September 7, 2016

Lisa Smith, Senior Planner
State of Maine
Governor's Energy Office
62 State House Station
Augusta, Maine 04333-0062

RE: ABB response and comments to RFI 201608160
Deployment of Québec-Maine Electric Vehicle Charging Corridor

Dear Ms. Smith:

Please find our attached responses to the State of Maine's RFI # 201608160, Deployment of Québec-Maine Electric Vehicle Charging Corridor. As global leaders in fast charging infrastructure, we hope you find our feedback useful and applicable.

Highway travel corridors are the optimal application for DC fast charging technology given the nature of highway travel and EV battery performance. As more EVs come to market with bigger batteries and greater range, drivers will be willing to extend their electric driving beyond local city commuting to more interregional highway travel. ABB is committed to the latest standards and future proof technologies that ensure reliability and longevity for DC fast charging infrastructure.

In addition to our hardware capabilities, ABB is an experienced key project partner to support both small regional and country-wide networks. We have many large scale projects installed globally with open connected services, enabling multiple payment options and service level agreements to promote reliability and uptime.

ABB looks forward to supporting the State of Maine and its partners to further vehicle electrification growth that connects highways to cities, meets the needs of the next generation of electric vehicles, supports lower vehicle emissions and promotes a clean, independent energy economy.

Feel free to contact me with any questions.

Sincerely,

Heather Flanagan

Heather Flanagan
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STATE OF MAINE
GOVERNOR'S ENERGY OFFICE

RESPONSE COVER PAGE

RFI#201608160
DEPLOYMENT OF QUEBEC-MAINE ELECTRIC VEHICLE CHARGING CORRIDOR

Lead Point of Contact for Response: Heather Flanagan, Marketing Manager	
Respondent's Organization Name: ABB Inc.	
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5900 Eastport Blvd	
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Section I. Organization

1. Complete Appendix A, cover page

Completed above.

2. Provide Respondent's location(s)

ABB is a publicly held corporation with global headquarters in Zurich, Switzerland; United States Corporate headquarters in Cary, North Carolina; and our EV Charging Infrastructure business is based in Richmond, Virginia, with service and tech support in Madison, Wisconsin.

3. Provide a brief description of Respondent's main products/services

The ABB group of companies provides thousands of products, systems, software and services for customers in the utility, automation and transportation segments. We are focused on electrification solutions in diverse power delivery industries.

ABB's Electric Vehicle Charging Infrastructure business is focused on DC fast charging stations, connected software and services that meet the needs of all battery electric vehicles available today and in the future. See question 8 for more elaborative description.

4. Provide a brief description of years in business

The ABB group of companies has been in the electrical engineering business for 130 years. While EV charging infrastructure is a very young market, ABB has been developing EV charging products and solutions for several years. ABB then acquired the European DC fast charging leader Epyon in 2011, and has since deployed several thousand DC fast charging stations around the world, cementing our position and commitment to the future of vehicle electrification technologies.

5. Provide a description of the management structure

ABB's corporate governance is led by a board of directors, with CEO Ulrich Speisshoffer leading the company. ABB is organized into four divisions according to the customers and industries we serve. Our EV Charging Infrastructure business falls under our Discrete Automation and Motion division, and within the Power Conversion for Transportation product group.

6. Describe any licensure required for any services described in the "Information Sought" section.

N/A

7. Provide clients that are using comparable products or services (including contact information).

Project references:

United States: ABB has now deployed over 300 dual standard DC fast charging stations on the EVgo network across the US, including CA, WA, AZ, CO, UT, TX, FL, MA, VT, PA, VA, MD, DC, WI and IL; installed at travel corridors and commuting centers as well as retail locations. With NRG EVgo as partner, ABB installed the first CCS compatible station in North America in 2013. Contact: Rob Barrosa, Director, Partnerships and Business Development; Telephone: 626-696-9155; Email: rob.barrosa@nrgenergy.com

United States: To support roll-out of the Soul EV, Kia chose ABB to equip its dealer network on the west coast.

United States: ZEF Energy in Minnesota uses ABB's Terra 53 dual standard chargers to serve the growing population of EVs in the Twin Cities. Last year, the company hosted an event to delivered DC power to nearly 100 EVs within a 24 hour period, choosing ABB's site for known reliability.

Canada: ABB has delivered several chargers to BC Hydro in a multi-year project as part of their Clean Energy Vehicle Program. ABB was selected to install several DC fast chargers around Vancouver and in popular tourism destinations in lower British Columbia. Among other criteria, ABB was selected for experience with charging infrastructure in rugged climate conditions.

Canada: AZRA's network of DC Fast charging stations in Quebec rely on ABB Terra 53's to enable their flexible, driver value focused network.

Estonia: ELMO fast-charging network enables travel for EV drivers across the country in the world's first nationwide EV fast charging network. ABB now has 200+ charging stations deployed in cities and along highways, in a project which began in 2012.

Netherlands: Fastned has a large and growing network of ABB fast-charging stations with national coverage, positioned directly on the highways across the Netherlands. These stations feature solar canopies and roadside driver conveniences.

Norway, Sweden and Finland: More than 70 ABB chargers have been installed on the Fortum Charge & Drive network across Norway, Sweden and Finland, in a project connecting drivers across the region.

Norway and Germany: Electric Mobility Operator CLEVER has installed 100+ chargers in Norway, and is now installing ABB fast charge stations in Northern Germany to expand its network into the continent.

United Kingdom: Multiple ABB stations coming online across the UK on the Engenie Network in 2016.

Austria: Earlier this year, ABB sold its 100th charger in Austria with SMATRICS, the country's largest provider of charging infrastructure. ABB was an early partner in Austria, having helped developing electric vehicle charging infrastructure networks there for nearly five years now.

EU: Volvo formed partnership with ABB to enable electric bus charging systems, now deployed in Belgium, Luxemborg and Sweden, with more locations planned.

New Zealand: In 2015, twenty ABB fast chargers went live in Aukland, New Zealand. During 2016, energy company Vector will install more ABB fast chargers throughout the city.

Chile: ABB DC fast charging stations are networked from ABB offices in Santiago out to Vina del Mar across Route 68, demonstrating charging infrastructure from the city, through the mountains and down to the beach.

China: ABB has deployed hundreds of fast charging stations and wallboxes in China, with partners BYD and Denza.

8. Describe skills pertinent to the specific work described in the RFI.

ABB manufactures DC fast charging stations with dual outlet capability (CHAdeMO and CCS), rated 50 kW for fastest standardized charging rates, meeting the high demand requirements of travelers along highway corridors. Our flagship Terra 53 model specifications are outlined in our data sheet; a link to this document can be found in Section III.

Supporting our hardware, ABB has a self-owned suite of software options that offer connected services for always live authentication, payment enablement, remote monitoring, upgradability and data telematics.

We also have a complete global service network, including a 24/7 customer service line, 100+ experienced field service engineers located in the United States, all within 2-4 hours of all major metropolitan areas and corridors.

ABB's product roadmap is growing, but discussion of future unreleased products are subject to a signed non-disclosure agreement. ABB regularly executes non-disclosure agreement with potential project partners and is certainly willing to facilitate this process to support furthering the State of Maine's long-term project goals. Please contact us if desired.

Section II. Response to Information Sought

1) Are the specifications described above sufficient to meet the EV Task Force goals of interoperability, accessibility, and reliability? If not, what changes should be made (e.g., distance between stations, proximity to corridor; choice of DCFC technology)? Should there be minimum requirements in the infrastructure to ensure interoperability?

The specifications outlined are sound in taking into consideration multi-standard units, flexible payment options, with interoperability and reliability as critical elements.

A special note on interoperability: A healthy, competitive marketplace is supported by charging infrastructure hardware and network operations that use open communications protocols, such as OCPP, to ensure any chosen networks are unrestricted. This reduces the risk to the site owner/operator of a vendor lock-in situation. Any funded charging infrastructure technology, especially those publicly funded, should always favor the most interoperable solutions so that operators and sites can switch network providers without the burden of replacing expensive hardware – and always be in control of choosing the optimal hardware solution for their needs.

Another concern in the current State of Maine specification would be siting distances of 50-70 miles. This approach may be adequate under optimal driving conditions, but may not always be enough under more severe conditions and terrain. Many BEVs produced over the last five years will offer drivers a range of 70 to 90 miles, so in theory a 50-70 interval may seem like a fairly adequate fit. However, EV battery range can be temporarily compromised by a number of factors such as freezing temperatures, high winds, high speed driving and hilly or mountainous terrain. Any or all of these conditions could render a 50-70 mile distance plan inadequate for most current BEVs on roads today.

Specifically, low temperatures and windy conditions can reduce EV range by 20-30%, as often experienced by EV drivers in colder weather states. In addition, highway driving at 65-70 miles per hour can reduce a battery's capacity as it is consumed much faster under higher speed travel conditions; unlike gas engines, EVs actually get lower efficiency with consistent highway-speed driving given increased wind resistance and very little breaking energy given back to the battery. Energy consumption can also be affected by increasing elevation along a corridor, such as Maine's rugged geography. While next generation electric vehicles may bear these distances more comfortably, we can still expect legacy and less expensive models to continue to be on roads for several years to come.

2) Should the Department seek a vendor to oversee the entire project, including selection and installation of system components, or simply provide cost-share for any company installing electric vehicle charging infrastructure along this corridor? Could there be a combination of both options?

The advantage of a common operator among all sites is a consistent logistical experience, greater likelihood for reliability of the whole system, and a more uniform experience to drivers.

The disadvantage of a common vendor or operator is if the vendor chosen is unprepared or 'in over their head,' the network may not operate in the most efficient manner. Emerging markets like EV infrastructure will always have inexperienced players that are not prepared for what it takes to maintain and keep current a network of EV charging infrastructure.

This is where interoperability is crucial, regardless of which approach is taken. Should infrastructure stakeholders be unhappy with the performance of the operator, hardware or back end service, it is much easier and more flexible to be able to bring in a replacement vendor, program or service, without losing value in all of the assets that are already installed and operating.

A cost sharing program with multiple owner/operators can work as a way to encourage local ownership and interest in each station. The downside of fragmented owner/operators is that not all of the individual operators may have the experience to follow best practices, carrying a greater risk of having stranded assets where some stations may not be well managed. Will every station be assured a sound plan for maintenance, service and upgrades? So long as agreements are secured around caring for the units once installed, this approach could work; but we believe it also carries some risk in losing the consistent, reliable concept of an, 'every 50 miles' corridor of charging stations that drivers will need to rely upon.

Ultimately, it's important for the Department to have guidelines for appropriate technologies and emphasize reliability and longevity of hardware and services. High quality, future-proof technologies, remote connectivity and diverse payment options should be chosen over cheap, low cost options that do not serve drivers' best interests, and ultimately harm consumer confidence in EV adoption; while also harming general public assurance that public money has been well-spent.

Network operators should be given guidelines on what is required for hardware and connectivity in terms of power delivery performance, enclosure construction, safety standards, driver usability, remote monitoring, interoperability, multiple payment options and service/maintenance support.

3) What should the Department and Task Force take into consideration when determining individual sites (e.g., cost, ownership, visibility, accessibility)? Should this initiative try to leverage potential hosts to purchase electric vehicles for use by their organization or others? Should that be a factor in the evaluation between competing host sites?

Host site selection should consider both driver needs and site logistical concerns:

- Most importantly, drivers should be assured that when they stop to recharge, they are safe. Features like dusk-to-dawn area lighting, shelter for inclement weather and security cameras not only aid driver comfort, but also act as a deterrent for vandalism.

- Siting must also consider the availability of safe and convenient ingress and egress, commercial grade electric power delivery, and local grid capacity to meet high power charging needs.

- Locations should give drivers options for refreshment, food and restrooms. Travelers will be more attracted to locations that offer a full retail experience, which enhances the commercial benefit to site hosts as well. Existing truckstop/travel plazas, convenience and near-highway shopping mall or retail locations have shown to be successful in attracting drivers while already having some civil and electrical infrastructure.

- While public wayside locations may seem logical, the current federal law prohibiting the sale of fuel, goods and services at those locations may decelerate deployment, commercial attractiveness and is generally discouraged.

- Site hosts should have a commitment to supporting uptime, maintenance, visibility and long-term system health, as we've outlined above in Section II, question 2.

4) What should be the minimum/ideal technological specifications, such as DCFC, level 2, or both; number of chargers per station; reliability and speed of technology?

Any highway corridor project should always include DCFC stations and DC fast charging technology delivers significant travel range in minutes rather than hours. Lower power charging (several hours) can be a cost-effective solution for home or workplaces where vehicles park for many hours, but lengthy charging times are inadequate for the 'charge and go' requirements of highway travelers. In addition, AC charging times will only become longer as batteries get bigger on newer model vehicles.

At critical travel junctures, more than one DCFC station is recommended. Ideally, sites will host multiple charging points to meet the needs of several vehicles during busy times, and provide redundancy should one unit be offline and/or in need of service.

AC Level 2 stations are also welcome by drivers of plug-in hybrid vehicles that do not have DCFC capability, and fairly easy to include with a DCFC installation. However, by virtue of their gas engine backup, plug-in hybrids have less critical electric range needs than drivers of BEVs.

5) What are the pros and cons of the various hardware options and operational/maintenance models and technologies?

We've outlined above the importance of DC over AC in highway corridor installations; and also assume that installations include dual outlet models addressing drivers of all battery electric vehicle regardless of manufacturer (i.e. Nissan Leaf, BMW i3, Tesla model S via adaptor, and future models planned by the major automakers).

Delving deeper into hardware and software technology considerations, ABB has published a white paper that highlights concerns that should be looked at closely when evaluating DC fast charging infrastructure, including a checklist of considerations. We take the clear position that quality, reliable and experienced solutions are far more cost effective over time than cheaper solutions. A link to this white paper can be found in Section III.

6) What are the various ownership models being used in other locations, and what are the pros and cons of each?

Our response here is somewhat addressed in Section II, question 2. To elaborate further, we have seen the best infrastructure deployment models around the world where decisions on operators, hardware and business model are made based on best practices, emphasizing the long term viability of a system that meets the needs of drivers. This means that operators need to be uniformly emphasizing the same criteria - reliability, redundancy, preventive service plans, connected remote monitoring, and well considered payment options; along with site conveniences, comforts and safety. This is more likely when overseen and executed by common, trusted entities.

A reliable system is less likely to perform consistently when multiple individuals or companies are attempting to deploy infrastructure with varying degrees of experience, knowledge, commitment and motivation. Individually managed stations are more vulnerable to risk of change, asset neglect and thus may become a weak link in a chain of corridor-based stations.

We've been part of network deployments all over the world, and the most critical pieces of success are long-term commitment, service strategy, intelligent site selection, value-based hardware selection, connected/remote capabilities, and an operator in a sound financial position to be able to execute on all of the above over time.

The industry has seen the most challenges and stranded assets where financial backing was given over to entities that were more about marketing than deployment – and more concerned with upfront hardware and installation cost than long term network management.

To note, ABB is network and operator agnostic; we simply have seen overwhelmingly a more successful model when stations, regardless of manufacturer, are harmonized by oversight and management, while entirely open and interoperable should changes be required to hardware, back-end or even operator.

7) Are there organizations/municipalities/businesses who would be interested in partnering with the state on this project? What might that partnership look like? Examples include, but are not limited to, additional infrastructure at charging locations; promotion of corridor; ongoing operations and maintenance; private or municipal ownership once completed. The form of local participation may be the subject of a future RFP.

As mentioned in question 6, ABB is agnostic on the entities chosen to participate, and are pleased to support any partner in choosing hardware with complementary connectivity, services and maintenance plans. We always prefer the more solid, bankable, experienced and interoperable partners and have worked with several of them.

8) How have other similar projects successfully promoted the existence and use of the facilities once installed?

Plugshare is the most commonly used tool for drivers to seek and find charging stations, as a crowd-sourced database of charging locations as a means to alert EV drivers of stations in their vicinity or planned route. We highly recommend having any public stations listed at this tool. Chargehub is another such tool, along with the DoE Alterative Fueling Station Locator.

Most network operators will often promote and publicize new sites among their customer drivers, while site hosts may also promote the infrastructure on their properties through local and social media channels to attract EV drivers to their place of business.

While auto dealers would be a natural means for consumer education, it's widely known that many dealers in the US are woefully uninformed about electric vehicles and charging technologies. Still, it is worth the effort to share information about latest charging station deployments in a given region with any dealer engaged in the sale of BEVs. Automakers at the corporate level who are engaged in EV infrastructure roll-outs may also facilitate this effort.

ABB is always willing to support PR and promotional activities that drive visibility and awareness. Our market engagement is at the B2B level and we do not promote ourselves or our stations directly to drivers and consumers, but we support success stories through our corporate, trade and social media channels.

9) Should data on the usage of the future charging infrastructure be collected? Are there privacy concerns related to the collection of data?

ABB does offer connected services that support APIs to third-party back end collection of data by operators/sites. This data is critical to healthy, interoperable business models that are engaged in sales and marketing efforts to drivers. However, ABB does not collect nor store driver or financial data, but we do clearly see potential risks if privacy issues are not considered by the operators and hosts who may collect this data.

We urge the State of Maine to make sure all vendors are very clear about who owns data on its funded infrastructure projects, and if a proprietary policy undermines interoperable solutions for the optimal driver experience, the State of Maine's long term project goals, or related concerns over consumer data ownership for publicly funded projects.

An added note on payment security, in addition to enabling RFID and PIN access, ABB also offers an integrated credit card reader solution that includes EMV chip technology as well as NFC smart phone capability, ensuring greater security for drivers and site hosts alike.

10) Please provide any additional information that may guide optimal design, purchase, installation, operation, maintenance, and ultimate use of the facilities.

When investing in DC fast charging stations that must operate dependably around the clock, the most future-proof charging hardware can be secured by higher quality hardware and connected

software capabilities. Stations should always be online and logging data so that operators can maintain, upgrade and monitor remotely, as well as enable any back-end system for authentication and payment, whether via network membership or credit card. We recommend any stakeholders engaged in EV infrastructure deployment emphasize long-term uptime factors as much as immediate economics to ensure the project benefits the most users for the longest equipment lifetime.

Industry estimates for cost of 50 kW DCFC stations around 30KUSD, with installation costs varying more widely, from a few thousand to 20KUSD, depending upon siting, existing power infrastructure, amenities, etc. Annual costs to maintain a charging station with full connectivity and a preventive maintenance program that includes routine maintenance should be budgeted from 1-2KUSD. Annual electricity costs vary widely by region, usage and utility agreements.

We reference again our Evaluator's Guide with Checklist to aid in addressing considerations for DC fast charging projects. Link available in Section III.

Section III. Attachments

Useful documentation

Terra 53 multi-standard DC charging station Data Sheet
http://search-ext.abb.com/library/Download.aspx?DocumentID=4EVC204301-LFUS&LanguageCode=en&DocumentPartId=&Action=Launch

EV Charging: An evaluator's guide to DC fast charging stations
http://search-ext.abb.com/library/Download.aspx?DocumentID=9AKK106713A2435&LanguageCode=en&DocumentPartId=&Action=Launch

Tech brief: Why is EMC important for public charging stations?
http://search-ext.abb.com/library/Download.aspx?DocumentID=9AKK106713A5736&LanguageCode=en&DocumentPartId=&Action=Launch

Integrated credit card payment terminal for Terra 53 EV DC fast charging station
http://search-ext.abb.com/library/Download.aspx?DocumentID=4EVC402201-LFUS&LanguageCode=en&DocumentPartId=&Action=Launch

Terra 53 UL Installation brief
http://search-ext.abb.com/library/Download.aspx?DocumentID=4EVC-EOFS01U-EN&LanguageCode=en&DocumentPartId=&Action=Launch

Videos

ABB, Your Global Charging Partner
https://youtu.be/aLh_P8TQzBg

ABB Web modules: Driver Care package
https://youtu.be/D4Uu1QVC6To

Useful links:

ABB: http://new.abb.com/ev-charging

Plugshare: https://www.plugshare.com

Chargehub: https://chargehub.com/en/

Alternative Fuels Data Center: http://www.afdc.energy.gov/