities with advanced metering infrastructure (AMI) are generating massive streams of data characterizing the usage patterns of individual consumers with unprecedented granularity.
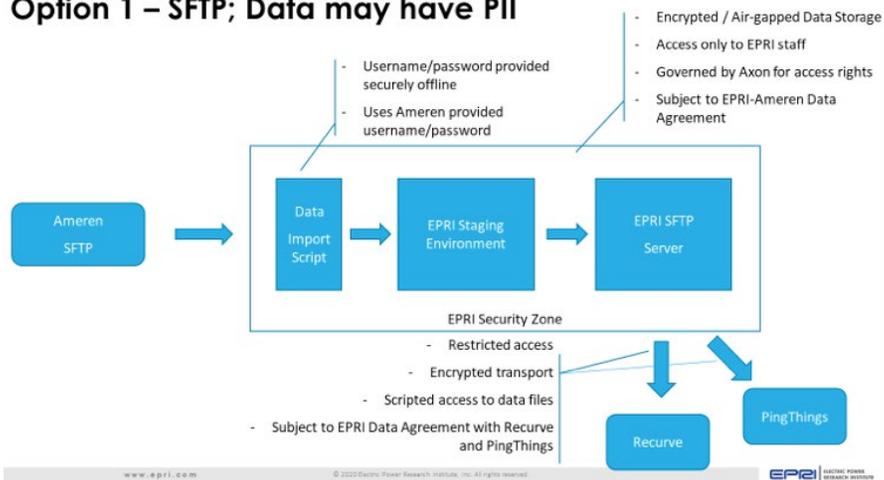

This pilot demonstrated use of meter-based analytics to analyze energy consumption during the pandemic (left) to support identification of high-potential customers (right)

This pilot was designed to explore the use of Recurve's Resource Planner tool and evaluate how AMI data could be applied for identifying and targeting business customers hit hardest by COVID-19. The Recurve platform analyzes the data generated by all customer meters in a utility's portfolio to disaggregate usage characteristics and identify the potential for behind-the-meter interventions. Robust meter-based analytics identify which individual customers will likely derive the most bill savings from specific energy efficiency, demand response, or renewable energy measures while also delivering benefits to the grid.

Project Overview

Recurve, EPRI, and Ameren worked together to enable the utility's Illinois Energy Efficiency Business Program to leverage AMI data and better support struggling enterprises through this challenging time by increasing the depth of customer targeting prior to direct utility engagement. According to Ameren's data, business customers showed an average 14% reduction in energy consumption in the early months after COVID-19. However, as shown above, individual accounts ranged from nearly a 100% reduction to a 200% increase, and around 28% of electric meters and 33% of gas meters exhibited greater usage.

Ameren and EPRI collaborated with Recurve to focus its analytics on increasing uptake of lighting measures and heating, ventilation, and air conditioning (HVAC) measures. Underlying goals included identifying those customers who would benefit most from efficiency retrofits with a high persistence of savings, streamlining the customer acquisition process, and reducing administrative costs to pass maximum benefits on to consumers.

Challenge: Customer and Community Engagement

Option 1 – SFTP; Data may have PII

- Username/password provided securely offline
- Uses Ameren provided username/password

- Encrypted / Air-gapped Data Storage
- Access only to EPRI staff
- Governed by Axon for access rights
- Subject to EPRI-Ameren Data Agreement

Ameren SFTP → Data Import Script → EPRI Staging Environment → EPRI SFTP Server

EPRI Security Zone
- Restricted access
- Encrypted transport
- Scripted access to data files
- Subject to EPRI Data Agreement with Recurve and PingThings

Recurve → PingThings

Option selected for transfer of data from Ameren to EPRI to Recurve

To ensure both secure and timely transfer of AMI data for use in this pilot, project participants agreed on data flow from Ameren to EPRI and then from EPRI to Recurve. The following options were considered:

1. **Secure FTP (SFTP) for data that may have personally identifiable information (PII):** Set up an SFTP transfer from Ameren to EPRI to Recurve. The EPRI environment, governed by Axon and an Ameren-EPRI data agreement, would include a mechanism to script the data transfer into a staging area and an EPRI SFTP server. Recurve would be provided with username/password-based access to download data from the EPRI SFTP server.

2. **Amazon S3 bucket with transfer acceleration:** Set up an Amazon S3 bucket so that secure data transfer could take place from Ameren's S3 bucket to EPRI's S3 bucket and Recurve could download the data from EPRI's S3 bucket.

3. **Physical hard drive:** Set up a secure EPRI environment for data transfer from Ameren to EPRI. The environment would include a mechanism to script

the data transfer into a staging area from which the data would be transferred into a physical hard drive. The hard drive would then be shipped to Recurve.

The SFTP option, illustrated in the figure at left, was chosen as the best approach, certified by Ameren's architecture review board, and approved by EPRI's IT policy compliance officer. The set of files that were transferred included meter-level AMI data along with metadata providing account information, including information pertaining to the businesses owning these accounts.

Results & Learnings

The secure data transfer approach adopted in this pilot supported the end-to-end process of transforming raw AMI data into insights that helped identify specific small business accounts significantly impacted by the COVID-19 crisis. Recurve's software-based platform ingested and analyzed vast amounts of AMI data to differentiate temperature-based baseline loads, other baseline loads, and discretionary loads and then to determine inefficient uses and the types of energy efficiency programs and measures that would deliver the most benefit for individual customers. "Targeting dashboards" displayed results in a simple, interactive, and user-friendly format.

Identifying customers most likely to benefit from lighting upgrades. Because most lighting is not used continuously, consumers with high, non-temperature-dependent discretionary loads are likely to have the

highest energy usage from lighting. To identify these customers, Recurve generated a targeting dashboard for lighting using the following parameters:

• Annual Usage: Top Three Quarters

• Percent Discretionary: Top Quartile

Business customers fitting these criteria have high potential for lighting upgrades: Discretionary consumption accounts for 55% of their usage, as opposed to 20% for the average. The dashboard includes additional filters for further targeting through program design and via marketing campaigns—for example, to the 3,066 customers who have increased their usage throughout the pandemic, to ensure that they receive the support needed to remain open; or to the 14,324 customers whose usage has decreased, to help them reduce energy costs and weather the storm.

Improving outcomes by targeting customers with high potential for HVAC savings. Recurve generated targeting dashboards for both cooling and heating, as shown on the next page. For cooling, the following criteria were applied:

• Cooling kWh: Top Quartile

• Percent Cooling: Top Quartile

A subset of 10,421 Ameren customers—9% of the total base—were identified as high-potential targets because cooling represents over 30% of their electricity usage. In comparison, non-targeted customers use, on average, less than 10% of their energy on cooling. Among targeted customers, 1,390 exhibited increased energy consumption during the pandemic, while the remainder experienced a decrease. Such further segmentation could help in fine-tuning marketing and outreach to specific customers based on how the pandemic has impacted their business.

Selected Customers: Electric Load Disaggregation
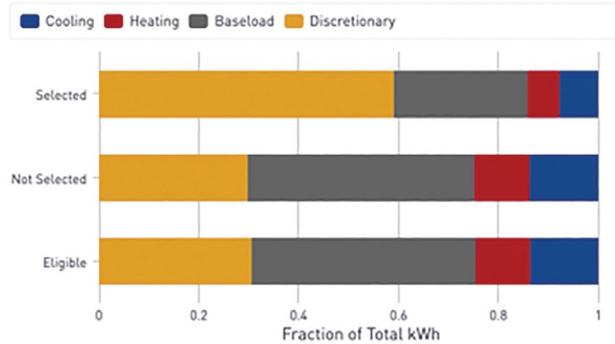
Avg. Customer Daily Load Shape
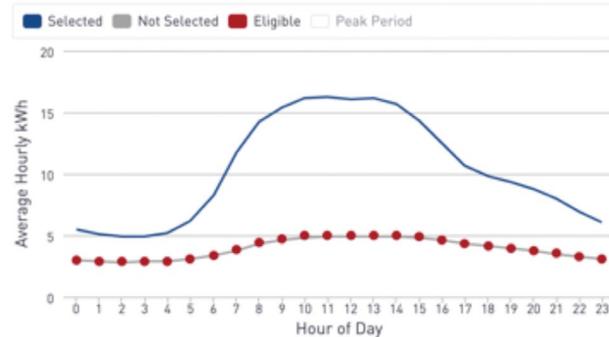
Targeting dashboards highlight the load curves and usage breakdowns of customers identified as having high potential for specific efficiency measures

For gas heating, Recurve applied these criteria:

• Heating Therms: Top Half

• Percent Heating: Top Half

The targeting dashboard identified 1,867 customers (4.4%) who consume over 97% of their gas for heating; the non-targeted subset uses less than 70% for heating. Among the targeted class, 149 customers showed increased gas and electric usage during the pandemic, while the remainder exhibited a decrease. Again, these insights can aid in customizing messaging during program outreach.

Implications & Next Steps

This pilot demonstrated that targeting dashboards for lighting, cooling, and heating created by Recurve based on Ameren's AMI data can facilitate the identification and further segmentation of customers with high energy-saving potential. These customers are most likely to be relying on inefficient technologies, to be struggling with high energy bills on a year-round or seasonal basis, and to be receptive to investing in efficiency upgrades.

The Ameren business effiency team has been trained to adjust dashboard filters to further analyze and refine the attributes of customer subsets, inform program design and marketing, and create targeted customer lists for use in deployment of lighting and HVAC initiatives. Using targeting to deliver solutions to the customers that need them most will help the utility streamline outreach and thereby pass on the maximum program benefit to its customer base. Recurve's Resource Planner platform also provides Ameren with the opportunity to dig further and identify high-value customers for any business offerings.

This pilot was focused solely on analyzing AMI data for customer targeting by efficiency programs, but the dynamic platform also can monitor real-time impacts at the meter, deliver insights on load shapes, and assess program performance. Working with programs in other states, Recurve observed that targeting can increase energy savings by over 70% per customer—potentially enabling higher savings claims relative to typical values. In addition, high-potential customers showed peak savings exceeding 200% of the expected total, which translates to double the grid value per project implemented.

This pilot showed the potential for meter-based analytics to lead to greater near-term cost-effectiveness for efficiency programs, as well as to enable the design and implemention of initiatives focused on increasing grid flexibility and resiliency, meeting other operational and business objectives, and supporting progress toward decarbonization.

Resources

incubatenergy labs

labs.incubatenergy.org

2020 Incubatenergy Labs Sponsors

Ameren

American Electric Power

conEdison, inc.

enel

Nebraska Public Power District
Always there when you need us

New York State of Opportunity | NY Power Authority

PGE

Southern California Edison®
An *EDISON INTERNATIONAL*® Company

SRP

TVA

Xcel Energy®

3002020655