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Feasibility Study of Smart Electric Vehicle Charging in New York State

Summary Report

May 2016

Report Number 16-17s

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Feasibility Study of Smart Electric Vehicle Charging in New York State

Summary Report

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NYSERDA Report 16-17s NYSERDA Contract 39152 May 2016

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Abstract

A feasibility study of smart electric vehicle (EV) charging identified technical and commercial barriers that exist and provided recommendations for implementing a smart EV charging model for New York. Various smart charging schemes that could be implemented in New York were assessed, with focus on smart grid integration, creating standards, connecting providers and customers, continuing the broad adoption of EVs, and supporting on-going regulatory reform. Short-term recommendations included developing smart grid EV deployment heat maps, demonstrating operations with other smart distributed energy resources, supporting applications the connect providers and customers, continuing efforts to broaden EV adoption, and continuing on-going regulatory reform to support market-based EV charging infrastructure development. Medium and longer-term opportunities are also discussed.

Keywords

Electric vehicle charging station, electric grid, distributed energy resources, smart grid, modernize electric grid

Acknowledgements

The authors gratefully acknowledge sponsorship of this project by NYSERDA under the direction of Nicholas Tichich and Adam Ruder. Smarter Grid Solutions' team members who contributed to this project include Jeremiah Miller, Paulina Tarrant, Bob Currie, Colin Gault, Ryan Sims, Chris Williams, Paige Medley, and Emily Wheeler. We also acknowledge the insightful input and contributions from the broad set of industry stakeholders, especially Matthew Wallace and Benjamin Dunton (New York State Department of Public Service), Sander Dolder (New York City Economic Development Corporation), Mike Swider (New York Independent System Operator), John Shipman and Sherry Login (Con Edison), Christopher Yee (National Grid), Chris Whitney (x4T), Charles Botsford (AeroVironment), Tim Kreukniet (Energy Transition-New York), Britta Gross (GM), Dan Bowermaster (EPRI), John Cerveny (NY-BEST), Werner Brandauer (CUNY), Jeremy McCool and Dahni-El Giles (HEVO Power), Guy Sliker (New York Power Authority), Jim Gallagher and Andrea Ruotolo (New York State Smart Grid Consortium), Scott Fisher (NRG Energy), and many other industry stakeholders.

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Summary

The goal of this project was to identify and prioritize smart EV charging ideas and opportunities for New York State through a stakeholder engagement and workshop process. The project identified technical and commercial barriers that exist for smart EV charging and pathways for implementation that will be generically applicable in New York State. The project also reviewed detailed paths forward for supporting and growing smart electric vehicle (EV) charging in New York State.

The identified paths focus on smart grid integration, transactive charge management structures for energy resource interoperability, options for policy frameworks and regulatory change, advancing user interfacing, and engaging electric vehicle supply equipment (EVSE) solution providers for advanced technology demonstrations. Therefore, the audience for this summary report is the electric vehicle industry innovators and smart grid innovators who are seeking to connect smart transportation to a modern, transactive, clean energy-powered electric grid.

Smarter Grid Solutions worked with the stakeholders to collect, evaluate, and identify priorities, along with consider technical and commercial barriers and pathways for implementation that will be generically applicable in New York State. The smart charging opportunities highlighted in this summary report reflect a selection of project findings for suggested priority short-term concepts initiating and strengthening smart EV charging from the premise that electric vehicles can be an integral part of a smart, renewable electricity grid. These opportunities have high stakeholder consensus and moderate-to-high market facilitation as assessed via the stakeholder survey and subsequent feedback. These opportunities are presented in this summary with the highest stakeholder prioritization first. Note that the smart charging opportunities and priorities in this report summary are from the interviewed stakeholders and their industry insight, and may not represent the priorities of other industry stakeholders or consumers.

As these opportunities are implemented and the smart EV market advances, these opportunities should also develop and mature to reflect the on-going challenges of connecting electric infrastructure to transportation infrastructure. Note that there is significant difficulty specifying and quantifying smart EV charging demonstration metrics due to how few smart charging activities have taken place.[1]

The following findings garnered strong consensus among stakeholders. More details about these opportunities, suggested key stakeholders to initiate action, and additional long-term schemes are presented in the full report.

S.1 Smart Grid Integration

Develop and publish "smart grid EV deployment heat maps"[2] that correlate and prioritize areas for cost-effective, fast charging infrastructure with transit corridors as well as high EV adoption socio-demographics. Advanced smart grid integration should be prioritized, where, for example, fast and cost-effective EV charging is enabled through real-time grid capacity availability[3] and coincident Distributed Energy Resource Management Systems (DERMS) smart grid investment. Stakeholders recommended the following demonstrations:

- Industry collaborative "smart grid EV deployment heat maps," including non-wired alternatives for fast EV charging infrastructure.
- "NY Prize EV Mobility" project – NYSERDA competition to create competitive cost effective and innovative outcomes from the heat-map studies.
- Competitive requests for proposals (RFPs) for utility and third-party partners and solutions to deploy the most economic fast charging smart grid demonstration solutions.

S.2 Standards for Integration

Demonstrating EV charging on a large scale with broader smart grid and DER integration into distribution networks will require some uniformity. Open standards that include smart charging are

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1 Rightly so, smart charging has not been a priority compared to incentivizing EV adoption generally, and likewise incentivizing more (albeit "dumb") charging stations.

2 "Heat maps" is a term used in a similar manner to how it is used, for example, in the solar electric market in reference to areas of the grid where connecting energy resources is easier/cheaper/more valued compared to other parts of the electric grid.

3 An example of such a smart grid innovation project that included real-time hosting capacity assessment through active network management is the Low Carbon London project, which is profiled in the report appendix.

recommended across the entirety of the smart grid industry. Stakeholders recommended the following demonstrations:

- Perform an engineering study on the smart grid open standards status and needs of New York State for integrating DER into the smart grid, including unidirectional and bi-directional EV charging.
- Assess short-term demonstration needs.
- Define the reference architecture and common information and control models for smart grid DER.
- Model and simulate smart grid communications and control network needs for large-scale DER adoption, including EV charging. Assess maturity, utilization attributes, and scalability for broader DER adoption.

S.3 Applications that Connect Customers and Service Providers

Supporting the various EV charging data and market signal needs of enterprise service provider and customer interfacing applications will help all participants in the industry. Interface application development includes customer application as well as utility and market participant interfaces. Stakeholders recommended the following demonstrations:

- EV charging user applications with:
    - Simple and comprehensive charge status, and proximity and availability of public charging options and charge duration.
    - Charge pricing and estimates of duration to full charge.
    - Role of time-of-use charging rates for duration of charge, if applicable.
- Simplified, single retail provider, public EV charge billing[4] – unifying customer billing and support through their existing retail provider to mitigate customers interfacing with multi-agent retail relationships and complex/varied pricing schemes.

S.4 Growing EV Adoption

Broader and higher EV adoption supports the industry by building sufficient customer demand for charging infrastructure. EV adoption is dependent on EV charging station availability and the impact that increased electricity bills will have on lifecycle cost of EV ownership. EV charging availability through moderate levels of public charging infrastructure has been found to mitigate range anxiety. Stakeholders recommended the following demonstrations:

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[4] This smart charging idea is modeled after the E.U. Green eMotion project, as detailed in the full report.

- Publish geographical and socio-demographic factors influencing EV adoption.
- Publish academic and private sector studies that can correlate increased EV adoption among various customer and stakeholder needs.
- Quantify total lifetime costs of EVs compared to traditional combustion vehicles. Use findings to support customer education and outreach, and target incentives that reduce lifecycle costs.
- Support consumer education and car dealer education.[5]

S.5 Incentivize Smart EV Charging Through Ongoing Regulatory Reform

Continuing ongoing regulatory reform and policy engagement supports market-based EV charging infrastructure development. Stakeholders recommended the following demonstrations:

- Connect smart charging programs to REV demonstration projects, such as those that investigate non-wires alternatives to traditional grid reinforcements for fast charging and complementary DER.
- Quantify through engineering studies the scalability of load shifting to support broader EV adoption and the marginal system technology costs (e.g., transactive networks) to support pilot testing.
- Analyze options to change tariffs to encourage the use of charging infrastructure (e.g. workplace or public charging).

These suggested smart charging concepts presented here are highlights of the short-term smart charging opportunities for New York. Additional medium and long-term opportunities are presented in the full report, and overall the opportunities are meant to inform current industry direction with the need for ongoing stakeholder engagement and market animation. The ideas and opportunities came out of the organic stakeholder engagement used throughout this project. Ongoing stakeholder engagement will be beneficial for refining and soliciting new opportunities as the smart charging market matures.

[5] Stakeholders indicated contradictory experiences in EV purchase experiences at vehicle dealerships, with many stakeholders indicating that car salesmen were not aware of all EV incentives available and disfavored EVs.

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