Smart EV Charging Systems at workplace

se.com/ca/microgridsolutions

Life Is On | Schneider Electric

Smart EV Charging Systems at workplace:

Overview:

AlectraDrive @Work is a multi-year pilot program that demonstrates the value of a smart electric vehicle (EV) charging system. It is able to balance the electricity needed to serve workplace buildings and onsite EV charging systems. The project provides businesses with turnkey smart charging solutions that integrates the workplace building and EV load management system with battery storage technology. The solution strategically charges EVs by considering factors such as planned departure time, the facility's electricity demand and provincial electricity prices in real-time.
The goal of the program is to showcase the value of smart charging systems, make it easier for workplaces to install EV charging stations and support the adoption of EVs.

Phase one of the program saw AlectraDrive @Work launch the first workplace site at the Markham Civic Centre in Markham, Ontario. Through the program, the Centre was equipped with a total of 16 Level 2 EV charging stations—10 outdoor and six indoor—in addition to two free stations available for public use 24/7. The program strives to make EV charging stations more accessible for drivers, lessen anxiety around battery charge, and ultimately, support the continued adoption of EV technology across Ontario.

As a first-of-its-kind workplace EV charging solution, AlectraDrive @ Work received the PEO 2019 York Chapter Engineering Project of the Year Award: Large Size Company Category. The project was also recognized by Plug'n Drive and the Canadian Electricity Association (CEA) through Alectra's receipt of the 2020 Tom Mitchell Electric Vehicle (EV) Utility Leadership Award.

As EVs continue to grow in popularity—with 30% of vehicle stocks expected to become electric by 2040, the accompanied rise in demand of vehicle charging facilities on the electricity grid becomes a barrier for further EV adoption. As renewable distributed energy resources are added to the grid, the complexity of the systems can be overwhelming. By easily managing the demand EVs have on the grid, Schneider Electric's EcoStruxure™ Microgrid Advisor facilitates the integration—thereby improving future electricity infrastructure decisions and encouraging EV adoption.

Client vision

Alectra Customers are seeking simple solutions to implement workplace EV charging systems that manage electricity demand energy costs and demand Response (DR) program.

Goal

Provide an easy, efficient and accessible charging solution for employees that encourages the adoption of EV technology.

Why It Matters?

The energy landscape has changed drastically over the last several years. Demand for energy has grown under the pressure of three global megatrends—decentralization, digitalization and decarbonization, forcing the industry to adapt in response.

While traditionally, energy has been distributed through one-way electrical grids, this is no longer the only model. With increased demand being placed on the grid, distributed energy resources (DERs) will play an important role in helping to offset the dependency and pressure placed on utilities, offering increased reliability, resiliency and sustainability with renewables integration. Microgrid operations will be a key player in the new distributed generation, ensuring our devices, homes and buildings stay powered. The new grid will be considerably more digitized and as such more flexible, dynamic, and connected with increased requirements for performance in a world where electricity is taking a higher share of the full energy mix.

As EVs continue to grow in popularity across Canada and governments establish new environmental mandates that support the adoption of these vehicles, providing accessible EV charging stations is critical. More EVs on the road means greater demands placed on the grid to meet electricity requirements for vehicle charging. The success of EVs depends on the feasibility and access to smart charging solutions that leverage DERs, such as battery storage and solar power, for managing demands and reducing costs. Data collected and analyzed from these systems can help improve operational performance, optimize load and meet the end user's needs.

Story

Alectra Drive for the Workplace' project at the City of Markham demonstrates the value of a smart electric vehicle (EV) charging system that balances the electricity needed to serve the building and EV charging stations to mitigate potential cost increases.

Solution

EcoStruxure™ Microgrid Advisor (EMA), which facilitates EV and DER integration using predictive analytics & algorithms for energy optimization and forecast of various DER, demand response and hour ahead energy pricing.

Schneider Electric's Participation

Alectra Utilities, alongside several industry partners, officially unveiled Alectra Drive for the Workplace in 2018 (later re-branded to AlectraDrive @Work). A leader in digital transformation and energy management, Schneider Electric was honoured to partner on the pilot program that provides EV users with an easy, and accessible charging solution to customers like the City of Markham. Over the long-term, the pilot program will help reduce fuel consumption and lower greenhouse gas emissions, supporting a cleaner, more sustainable world.

As part of the project, Schneider Electric supplied their Distributed Resource Management System (DRMS). DRMS is a microgrid solution that manages and minimizes energy required by the Centre and charging stations during peak periods, ensuring EVs continue to receive an adequate charge. DRMS collects and analyzes real-time data to help optimize electricity loads across the Centre and charging stations. As a result, EV users can charge their vehicles to 100 per cent capacity within approximately four hours, while they are at work.

The installation of Schneider Electric's EcoStruxure™ Microgrid Advisor (EMA) helps facilitate EV and distributed energy resources integration using predictive analytics and algorithms for energy optimization and forecasting of various distributed energy resources, demand response and hour ahead energy pricing.

Solutions provided by Schneider Electric for the project, included:

- Management of DERs including energy storage, HVAC and EV charging stations
- Demand Response scenario
- Integration of H-1 electricity price
- Connection with EV fleet management software for having EV participating into Demand Response charges
- Facilitate demand response programs

Smart Charging

Data-driven analytics from customer EVs and smart EV workplace charging stations can provide the foundational intelligence for new microgrid control systems. Maximizing the operational performance of assets, optimizing load and meeting end users' needs can provide new services as well as new revenue streams. By collecting data (such as electricity price, facility demand and vehicle battery state of charge), and calculating optimal plans considering specific objectives and operational constraints, the microgrid control system makes the 'best' near real-time decisions based on complex analytics. For these reasons, the microgrid controller should be able to interact with a cloud-based solution for predictive control, as well as the connection with the utility, increasing the reliability and accuracy of decisions taken and to optimize the DER usage. The cloud-based platform also integrates weather forecasts and can respond to the utility's requests (such as demand response).

By making EV charging stations more accessible in buildings, the battery range anxiety for EV drivers will reduce. This decision will also support Canada's goal of increasing EV adoption sooner to reduce GHGE Emissions. Building Owners are seeking simple solutions to implement EV charging systems that manage electricity demand and energy costs, while providing their occupants with the technologies they need to confidently drive their EVs to and from work. As the use of EVs becomes more common in Canada, increased load from vehicle charging will need to be managed to reduce costs to building owners and utilities. Electric vehicle (EV) smart charging systems balance the electricity needed to serve the building and EV charging stations to mitigate potential cost increases and provide an easy and accessible charging solution for occupants, which encourages the adoption of EV technology.

" AlectraDrive @Work is a first-of-its kind workplace EV charging pilot that leverages industry collaboration and integrated smart technologies to provide a turnkey solution for EV drivers and their employers, while demonstrating the benefits of EVs on the grid."

— Neetika Sathe,
Vice President, GRE&T Centre, Alectra Utilities

The cloud-based platform also integrates weather forecasts

Benefit

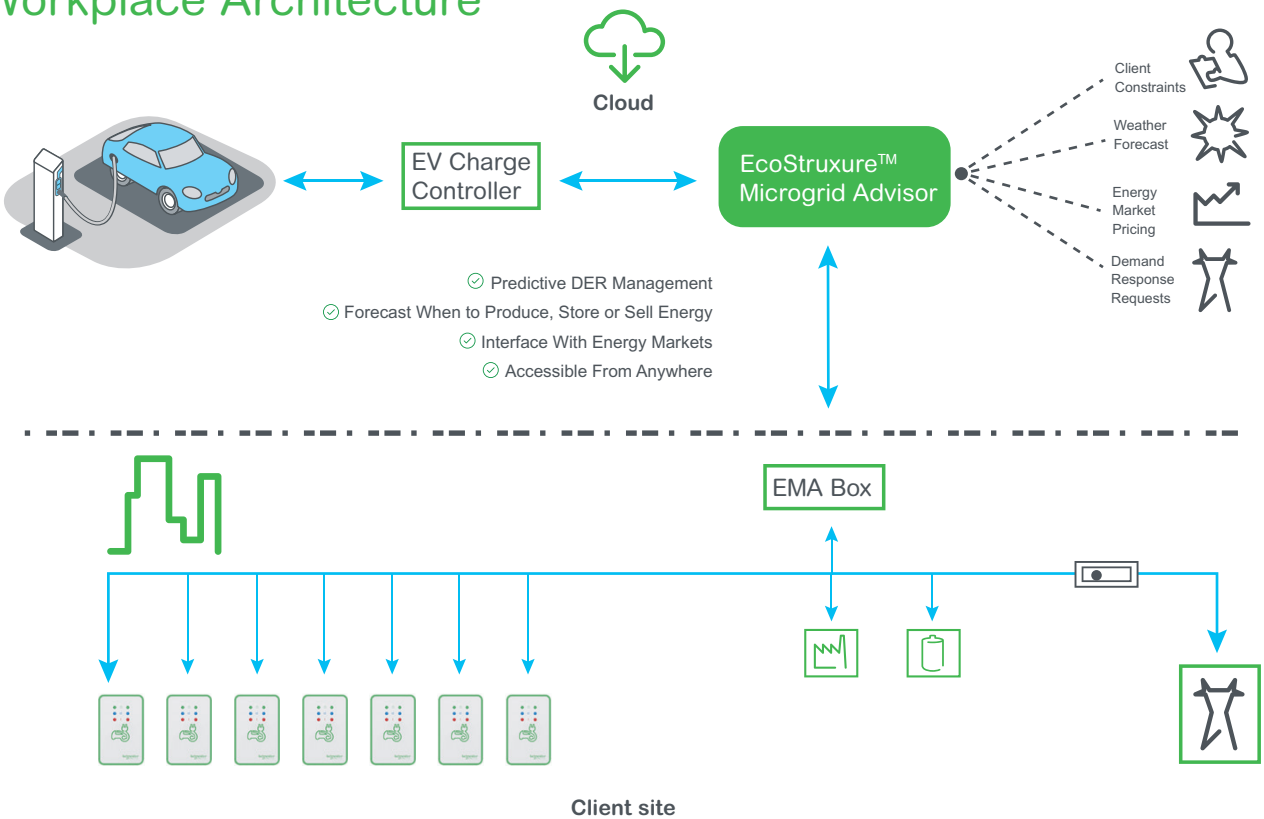
The Distributed Resource Management System (DRMS) manages and optimizes the electricity needed by the Markham Civic Centre and EV charging stations during peak hours while providing adequate charge to the electric vehicles.

- The DRMS collects real-time data to optimize electricity loads to the EVs and building service equipment.
- Reduced battery range anxiety — Level 2 (L2 240V supply) chargers can charge to 100% capacity in approximately four hours, enabling participants' EVs to be fully charged during work hours.
- EVs reduce fossil fuel consumption and greenhouse gas emissions, as well as the resulting climate change.

" The City of Markham's Alectra Drive for the Workplace pilot program is a great example of industry partners coming together to support a more sustainable future. The program not only supports the adoption of electric vehicles across Ontario, it's also a notable step forward for Markham in meeting its net-zero energy strategy by 2050. As a leader in energy management, we understand how actionable steps like this one can lead to lower fuel consumption, reduced greenhouse gas emissions, and the resulting climate change. It's an honor to work alongside organizations like the City of Markham that reflect our own values in providing accessible, reliant and sustainable energy."

— Frederick Morency,
Vice President, Canada Field Services

Electric vehicle Smart charging system at Workplace Architecture



Monitoring and Forecasting

The cloud-based platform, EcoStruxure™ Microgrid Advisor (EMA) allows the site manager to visualize his site and his DERs remotely, from anywhere with an internet connection using a computer, tablet, or smartphone. Monitoring and forecasting of all the DER connected to the platform are done with a 15 minutes refreshment rate.

It can monitor:

- How the DERs are performing
- The forecasted energy production / consumption
- The comparison between forecasted and actual values
- The different costs and savings/earnings

Each DER energy consumption / production can be seen at different time frame:

- In the past
- In real time (updates every 15 minutes)
- In the future, with a forecast of energy production / consumption for the next 24hr

It can export those data in an excel file to perform deeper analysis.

Example:

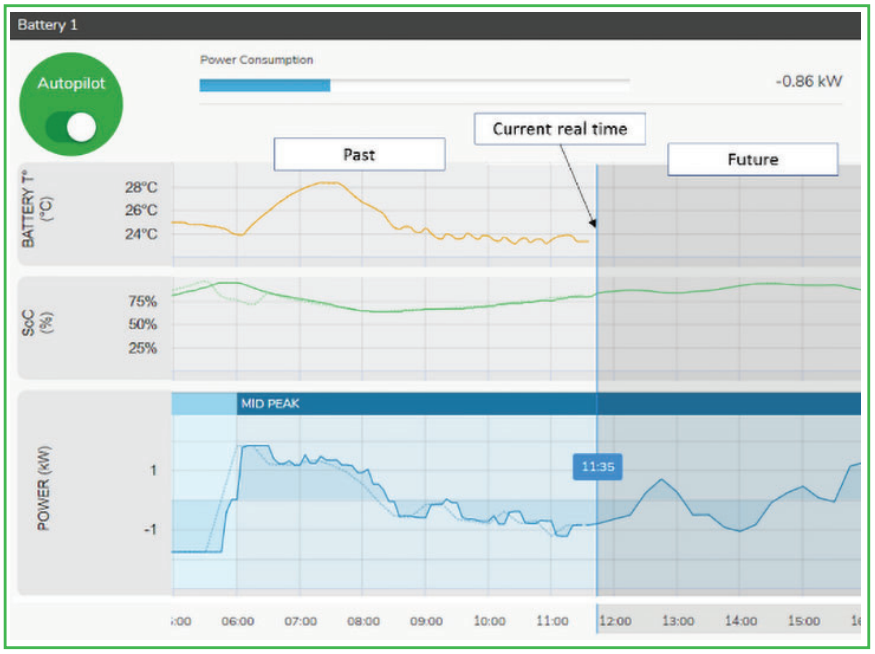


Figure 1 - Monitoring and Forecasting Use Case Example

Demand Charge

Distributed Energy Resources (DER) reduce site power consumption during peak periods. To reduce the demand charge part of the bill, EcoStruxure™ Microgrid Advisor (EMA) can leverage the DER flexibility to reduce the consumption peak of the facility (peak shaving) and therefore reducing the demand charge for the customer.

To achieve that, the EMA Controller Box will curtail available DERs respecting their DC flexibility rank; DERs having a smaller DC Flexibility rank are curtailed at first.
The DC Flexibility rank parameter is defined in the EMA cloud application for each site at commissioning phase.

Example:

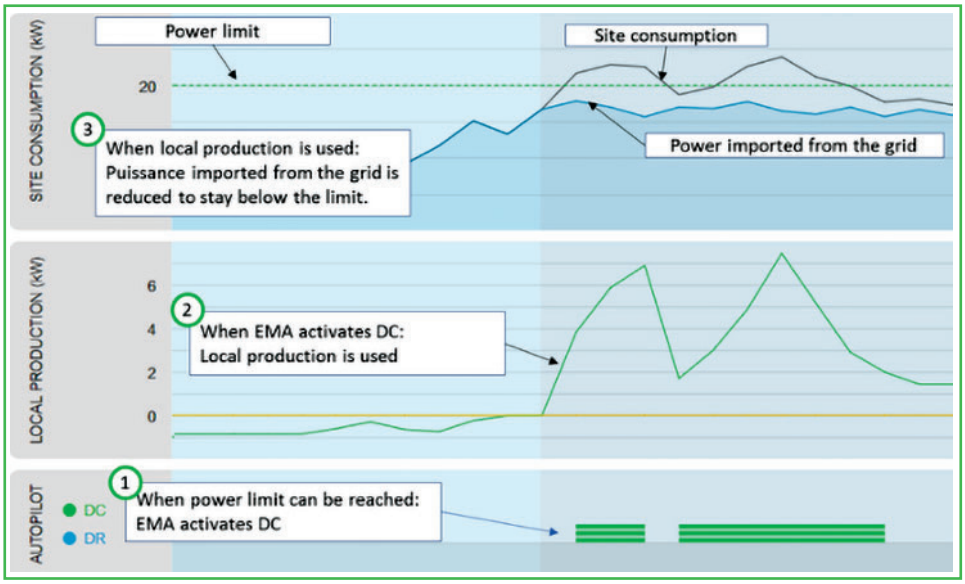


Figure 2 - Demand Charge Use Case Example

Demand Response

EcoStruxure™ Microgrid Advisor (EMA) can be used to perform Demand Response events. To do so, it must be connected to a utility or a commercial aggregator platform which can monetize demand response orders.

Demand Response can be performed in an innovative way with EMA and its forecasting capabilities. EMA knowing the future flexibility of the different DERs, the software can propose which flexibility tenders can be accepted or rejected to the utility or commercial aggregator. If they are accepted, then EMA will execute the Demand Response orders to the DERs through the Controller Box. The validation of actual execution of Demand Response is made by the DRMS using its calculation.

Considering the historical data, EMA will forecast the available volumes of Demand Response for the next 24 hours. These available volumes are aggregated by EMA as 24 blocks of 1 hour each. These blocks must be activated at least 30 minutes before activation time.

The volumes of load curtailments will be initially calculated by EMA for the next 24-hourly buckets. Each 1-hour bucket will be determined independently from the neighbouring hourly buckets. This is a theoretical flexibility availability, because if a load reduction is activated on one hourly bucket, it affects the availability of load reduction of the neighbouring hourly buckets (typically the previous hour and the following hour).

Example:

EMA proposes a tender of 100kW for 1 hour to a commercial aggregator. The commercial aggregator could accept the offer. Then EMA sends this order to the EMA Controller, where loads will be curtailed, production sources will be turned on and the energy storage system will be discharged for reaching the 100kW for 1 hour.

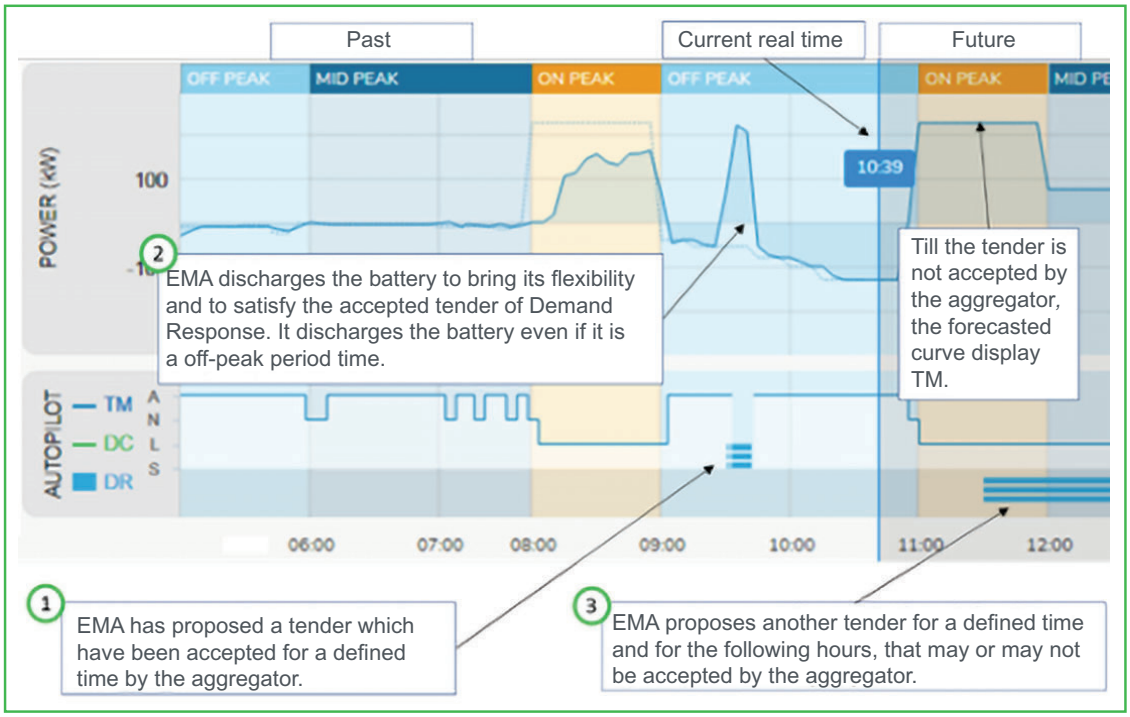


Figure3 - Demand Response Example

Tariff Management

Tariff Management consists of controlling DERs according to the variable electricity tariff rate. In this use case, EcoStruxure™ Microgrid Advisor (EMA) will reduce the energy consumption of the site and increase the site's energy production during the expensive tariff period. It will increase the site's energy consumption and decrease the site's energy production during the off-peak period.

These actions would be made while considering the comfort of the site occupants.

Example:

EMA consumes energy from the grid when it's cheaper and becomes the local source during on peak hours. Another option is to charge an energy storage system during off peak hours and discharge it during the on peak hours. It is possible to also use the thermal inertia of the building to shift the HVAC energy consumption.

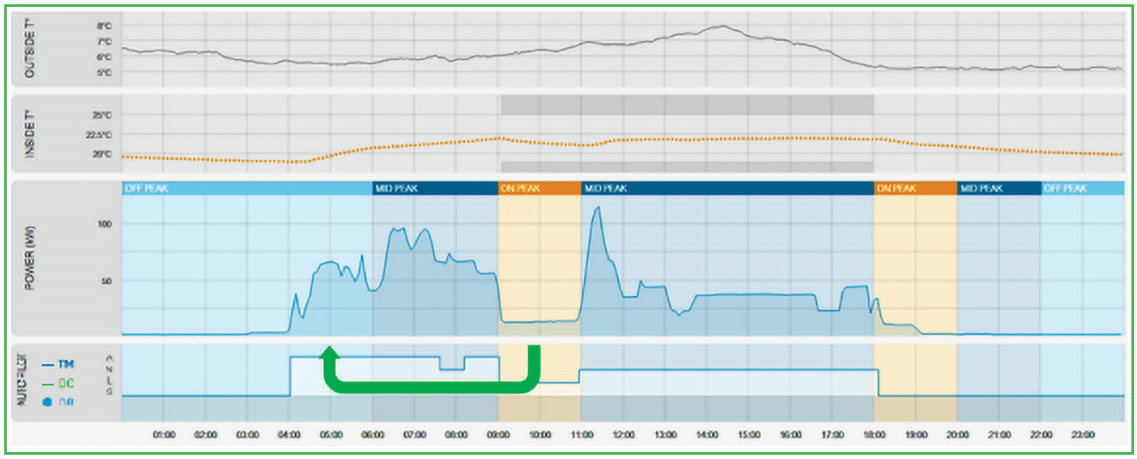


Figure 4 - Tariff Management Use Case Example

Life Is On | Schneider Electric

Have Questions?

Visit se.com/ca/microgridsolutions or
Call Schneider Electric Customer Care at 1-800-565-6699

Schneider Electric Canada, Inc.

5985 McLaughlin Road
Mississauga, ON L5R 1B8
Tel: 1-800-565-6699
www.se.com/ca

se.com/ca/microgridsolutions