MACHINERY AND EQUIPMENT

MRO

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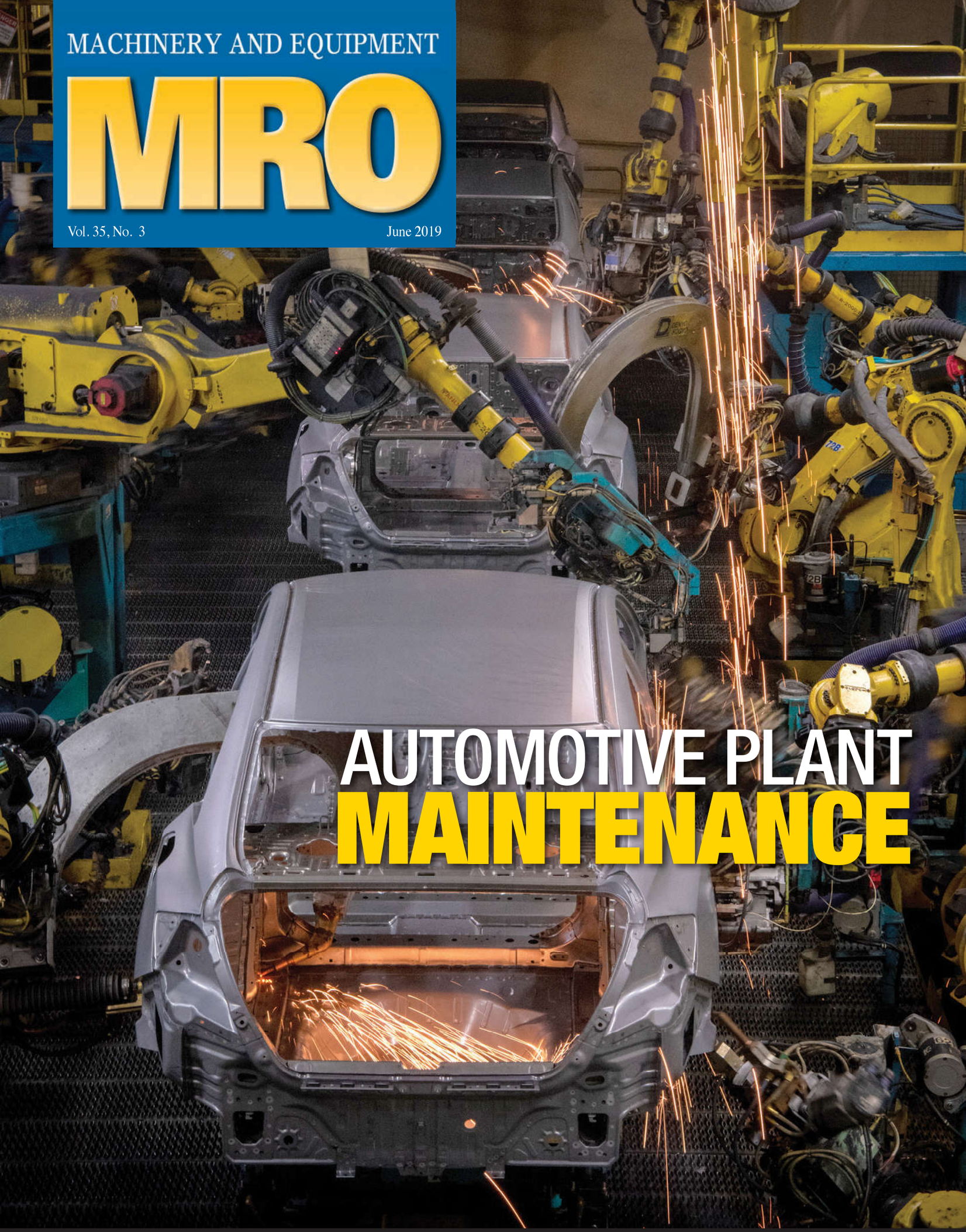

AUTOMOTIVE PLANT MAINTENANCE

WHAT'S NEW | BEARINGS | IIOT | TRANSFORMERS | HEATERS | GEAR UNITS | SENSORS

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Always Make Time for Education

One of Plato's famous quotes — "If a man neglects education, he walks lame to the end of his life" — rings very true in the world of maintenance. As machines change, processes change, technologies change, and the need to learn how to maximize uptime is a never-ending cycle. Using the old adage *Well, that's how we've always done it* does not hold water in 2019. In fact, in order to stay in business in an ultra-competitive world, you need to be constantly improving.

Recently, MRO went down to Cleveland, for the Reliable Plant Conference and Exhibition. A big part of the show was a wide selection of learning sessions, which were all well attended. At any given time, multiple sessions were taking place, so it was important to select the session that was most relevant to each individual. Sessions were broken down into 10 categories: maintenance management, IIoT, reliability engineering, root cause analysis, condition monitoring, oil analysis, lubrication program management, contamination control, lubricant selection, and hydraulics.

One of the main takeaways from the sessions I attended was that today, there is not just one right answer to any given question. Depending on the needs of your organization, what has worked in the past may not work now.

Take, for example, sensors. They can be wired or wireless, with pros and cons for each, and with ever-changing technology. While one may think that just putting wireless sensors on everything is the best solution, this may not be the case. Wireless sensors use batteries and depending on the number of readings needed from the sensor, the batteries may need to be replaced too often to be practical.

On the flip side, using wired sensors allows for continuous power and readings; however, wires are needed and may be a safety issue. New wireless technology allows for sensors to last longer, with a greater range, and some can even recharge themselves based on what machine they are attached to. As technology improves, so does the range of options available to companies.

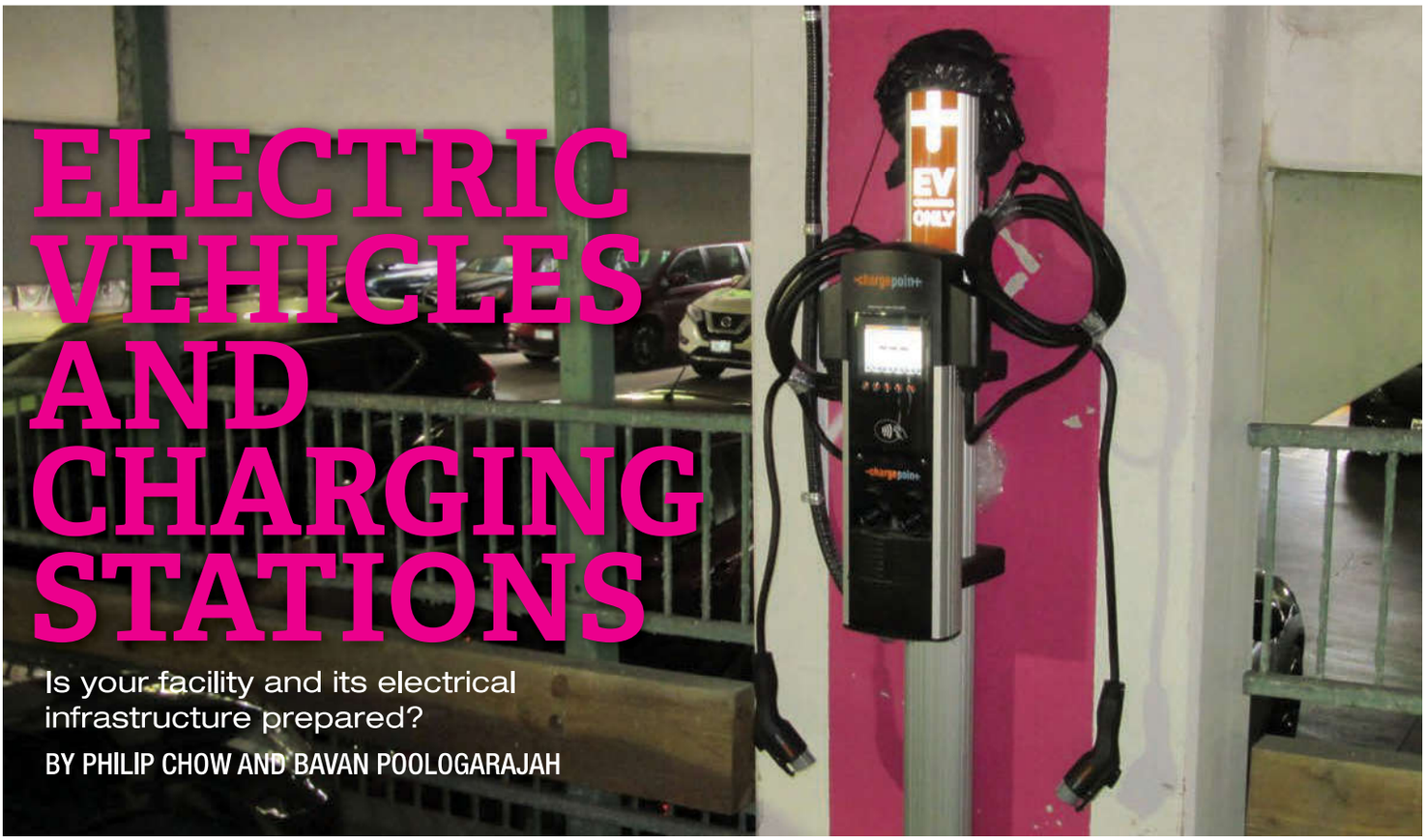
What the sessions provided was an overview for attendees to learn about what may be the best option for them, as well as the technologies on the market they may not have been aware of.

Another big part of learning is to learn from others. Case studies are important to look at as other options that may work for you. In the end, they may not, but seeing all that is available and how things are done, is the best way to have an organization that is efficient and operates with the most uptime.

I'll end with another of Plato's quotes that sums things up: "A good decision is based on knowledge and not on numbers." **MRO**

Good day,

Mario Cywinski
Editor



ELECTRIC VEHICLES AND CHARGING STATIONS

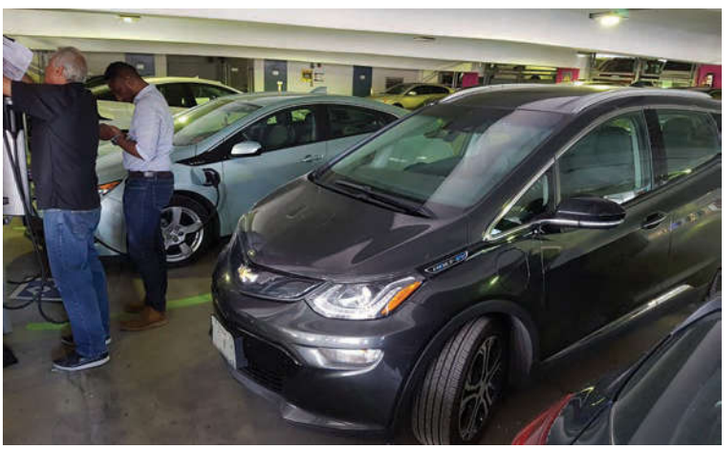
Is your facility and its electrical infrastructure prepared?

BY PHILIP CHOW AND BAVAN POOLOGARAJAH

Electric vehicles (EVs) are becoming an increasingly popular mode of transportation amongst Canadian drivers. With government incentives (in some provinces and federally), consumers have been able to offset cost premiums associated with purchasing EVs. Coupled with the benefits of improved battery technology and driving range, EV sales are on the rise, now making up approximately eight per cent of new Canadian light vehicle sales in the third quarter of 2018.

EVs present a challenge for institutional-type facilities with a significant amount of on-site, long-term parking, in terms of how to address the charging requirements of vehicle owners. With a three million square-foot campus on Bayview Avenue, vehicular traffic that exceeds 10,000 cars per day, and 4,535 parking spots, Sunnybrook Health Sciences Centre recently completed a project that involved installing dedicated EV charging stations for 20 EVs.

Located in Toronto, Sunnybrook Health Sciences Centre is a full-service 1,359-patient bed hospital affiliated with the University of Toronto and Veterans Affairs Canada. The campus has approximately 31 separate parking lots of varying sizes and arrangements for visitors and staff.



In early 2018, Sunnybrook's Plant Operations and Maintenance (POM) department began receiving reports of localized power outages in several staff parking lots. Upon investigation, maintenance staff discovered EV owners had been plugging into housekeeping receptacles, using 120V adapters and extension cords to charge their vehicles.

The increase in electrical demand load subsequently tripped circuit breakers in local lighting and receptacle panels. Notices discouraging the use of housekeeping receptacles for charging EVs were circulated; however, the lack of charging facilities for drivers with longer commutes would mean that likelihood of future occurrences would be high.

"Sunnybrook recognized the growing use of electric vehicles by commuters and that the need for on-site charging stations would require an engineered review of how available technologies could integrate with the campus power distribution system," said Michael McRitchie, Director of POM.

After recognizing the need for EV charging stations, Sunnybrook knew the next step was to review available funding sources that would support a project. The POM department has an internal energy management group, which works to reduce overall energy (both electricity and natural gas) and water consumption, and promote green initiatives within the organization. Another important function of the energy management group is keeping abreast of various government incentives and rebates for upgrades aimed at promoting energy efficiency.

Incentive programs are often an integral part in the budget for larger infrastructure projects, as they help offset hospital

Photo credit: Philip Chow

funding, so it can be used for other important needs. While maintenance work orders for inadvertent tripped circuit breakers started arriving, Sunnybrook's energy management group was working to finalize a funding application for the Workplace Electric Vehicle Charging Incentive Program (WEVCIP). It was offered through the Ministry of Transportation through the Government of Ontario's previous cap and trade program.

For Michael Lithgow, Manager of Energy and Climate Change and Sunnybrook's project lead, WEVCIP offered the perfect solution for an EV charging station project. "WEVCIP would provide the funding necessary to ensure a meaningful number of EV charging stations are installed at Sunnybrook."

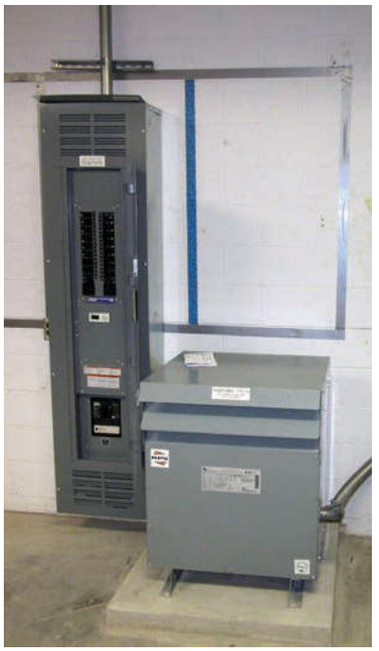
The first step in the project was to select what type of charging station would best meet Sunnybrook's needs and determine how many charging stations could be installed within budgetary constraints. Similar to the EVs that they service, EV charging stations are available in a variety of implementations, with varying options and functionality.

One of the first decisions to be made was what charging level to provide. Three levels of charging are available, classified by charging voltage and time to fully recharge a battery. Level 1 charging utilizes a 120 VAC source and an adapter that plugs into a standard 5-15R or 6-20R wall-mounted receptacle. Typically found in household garages, Level 1 charging is a simple means of charging an EV and takes the longest to fully charge a battery.

Level 2 charging utilizes a 208/240 VAC, single-phase source and an SAE J1772 electrical connector, which is accepted by many EV models. Level 2 charging stations are the most common form of charging found in public parking areas and an EV can be fully charged in four to six hours.

Also known as DC fast charging, Level 3 charging utilizes a 480 VAC input and recharges most EV batteries (up to approximately 80 per cent charge) within 30 minutes to an hour. While Level 3 charging offers the most expedient means to recharge a battery, charging stations are the most expensive option. Numerous Level 2 charging stations can be installed for the cost of one Level 3 charging station and a CHAdeMO charging socket is required, which is not universally available in all EVs.

Furthermore, operability of a Level 3 charging station is comparable to that of a traditional gas station, where cars



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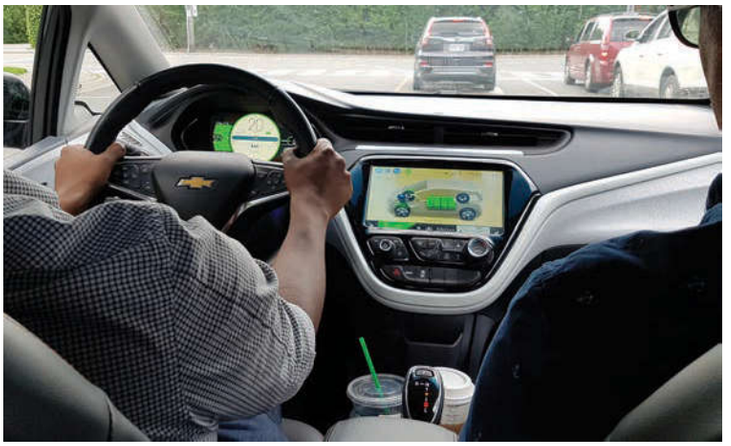


refuel and leave shortly thereafter, making re-fuelling space available to the next customer. This mode of operability is not suitable for long-term parking and would require a separate short-term area within a parking lot, along with additional enforcement to ensure users leave in a timely fashion.

Level 2 charging stations were selected as the optimal means to provide a reasonably fast recharge for long-term parking users at Sunnybrook.

With the type of charging station and proposed locations for installation selected, the next step was structuring a project that would give stakeholders direct input into equipment selection, while maximizing the number of charging stations that could be installed with the available project budget.

Procurement was split into two separate scopes: a request for proposal for the supply of Level 2 EV charging stations and a construction tender for the installation of owner-supplied charging stations.

Main considerations for the supply of EV charging stations included physical construction and design features of charging stations (retractable charging cords were an important feature that promoted good housekeeping in parking areas) service agreements to manage maintenance and revenue generation; built-in wireless connectivity (Wi-Fi or cellular) to minimize the requirements for communications cabling; and warranty coverage (it was found that a number of third-party resellers have more warranty limitations, when compared to the original supplier).

An important feature that had direct input into the installation design was the use of single-head versus dual-head EV charging stations. Dual-head units would allow two vehicles, in adjacent parking spaces, to be serviced by a single charging station, equipped with two charging cords. Two separate 40A, 2P, 208V branch breakers would be required for each dual charging station to avoid impacting the recharge time. While dual-head units would require the use of slightly larger electrical raceways, there would be savings on installation costs by decreasing the number of locations and electrical raceways run to more locations.

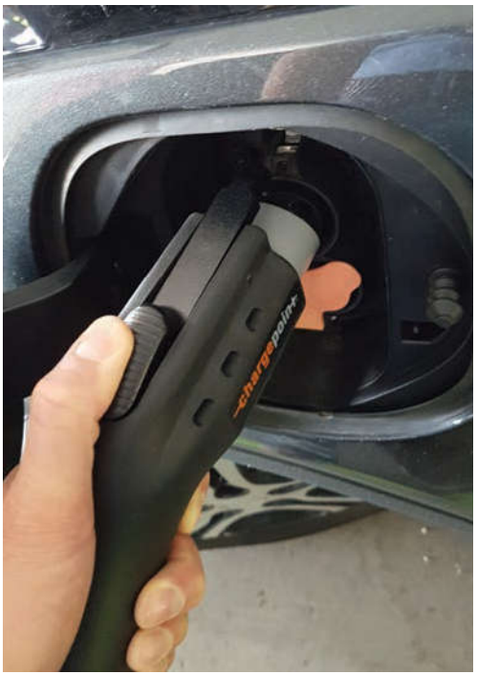
A review of the increase in electrical demand load, due to added EV charging stations, was performed and it was determined that 208V power distribution equipment, local to the proposed parking lots, would not have sufficient capacity for the number of circuits and increased load. New power distribution equipment, connected to upstream 600V distribution, would be required. This would involve modifications to existing 600V switchgear, new distribution panels and dry-type transformers, and new receptacle panels dedicated to the EV charging stations.

Photo credit: Philip Chow

Feeder routes through occupied hospital areas and through the use of existing beam pockets in parking areas were carefully detailed. Engineered drawings and specifications for the power distribution upgrades and the installation of EV charging stations were produced and the scope of work was tendered to electrical contractors.

As the supply of EV charging stations was procured separately from the installation scope of work, both unit prices and itemized scopes of work with add/delete prices were utilized in both procurement processes. This provided flexibility to maximize the number of charging stations that would be installed, within the project's budget. The supply of Level 2 EV charging stations was awarded to Precise Parklink Inc., and the installation scope of work was awarded to Ontario Electrical Construction Ltd.

Ten dual-head charging stations were installed, providing dedicated charging infrastructure for up to 20 EVs. The installation was evenly split between two separate parking garages, on opposite sides of the campus. Site work was co-ordinated by Saleh Daei, Manager of Energy and Sustainability and Solomon Ayeneababa, Manager Parking and Transportation Services, at Sunnybrook Health Sciences Centre.



Parking spaces were repainted and new signage was installed to identify dedicated parking spaces for EV use. The project engineers with the use of a rented Chevrolet Bolt completed final commissioning. The entire project was successfully completed in approximately four months. By understanding the growing need for EV charging stations and undertaking the necessary project planning, institutional facilities can help ensure their parking areas are ready for the increasing number of EVs on Canadian roads. Within several weeks of completion, all EV charging stations at Sunnybrook were in use. Sunnybrook has started planning for the installation of additional EV charging stations to keep pace with demand. **MRO**

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Bavan Poologarajah, EIT, was the senior electrical designer on the project and worked on the project from initial concept design to final commissioning. Bavan has worked on a number of electrical projects in critical facilities and can be reached at Bavan.Poologarajah@hhangus.com.

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