



# GLOBAL EMERGING ENERGY SOLUTIONS FOR CUSTOMERS

Case Studies

*December 2020*



Edison Electric  
INSTITUTE

INTERNATIONAL  
PROGRAMS

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# INTRODUCTION

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As technology advances and customer expectations continue to evolve, electric companies are creating new ways to deliver the energy future. The electric power industry is transitioning its generation fleet to provide clean, reliable, and affordable energy to all customers, including those in rural and remote communities. By rethinking the role of electricity services, electric companies have developed innovative solutions that enhance the customer experience and strengthen their relationship with communities. EEI member companies are leading the industry by leveraging data to provide customers with more information, choice, and control over their energy use.

The electric companies included in this report represent seven countries in five regions. These case studies demonstrate the diversity of approaches that EEI members are employing to meet fast-changing customer preferences across four key areas:

- Energy delivery
- Smart home energy management
- Transportation electrification
- Customer engagement and billing

Electric companies are innovating their **energy delivery** methods to provide energy solutions for low-income, rural, and remote customers who may not be able to afford traditional connections to the energy grid. Many companies also are providing customers with more control over the attributes of their energy, through new offerings such as customer-owned renewable energy programs.

To create personalized and **smart home energy management** experiences for customers, electric companies are leveraging new sensors, communications devices, and other digital technologies on their systems. Through energy efficiency measures, electric companies also are helping customers control their energy use, conserve energy, and save money.

Furthermore, electric companies are driving the transition to **electric transportation** by addressing barriers in consumer awareness and investing in charging infrastructure. As customer interest in electric transportation grows, electric companies also are developing solutions to manage and optimize vehicle charging.

Finally, to meet customers' needs for more convenience and more information on energy usage, electric companies are enhancing their **customer engagement and billing** with new platforms and programs.

The projects and programs included in this report highlight EEI international member company efforts to enhance the customer experience with the goal of inspiring other electric companies as the industry continues to reimagine customer service. This casebook will be updated with additional company case studies on a continuing basis. To view projects from EEI's U.S. member companies, [click here](#).



# Electricity for All Program

## HIGHLIGHTS

So far, the **ELECTRICITY FOR ALL** program has energized **20%** of the Ivorian population.

**765,000+**  
**CONNECTIONS**  
made under the program.

Post-connection, **96%** of beneficiaries continue to **PAY FOR THEIR ENERGY** under a linear tariff.

Compagnie Ivoirienne d'Electricité (CIE) developed the Electricity for All program (French: *Programme Electricité Pour Tous*, or PEPT) with several state and nonstate entities to address the high upfront customer connection costs inhibiting electricity access across the country. In Cote d'Ivoire, the cost to connect a household to the grid is approximately \$300 USD, which is a significant financial burden for low-income populations.

The Electricity for All program gives customers access to interest-free, unsecured loans to finance their connection costs, which are then paid down as part of their electricity bill over the course of three to ten years. Through the program, CIE also installs smart meters at the point of service, providing customers with more control over their energy consumption. CIE's linear tariff assesses a prepaid fee for a preset number of kWh every month, allowing customers to calibrate

payments to stay within their means. On top of the linear tariff, customers also pay a fixed amount towards the repayment of their connection costs.

CIE acts as the program operator and administrator, managing the connections and installations of smart meters and collecting payments from customers. Recently, the World Bank provided \$25 million USD to cover a portion of the connection costs absorbed by CIE. This funding was used to connect 40,000 customers in 2018, with another 75,000 connections in 2019. The African Development Bank and European Union also have contributed €30 million to PEPT.

In 2020, the program expects to connect at least 220,000 households, with plans to connect 200,000 households per year until 2025 to provide electricity access to more than 90 percent of the country.



# Base Power All-in-one Off-grid Energy System

## HIGHLIGHTS

43

Base Power  
**SYSTEMS INSTALLED.**

Through these systems,  
distribution companies  
like Powerco have

**SAVED MORE THAN**

**\$15 million**

of capital expenditure.

The Base Power system  
combines solar panels,  
batteries, and a backup diesel  
generator to meet

**REMOTE CUSTOMER  
DEMAND.**

Powerco's Base Power is an all-in-one self-generation system designed to bring reliable power to the electric company's remote customers in New Zealand. Base Power systems feature photovoltaic solar panels with batteries to store excess energy and a diesel generator to provide backup power when needed. Powerco offers these units as an alternative electricity supply for areas where upgrading the electricity network to improve supply is not cost effective. Generally, Base Power units are proposed for remote, rural customers, with a range of models to cater to different customer needs (from homes, to remote huts, to workplaces).

Powerco created these units in collaboration with other distribution companies, ensuring they would be simple to operate and maintain. Most of the Base Power units supply power at the same voltage and

frequency as the energy grid, giving customers a seamless experience. The units also are easy to use – the only thing customers need to do from time to time is refill the diesel tank for the backup generator when fuel levels are low. Furthermore, Base Power units are designed to be transported by helicopter to locations that are difficult to access, which makes them ideal for both remote placement and for use in emergency situations when access to power from the energy grid would be too costly or logistically unfeasible.

Powerco trialed these units for several years before beginning to distribute them more broadly in late 2017. Today, 43 Base Power systems have been installed to customers in remote and rural areas, providing an alternative to the energy grid where system upgrades would not be cost effective.



# Hot Water Load Management Trial

## HIGHLIGHTS

From August 2017 to 2018,

**104**

homes participated in Vector's **PILOT PROGRAM.**

Customers using the load management technology **REDUCED AGGREGATE PEAK LOAD**

**> 25%**

during the evening peak.

In one neighborhood alone, deploying this technology at scale could defer a

**\$1.6 million**

system upgrade to the zone's substation for another 10 years.

Vector Limited recently piloted new wireless technologies to revamp a demand side management (DSM) program it has been operating since the 1950s with around 40 percent of their residential customers. The program focuses on electric water heating, which the electric company estimates can represent up to 20 percent of total peak demand during winter months. As a winter-peaking electric company, Vector sees hot water load management as an opportunity to accommodate peak demand without investing in new infrastructure.

In the legacy DSM program, Vector used a ripple control system that sent signals from substations to houses to turn electric water heaters on/off for load control. To increase control and granularity of the system, Vector piloted a radio-based technology to determine if it could replace the ripple control system.

Vector is one of the first electric companies to apply these devices to water heating load control.

The radio devices allow Vector to identify which homes have the highest peak shaving potential and then send the shut-off signal directly to those homes. The pilot, conducted in a residential neighborhood, saw significant load reductions during the evening peak period. Moreover, the company received no customer complaints regarding their hot water systems during the trial. Vector predicts this technology, when deployed at scale and linked to its fully deployed distributed energy resource management system (DERMS), could defer the need for substation upgrades and other grid investments, allowing Vector to maximize existing resources to the benefit of all customers.



# Line Voltage Communicating Thermostat Pilot

## HIGHLIGHTS

From 2016 to 2017,  
**30**  
 employees participated in  
 Hydro-Québec's  
**LVCT PILOT PROGRAM.**

On average, LVCTs enabled  
 households to  
**REDUCE PEAK LOAD**  
**~ 2 kW**  
 for both morning and evening  
 peak events.

LVCTs are  
**CLOUD-CONNECTED,**  
**PROGRAMMABLE**  
 thermostats for baseboard  
 heating.

Hydro-Québec conducted a pilot program for line-voltage communicating thermostats (LVCTs), thermostats used particularly for electric baseboard heaters, among employees from November 2016 to March 2017. As a winter-peaking electric company, Hydro-Québec wanted to see how LVCTs could be used for peak load reduction, energy efficiency programs, and customer savings given two-thirds of households across the province of Québec use electric baseboard heating as their main heating source.

LVCTs are programmable and cloud-connected, which allow for a suite of capabilities such as remote control, occupancy sensing, energy use reporting, self-learning, and security, among others. Hydro-Québec piloted the technology to investigate whether LVCT users would realize savings and how effective LVCTs were as a form of demand

response. As part of the program, 30 Hydro-Québec employees were given LVCTs at no cost, while another 30 employees served as a control group.

During the trial, commands were sent remotely to preheat rooms two-hours before peak morning and evening periods, and then reduce heating at the time of the peak. This technology successfully shifted their energy load to off-peak periods by an average of 2 kilowatts for both morning and evening events. Additionally, participants were satisfied with the LVCTs, noting their ease of use and extra convenience in comparison to their previous thermostats. Hydro-Québec will continue to explore new technologies, such as LVCTs, and other demand response approaches to efficiently manage customer demand without costly infrastructure upgrades.



## Power Changers Program

### HIGHLIGHTS

**613**

**HOUSEHOLDS**  
signed up for the program  
trial.

Participating households  
achieved an average of

**23-36%**

**REDUCTION IN PEAK  
ELECTRICITY DEMAND.**

**70%**

Of participants said the  
program helped them  
**LOWER ELECTRICITY  
BILLS.**

Jemena Ltd., a distribution company in Australia, partnered with the Victorian State Government and other technology partners to design a digital customer experience to trial the concept of behavioral demand response. Called *Power Changers*, the program leveraged smart meters and smartphone technology to advise and empower residential customers to effectively manage their home energy use during Australia's summer months from December 2017 to February 2018. In Victoria, households can use three times more electricity than average on hot days, increasing peak demand and straining Jemena's energy grid where the network already is nearing capacity.

Customers participating in the trial were offered an opportunity to compete in various energy management challenges. When a peak event challenge was accepted by the

customer, they would receive an energy consumption target for a three-hour period. If they could keep their energy usage below the target, customers would earn redeemable community or individual reward points, which they could track through a *Power Changers* smart-phone application (app). Participants could earn additional points by completing quizzes and other activities through the app.

On average, households reduced their benchmarked peak electricity usage by 23-36 percent (0.4 to 0.7 kW) and the program contributed \$35,000 through the Community Rewards program and nearly \$16,000 through the Direct Rewards program. Nearly 85 percent of participants were satisfied with the program and Jemena is exploring expanding beyond residential customers and bringing together more demand response solutions to realize greater network benefits.





## Elderly Care Plan

### HIGHLIGHTS

The program was piloted by

**300**

**TRIAL USERS**

for one year before becoming publicly available.

By 2040,

**9 million**

Japanese senior citizens **AGED 65 OR OLDER** will be living alone.

The Elderly Care Plan uses energy disaggregation technology to parse out **APPLIANCE-SPECIFIC DATA** from a single smart meter.

In August 2017, one of Tokyo Electric Power Company's (TEPCO) subsidiaries, TEPCO Energy Partner, Inc., launched an energy management and monitoring program to address and better serve the needs of Japan's growing elderly population. This program, the Elderly Care Plan, leverages energy disaggregation technology to identify appliance-specific data from the load signals of a single utility meter.

With sensors and algorithms from this technology that analyze usage in real-time, TEPCO can identify and match patterns in the current to the patterns of certain appliances, such as refrigerators, air conditioners, microwaves, and others. These appliance-specific data are then made available to customers through an app that can evaluate behavioral irregularities by usage patterns.

The program serves customers in their 40s-70s who have taken on custodial care of relatives in their 60s and older. The appliance data allows customers/custodians to monitor changes in energy usage over time, which could provide early indicators of any declines in physical or mental health or instances that require immediate assistance (i.e. if the air conditioning is not being turned on during very hot days).

TEPCO plans to apply disaggregation technology to other business lines and customer segments, including more widespread home energy management systems. However, their choice to begin with products and services tailored to the elderly demographic shows TEPCO's commitment to meet the unique and changing needs of their customers.



**STATE GRID**  
CORPORATION OF CHINA

## Smart Internet of Vehicles Platform

### HIGHLIGHTS

**30,000+**

**MILES-LONG**

EV charging network serving more than 20 provinces in China.

SGCC built a virtual **INTERNET OF VEHICLES PLATFORM** to enable information sharing and deliver app-based services to customers.

Network has more than

**457,000**

**CHARGING PILES.**

State Grid Corporation of China (SGCC) is one of the most active electric companies in the electric transportation space and is one of the world's largest electric companies, serving more than 1.1 billion customers. Most notably, SGCC supports a 30,000-mile long network connecting more than 457,000 electric vehicle (EV) charging stations and piles, covering 85 percent of China's territory as of early 2020.

To connect this expansive system, SGCC built a smart internet of vehicles (IOV) platform through its subsidiary State Grid EV Service Company (SGEVS). The IOV platform enables information-sharing among different charging station equipment operators and offers app-based products and services for end-use customers. The platform manages all data flowing through the charging station network, allowing for efficient charging, billing, ticketing, and fault monitoring at each one.

On the customer-facing side, SGCC has deployed three successful apps to create a positive and beneficial charging experience: *e-Charging* provides customers with car charging payment options; *e-Ride Sharing* allows customers to carpool in EVs; and *e-Riding* supports EV rentals with navigation to nearby charging stations and 24-hour customer service and emergency repairs. SGCC continually evaluates these apps and identifies services for new apps to improve and to strengthen the customer relationship.

SGCC considers the network as a basis for a future smart grid to effectively coordinate and optimize grid operations as more distributed energy resources come online. More than five million registered EVs are expected on the roads in China by 2020.



## EV.X Mobile App

### HIGHLIGHTS

The EV.X App uses **BEHAVIORAL ANALYSIS** to provide users with targeted and data-driven information on the benefits of EV adoption.

**25,680+**  
**USERS OF THE APP**  
as of November 2020.

Within a year, the app has recorded nearly  
**267,000**  
**TRIPS TAKEN.**

Energias de Portugal (EDP) launched a mobile application in 2018 that provides users with data-driven and tailored information on the advantages of adopting an electric vehicle (EV). The EV.X app leverages behavioral analysis to produce a report from all trips users take by car. The report outlines the potential financial savings and environmental benefits that could have been achieved if the user had been driving an EV instead of their standard internal combustion engine vehicle.

These comparisons consider the number of trips, distance, and fuel consumption and then provides the user with a report outlining what the savings for both fuel expenses and carbon emissions would have been if the user had been driving an EV. The app also provides information on charging stations along trip routes, to assuage concerns users may have regarding range anxiety, which remains one of the top barriers to EV adoption.

The EV.X app is available at no-cost in 21 countries through the Apple and Google app stores, with more than 25,680 users as of November 2020. EDP believes that this app will raise awareness of the benefits of EV adoption and assist customers in overcoming negative perceptions of EVs, ultimately propelling market development for EVs. With the information gathered by the EV.X app, EDP also will be able to better understand driver patterns, which could help the company make more informed decisions for future EV infrastructure deployment, including future locations of charging stations.

While the EV.X app still is relatively new, it may serve as a powerful tool for influencing customer perceptions of EVs and supports broader national and regional greenhouse gas reduction goals.



## Voice Assistant Customer Self-Service

### HIGHLIGHTS

Since launch,  
**7,000+**  
**CUSTOMER INTERACTIONS**  
with the voice assistant skill.

The skill is designed to answer the most common **CUSTOMER QUESTIONS**, including information about their electricity bill and outages in the area.

**1<sup>st</sup>**  
electric company in Canada to offer this service.

Hydro Ottawa recently launched a voice assistant skill for customers, becoming the first Canadian electric company to offer this service. The skill gives customers 24/7 access to Hydro Ottawa through both Amazon Alexa and Google Home products (whether through smart speakers, phones, or tablets), and is designed to answer some of the most common questions Hydro Ottawa receives from customers regarding their electricity usage.

For example, customers can ask questions about the current electricity rate or Time-of-Use period and receive up-to-date information on their electricity bill. The voice assistant also can share energy conservation tips to help customers better understand how to save electricity and lower their bills. Through the Hydro Ottawa skill, customers also can learn about power outages in Ottawa, including

where they are and how many customers are affected.

The experience is conversational, with the voice assistant responding to customer questions and asking follow-up questions for an interactive discussion. Since the skill's inception, there have been more than 7,000 customer interactions with this new communication channel, which Hydro Ottawa expects to continue growing.

This voice assistant skill is one of many Hydro Ottawa customer solutions leveraging new digital technologies to provide customers personalized and actionable energy insights. In recent years, the electric company also has launched a mobile app for customers to gain additional information and insights on their energy use and access latest information on power outages, among other benefits.



## Advantage Power Pricing

### HIGHLIGHTS

The Advantage Power Pricing Program allowed customers to voluntarily sign up for **ELECTRICITY PRICING ALTERNATIVES** to reduce their electricity costs.

**8,000**  
**CUSTOMERS**  
**PARTICIPATED**  
in the pilot project.

With the Dynamic Plan, customers showed a **13%** **REDUCTION IN ENERGY USAGE** during peak hours.

In September 2017, Alectra Utilities launched the Advantage Power Pricing (APP) program, a pilot project to empower customers to save on energy costs by voluntarily signing up for one of three electricity pricing alternatives: Overnight, Dynamic, or Enhanced. The program was established under the leadership of the Ontario Energy Board (OEB) through the Regulated Price Plan (RPP) Roadmap pilots initiative.

The APP Overnight Plan was ideal for shift workers or electric vehicle (EV) owners, with extremely low electricity rates from 12 a.m. to 6 a.m. To make up for this low rate and to further incentivize shifting energy usage to off-peak periods, the on-peak rates under this plan were somewhat higher than standard time-of-use pricing. The trial ran through May 2019, and results showed a substantial decrease in energy usage during peak hours (around 9.6 percent). If this program were scaled, the 80 percent reduction in charging costs could make owning an EV in Ontario more affordable.

Another pricing option, the Dynamic Plan, was extended to run until October 31, 2019. This pricing option featured a peak period from 3 p.m. to 9 p.m., but lower off-peak rates than standard time-of-use pricing. The plan also included a “critical peak price” period for up to four hours on the days with the highest demand in both summer and winter. Customers who volunteered for this pricing plan showed a 13 percent reduction in energy usage during peak hours.

Overall, the customers that participated in the pilot project benefitted from greater choice in rate plans, more real-time information, and more control in managing their energy costs. Learnings from this pilot can help electric companies better understand how customer choice, energy literacy, and other factors may lead to changes in customer behavior. Moreover, the results from this project could be used to inform decisions by the OEB on future electricity pricing plans.

# ABOUT EEI

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The **Edison Electric Institute** (EEI) is the association that represents all U.S. investor-owned electric companies. Our members provide electricity for about 220 million Americans, and operate in all 50 states and the District of Columbia. As a whole, the electric power industry supports more than 7 million jobs in communities across the United States.

In addition to our U.S. members, EEI has more than 65 international electric companies with operations in more than 90 countries, as International Members, and hundreds of industry suppliers and related organizations as Associate Members.

Organized in 1933, EEI provides public policy leadership, strategic business intelligence, and essential conferences and forums.

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