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USING REAL EV DATA TO DESIGN SMART CHARGING STRATEGIES

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Plug-in electric and plug-in hybrid electric vehicles (EVs) are clean transportation technologies that are slowly gaining a share of the Canadian transportation market. The number of EVs is expected to increase significantly in the coming years, creating a challenge for electricity delivery systems by raising the power demand and stressing distribution system assets. These negative impacts can be mitigated using smart charging strategies, which consist of controlling EV chargers to operate in periods of low demand and thus reduce their impact on distribution grids.

To design strategies to minimize EV impact, a key element is learning to understand EV owner behavior related to battery charging. Drive4Data, an initiative from the Waterloo Institute of Sustainable Energy, provides the actual performance measurements to researchers in the Power and Energy Systems and the Information Systems and Science for Energy groups to use for their work on grid EV control. The research groups are analyzing this database to identify patterns regarding the minimum battery state-of-charge, charging levels, charging times, and frequency of charging in different EV types, to use the information as input data in EV impact studies and smart charging strategy design.

Access to actual EV charging data is important in order to confirm or discard many assumptions found in the literature regarding behavior of EV users and to thus propose more realistic charging algorithms. For example, the researchers have identified that Plug-in hybrid EV users tend to discharge their batteries up to the minimum acceptable level, possibly because they can rely on the gas engine to support the vehicle operation. In contrast, researchers observed that Plug-in EV users act more conservatively since they tend to connect and charge their batteries more often, even several times per day, to keep the state-of-charge of their batteries at high levels.

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