

**BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking to Consider  
Alternative-Fueled Vehicle Programs,  
Tariffs, and Policies

Rulemaking 13-11-007  
(Filed November 22, 2013)

**REPLY COMMENTS OF THE NATURAL RESOURCES DEFENSE COUNCIL ON  
VEHICLE-GRID INTEGRATION COMMUNICATION PROTOCOL WORKING  
GROUP ENERGY DIVISION STAFF REPORT**

April 4, 2018

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## I. INTRODUCTION

Pursuant to the *Assigned Commissioner's Ruling Seeking Comment on Vehicle-Grid Integration Communication Protocol Working Group Energy Division Staff Report* of February 23, 2018, the Natural Resources Defense Council (NRDC) provides these reply comments to the California Public Utilities Commission (CPUC).

California has set several pivotal goals to reduce greenhouse gas (GHG) emissions and address the threat posed by global climate change. Senate Bill (SB) 32 requires a 40 percent reduction in GHG emissions below 1990 levels by 2030 and an 80 percent reduction in GHG emissions by 2050. SB 350 both increased the Renewable Portfolio Standard to 50 percent and established specific directives for the CPUC to accelerate transportation electrification and to leverage the energy storage inherent in electric vehicle (EV) batteries to facilitate the integration of variable renewable generation.<sup>1</sup> For example, SB 350 established Public Utilities Code section 740.12, which includes the following subsection 740.12(a)(1)(G):

*Deploying electric vehicles should assist in grid management, integrating generation from eligible renewable energy resources, and reducing fuel costs for vehicle drivers who charge in a manner consistent with electrical grid conditions.*

As the transportation sector is the single largest source of GHG emissions in the state, California has set a goal of deploying at least five million zero-emission vehicles by 2030, as well as deploying 250,000 charging stations, including 10,000 Direct Current (DC) fast charging stations.<sup>2</sup>

Achieving these goals will require widespread transportation electrification and vehicle-grid integration (VGI) solutions such as smart charging. There is a large potential for smart charging and electrification of transportation to both increase operating cost savings relative to conventional vehicles and to offer grid services, such as ancillary services, congestion management, as well as aid in resilience. A best practices manual for utilities regarding EVs done by the Zero Emission Vehicle Alliance (ZEVA) describes smart planning for charging and

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<sup>1</sup> Senate Bill 350 (De Leon) - Clean Energy and Pollution Reduction Act of 2015  
([https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=201520160SB350](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350))

<sup>2</sup> Executive Order B-48-18 - Zero-Emission Vehicle Executive Order of 2018  
(<https://www.gov.ca.gov/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/>)

Electric Vehicle Supply Equipment (EVSE) as necessary to guarantee grid stability in the longer term.<sup>3</sup> In sum, smart charging can improve the economics of transportation electrification by lowering operating costs for EV drivers and can also lower the cost of integrating variable renewable energy resources and managing an increasingly dynamic grid.

A study done by the National Renewable Energy Laboratory (NREL) and Lawrence Berkeley National Laboratory (LBNL) investigating the global potential of VGI identifies the lack of widely adopted standards, especially communication protocols, as a major barrier to minimize investment risk, allow interoperability between automakers, enable smart charging technologies, open payment, and driver access to charging infrastructure.<sup>4</sup> The main goal of the working group, establishing a communication protocol standard for VGI, is a necessary step and would jumpstart the VGI industry to allow for easier market integration of smart charging technologies. California is a leader in the EV industry and defining communication standards that advance VGI services will have impacts across the nation.

The VGI working group engaged in valuable discussions and made progress toward defining hardware and communications standards to enable VGI. However, given the short time frame of six months, with an extension of three months, it is understandable that a protocol was not selected by consensus. In Europe and Japan, the first requirements for a protocol were not defined until after four-to-six years of collaboration between stakeholders, and it is still an ongoing and adaptive process. Nine months does not allow for sufficient due diligence and independent cost benefit analysis of the impact of implementing different communication protocols.

We still see this working group as an opportunity to fast-track VGI in the energy sector and lower long-term costs. The working group should continue to complete “Deliverable 2” (determining the value of VGI), as well as “Deliverable 3” (policies and regulations to enable VGI) with a longer timeframe. This will enable stakeholders to gain research and insights from

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<sup>3</sup> International Council on Clean Transportation – Literature Review on Power Utility Best Practices regarding Electric Vehicles. 2016.

([https://www.theicct.org/sites/default/files/publications/Power-utility-best-practices-EVs\\_white-paper\\_14022017\\_vF.pdf](https://www.theicct.org/sites/default/files/publications/Power-utility-best-practices-EVs_white-paper_14022017_vF.pdf))

<sup>4</sup> International Energy Association. Global View: Vehicle to Grid integration. 2017.  
(<https://www.iea.org/media/topics/transport/VehicleGridIntegration.pdf>)

existing programs and the natural growth of the sector, as well as time to properly evaluate the pros and cons of communication protocols, and recommended policy and regulations to both grow and sustain VGI services. A recommended path forward for the working group is detailed in Section III.

## **II. RECOMMENDED MODIFICATIONS TO THE STAFF REPORT IN RESPONSE TO PARTY OPENING COMMENTS**

While NRDC did not actively participate in the working group, we conducted extensive engagement with working group participants and have carefully reviewed stakeholder opening comments to inform the following recommendations.

### **A. Functional Requirements to Be Included in Deliverable 1**

#### 1. Minimum Network Speeds Should Be Specified for Appropriate Use Cases

The California Electric Transportation Coalition (CalETC) et al. express concerns regarding the lack of clarity in the definition of “network speed” as a functional requirement, and suggest that an evaluation as to the need for and the value of frequency regulation be conducted before establishing standards for VGI designed to provide frequency regulation.<sup>5</sup> We agree that the draft report is too vague in this regard and that performance speeds need to be specifically quantified to ensure that network speeds meet the needs of defined use cases. We also agree that the additional analysis as to the potential costs and benefits of various VGI services, including frequency regulation should be conducted. Though questions persist as to the scalability of the market opportunity, using VGI to provide frequency regulation has already been proven as a viable business model in the real world by companies like NewMotion and Nuuve and it should not be neglected.<sup>6</sup> Network speeds which can adhere to frequency regulation should be evaluated for inclusion in the functional requirements.

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<sup>5</sup> CalETC opening comments filed March 28<sup>th</sup>, 2018, page 17. The performance attributes do not clearly align with the VGI goals. For example, while “network speed” may be important in some contexts, it is not relevant for all VGI services. The concept of “speed” is not defined outside of an EVSE context (e.g., the PFE to EV context). In addition, there has not been a comprehensive evaluation of the need or value of frequency regulation to determine that VGI programs must meet the requirements to support frequency regulation.”

<sup>6</sup> NewMotion V2G Services – (<https://newmotion.com/en/drive-electric/v2g-charging-next-generation-technology>); Nuuve Aggregating V2G Resources - (<https://www.level-network.com/wp-content/uploads/2018/02/Paige-Mullen-nuuve.pdf>)

## 2. Open Payment Should Be Standardized at Public Charging Stations

Siemens identifies “open payment” as a requirement that was not addressed in the staff report.<sup>7</sup> We agree that a common open payment standard should be defined for all public charging stations that does not require the EV driver to become a member of a proprietary network or install a network-specific smartphone app. Ensuring open access to public chargers in California was the goal of the Electric Vehicle Charging Stations Open Access Act, which prohibits requiring subscription fees or memberships as a condition of use for publicly accessible chargers.<sup>8</sup> The report mentions this requirement on page 17, but falls short of making a recommendation, which could potentially be acted upon by the California Air Resources Board (ARB), which is charged with implementing the Electric Vehicle Charging Stations Open Access Act. The staff report should be revised to include a recommendation that ARB require common payment methods (e.g. credit card, Apple Pay, Google Pay, PayPal) for all public charging stations.

## 3. A More In-Depth Discussion of Cybersecurity Should Be Included in Deliverable 1

CalETC et al. raise cybersecurity concerns as a significant barrier to determining a VGI communication protocol and recommend that the staff report incorporate a more in-depth discussion of cybersecurity.<sup>9</sup> NRDC agrees with CalETC et al. that a more detailed discussion should be included in the report. The draft report suggests that a separate working group be formed to define cybersecurity requirements. We agree that cybersecurity is an important aspect which should be considered when offering VGI services. However, it may not be necessary to establish a separate working group dedicated to this topic. The VGI working group could consult with cybersecurity experts and include their input in the working group’s findings. In any case, a functional requirement defined for cybersecurity should be included when determining standards and protocols for VGI.

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<sup>7</sup> Siemens opening comments, page 5, filed March 28<sup>th</sup>, 2018.

<sup>8</sup> Open Access 2013. Senate Bill 454 (Corbett, Chapter 418, Statutes of 2013)

<sup>9</sup> CalETC et al. opening comments page 10.

## **B. Specific Communication Standards**

### **1. Table 3 Should Be Revised to Reflect Updates to IEEE 2030.5 and OCPP**

Both CalETC et al. and KITU recommend that Table 3 be updated to reflect the fact that the communication standard IEEE 2030.5, which was updated in December, 2017, can now support all functional requirements defined by the working group.<sup>10</sup> We agree that the most recent representation of protocol functionality should be reflected in the final report. Table 3 should be revised to reflect the update to IEEE 2030.5 and the latest version of OCPP (2.0), which has many extensions, including compatibility with ISO 15118 and IEEE 2030.5.

### **2. The Working Group Should Pursue Both Vehicle and EVSE-Centric Solutions**

CalETC et al. notes that vehicle-based telemetry can be leveraged to aggregate EV load and provide VGI services while potentially avoiding additional costs associated with third-parties and “smart” EVSE, while Oxygen and the Joint OEMs note that EVSE-centric solutions such as ISO 15118 need not displace vehicle-centric, telemetry-based solutions, and could provide additional functionality.<sup>11</sup> NRDC supports the use of already-imbedded functionality and technology to provide cost-effective VGI services. However, a vehicle-centric model could potentially exclude EVSE-based solutions that might also prove cost-effective or necessary for certain use cases, and if automakers are unwilling to collaborate with third-parties or allow for open communication between the EV and EVSE, it could undermine potentially beneficial solutions. State policy should strive to be agnostic as to the technological and provider pathway and encourage, utilities, automakers, and third parties to offer VGI services to lower the overall cost of managing the grid. Ideally, EV drivers would be able to choose between competing solutions. While the CPUC and the CEC lack jurisdiction over automakers, the working group could nonetheless include a list of pros and cons for each communication standard that identifies both the potential cost savings and market implications associated with reliance on existing vehicle telemetry to deliver VGI services. Vehicle-based and EVSE-based solutions need not be mutually exclusive; one or both could be more appropriate for a given use case.

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<sup>10</sup> CalETC et al. opening comments page 5 and KITU opening comments page 4 filed March 28<sup>th</sup>, 2018.

<sup>11</sup> CalETC et al. opening comments, page 8; Oxygen opening comments, page 5 and Joint Automakers opening comments, page 3, filed March 28<sup>th</sup>, 2018.

### **C. A Workplan for Deliverable 2 and Deliverable 3 Should Be Included in the Appendix.**

A call to assess the potential value of VGI is requested from almost all parties to both identify the most promising use cases and to perform a cost benefit analysis of each proposed communication standard. As the Office of Ratepayer Advocates (ORA) states:

*An important topic that was not resolved by the Working Group is quantifying the value of VGI to various stakeholder groups, including ratepayers. ORA agrees with the Staff Report's assertion that managed charging will become increasingly important to align electric vehicle (EV) charging with clean energy generation, achieving emissions benefits, and maintaining the safety and reliability of the grid. If the value of these benefits were distinctly defined it would help to enable prioritization of technologies and protocols.<sup>12</sup>*

NRDC agrees with this statement that assessing the value of VGI will help prioritize technologies and protocols. A work plan to address Deliverable 2, which includes assessing the value of VGI should be included in the appendix of the filed work document.

Likewise, NRDC agrees with CalETC et al. the working group should continue its work on Deliverable 3, which includes investigating changes to policies and regulations that are necessary to enable VGI. This investigation should be informed by the assessment of the value of VGI services to determine which policy and regulatory changes could both increase the uptake and value of VGI services. The appendix of staff report should include a work plan to complete Deliverable 3, as defined in the original scope of the VGI working group.

### **III. RECOMMENDED PATH FORWARD FOR THE VGI WORKING GROUP**

KITU Systems questions whether there is a need for a standardized communication protocol for VGI.<sup>13</sup> This contradicts the conclusion of the International Energy Agency (IEA), which has noted that establishing a communication standard will enable EV adoption and minimize stakeholder investment risk.<sup>14</sup> Defining standards for EV technologies will lower costs of VGI, as well as fast track the integration of VGI services. The working group's discussions

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<sup>12</sup> ORA opening comments filed March 28<sup>th</sup>, 2018, Page 4.

<sup>13</sup> KITU opening comments filed March 28<sup>th</sup>, 2018, Page 4, "No economic analysis of the benefits of selecting a single protocol or conversely, of the effects of not making a determination at this time have been provided in the Working Group."

<sup>14</sup> International Energy Agency – Vehicle to Grid Integration. 2017.  
(<https://www.iea.org/media/topics/transport/VehicleGridIntegration.pdf>)

and detailing of use cases is a valuable first step to define a communication protocol and identify barriers to VGI services. NRDC sees this as a productive venue to foster open dialog and begin stakeholder collaboration to enable VGI services.

Given the limited timeframe, it is not surprising that consensus for a communication standard was not reached and that Deliverable 2 (determining the value of VGI) and Deliverable 3 (determining policy and regulatory changes that would further enable VGI) were not completed. As stated in the introductory section, numerous organizations (e.g. IEA, NREL, LBNL, European Commission) have noted that defining a communication standard for smart charging will lower investment costs, hasten adoption, and allow interoperability. Opening comments reveal a consensus recommendation that the VGI working group should continue. We agree and offer the following considerations for that future work.

#### **A. The Working Group Should Continue, but Convene Less Frequently**

The working group should continue over a multi-year period, but meet less frequently to complete Deliverable 2 and Deliverable 3. This extended timeframe will allow for discussions to include results from existing and future pilots and give stakeholders time to perform due diligence or cost impact assessments for standards and regulations being considered.

#### **B. The Scope of Future Discussions Should Include Recommendations for Private Charging**

CalETC et al. recommends excluding private single user EVSEs due to cost and cyber security concerns.<sup>15</sup> While NRDC agrees that investigations in cybersecurity, software and hardware costs are needed to determine requirements for VGI, these concerns also exist for public charging stations, which are already in scope. Consistent with research conducted by NREL and LBNL, many working group participants identified private charging locations where cars are parked for the vast majority of the day as having some of the highest potential for VGI.<sup>16</sup>

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<sup>15</sup> CalETC et al. opening comments page 21. “As the Staff Report correctly noted, there are cost concerns that outweigh the additional benefits in private locations such as homes, and correctly mentioned “cybersecurity, metering, and software development costs may be additional to any hardware costs.”

<sup>16</sup> Joint OEMs (Volkswagen, AUDI, Porsche, Daimler (Mercedes-Benz), Lucid Motors, and Iotecha) Comments, Page 2. ChargePoint opening comments – Page 2, KITU opening comments page 2, Hank McGlynn opening comments page 3, and ORA opening comments – Page 5 Filed Marched 28<sup>th</sup>, 2018; Global View: Vehicle to Grid integration. 2017. (<https://www.iea.org/media/topics/transport/VehicleGridIntegration.pdf>)

A study by Idaho National Lab of over 8,300 electric vehicle owners showed that more than 80 percent of the charging was done at home and 95 percent of EV owners preferred charging at home to public and workplace charging.<sup>17</sup>

NRDC recognizes the CPUC and the California Energy Commission (CEC) lack jurisdiction over private charging stations that are not deployed pursuant to utility or state programs, but they should still be included in the scope of future working group discussions because the group's recommendations could impact the residential, workplace, and fleet charging segments directly (through utility and CEC programs) and indirectly through the market-shaping influence of the combination of utility and CEC programs. The working group should not neglect the segments where the vast majority of EV charging takes place. When a common communication protocol is established, it has been shown that it can decrease the overall cost of implementation and can fast track VGI participation.<sup>18</sup> The same cost reduction opportunities should be available to private EVSEs as well. Therefore, we recommend including private residential charging in the working group's scope with an aim to make a recommendation for standards that enable VGI. Further requirements for specific communication protocols can be included in utility and CEC pilots and programs.

### **C. An Independent Communication Protocol Expert Should be Retained**

Consistent with a recommendation made by Siemens, an independent EV communication protocol expert with experience in facilitating similar working groups should be retained to lead the discussions of the working group and compile the final deliverables.<sup>19</sup> Stakeholders in this working group have posed concerns regarding the costs to upgrade EVSE to adhere to specific communication protocols required to enable certain smart charging use cases, but those concerns have been difficult to quantify due to proprietary issues. An independent expert could potentially overcome this hurdle by executing non-disclosure agreements that would allow for cost data to be compiled in a manner that would not compromise proprietary interests. An independent expert

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<sup>17</sup> Idaho National Lab. Plugged in: How Americans Charge their Electric Vehicles. 2017. (<https://avt.inl.gov/sites/default/files/pdf/arra/PluggedInSummaryReport.pdf>).

<sup>18</sup> ZEVA Best Practices. 2017. ([https://www.theicct.org/sites/default/files/publications/Power-utility-best-practices-EVs\\_white-paper\\_14022017\\_vF.pdf](https://www.theicct.org/sites/default/files/publications/Power-utility-best-practices-EVs_white-paper_14022017_vF.pdf))

<sup>19</sup> Siemens opening comments filed March 28<sup>th</sup>, 2018, Page 6.

would also be well situated to allow for impartial assessment of the VGI communication protocol requirements and investigate stakeholders' concerns with each protocol.

#### **D. Working Group Proceedings Should Be Structured to Allow for the Participation of End-Users**

The perspective of end-users (e.g. drivers, fleet managers, site-hosts) should be heard to ensure the value of VGI services is passed through to the people who are making the primary investments in the vehicles needed to enable VGI. Due to the highly technical scope of the working group meetings and extensive time investment, it was difficult for such parties to engage to this point. The participation of parties such as Plug in America, transit agencies, and fleet managers should be actively pursued. Future meeting schedules and agendas should be shaped and structured in a way that allows such parties to attend periodically (and avoid highly technical discussions).

#### **E. Assessing the Value of VGI**

##### **1. Determining and Prioritizing the Potential Value of VGI**

Multiple parties call for a value of VGI assessment to be done to identify the most promising use cases for VGI services.<sup>20</sup> This value determination should not only include existing value of VGI services, but also be coupled to Deliverable 3 and examine the impact of potential policy and regulatory changes on potential value streams for VGI.

CalETC et al. identify large-scale demonstrations as the most important path forward in understanding the value of VGI.<sup>21</sup> Meanwhile, ORA suggests customer-funded utility programs should be limited to new technologies that have not already been included in existing programs.<sup>22</sup> CalETC et al. also outlined several existing and upcoming pilots and demonstrations that include VGI elements.<sup>23</sup> Insights from the existing pilots and programs identified by CalETC et al. should be included in the value of VGI assessment. NRDC agrees that existing or planned pilots and programs, the primary purpose of which may not be to advance VGI, should nonetheless be leveraged to demonstrate the value of VGI services in the real world. Additional

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<sup>20</sup> CalETC et al., Siemens, Joint Automakers, ORA, and ChargePoint.

<sup>21</sup> CalETC et al. opening comments, page 27.

<sup>22</sup> ORA opening comments filed March 28<sup>th</sup>, 2018, page 5.

<sup>23</sup> CalETC et al. opening comments, pages 25-27.

pilots and programs dedicated to testing and validating the value of VGI services will also likely be needed. Such programs and pilots will be well suited to demonstrate the value of VGI services in the near-term, however, simulation studies done in collaboration with academic institutions will likely be needed to investigate the longer-term value of VGI with higher levels of both transportation electrification and renewable energy penetration.

## 2. Leveraging Other Efforts to Inform Cost Benefit Analyses

To determine if the return value of VGI is higher than the added cost of implementation to all stakeholders, a cost benefit analysis should be performed that details the costs associated with mandating various communication protocols. ChargePoint specifically requests software engineering in addition to hardware costs be included in the cost benefit analysis.<sup>24</sup> We agree that both hardware and software engineering costs should be included in the analysis, but suggest that the analysis be done from the perspective of the end-user (e.g., the EV driver, site-host, fleet manager), to ensure the value of VGI services flows to the people making the primary investments in the vehicles needed to provide those services.

## 3. Program and Pilot Data and Findings Should Be Shared

To accurately assess the value of VGI, open access to data and results from pilot and demonstration programs is vital. As CalETC et al. comments:

*An EV data-sharing effort is needed in 2018. The Joint Parties support the recommendation on page 81 of the draft 2017 Integrated Energy Policy Report for the CEC to lead a collaborative effort with researchers, local government, air district, and utility charging infrastructure program administrators, and others to share data about charging-infrastructure programs. Given that charging-station and EV data is being collected in multiple forums, the Joint Parties support this recommendation so that experts will be brought together to compare and understand existing data, and determine what gaps need to be addressed. In addition, this voluntary approach is more cost-effective and will yield better results than a mandatory data collection approach (e.g., the CEC's proposed Title 20 requirements on charging stations).<sup>25</sup>*

We support the data-sharing effort suggested by CalETC et al.

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<sup>24</sup> ChargePoint opening comments filed March 28<sup>th</sup>, 2018, page 2.

<sup>25</sup> CalETC et al. opening comments, page 30.

## **F. Making V1G Eligible as a Form of Energy Storage Would Allow the Market to Determine the Value of VGI Services in the Real World**

Conducting analysis to quantify the potential value of VGI services is important, but will be less effective at persuading profit-motivated business to make the investments needed to realize VGI services than making smart charging (V1G) an eligible resource within the CPUC's energy storage mandate. Making V1G an eligible resource would provide a clear market signal, without which necessary investments may not materialize, and it could be accomplished with the stroke of a pen.

To illustrate the need for this market signal, we reproduce comments filed in the energy storage proceeding by the Alliance of Automobile Manufacturers (which represents BMW Group, FCA US Group LLC, Ford Motor Company, General Motors, Jaguar Land Rover, Mazda, Mercedes-Benz USA, Mitsubishi Motors, Porsche, Toyota, Volkswagen, and Volvo) and American Honda:

*It is now apparent that controlled charging is not developing absent greater attention from the Commission. Similar to the way that 'bi-directional storage technologies' benefited from the Energy Storage Procurement target, it is necessary for the Commission to provide similar attention to controlled charging in order for this technology to reach its full potential. At the beginning of the storage proceeding, energy storage faced uncertainty regarding the value of grid services to developers. The Energy Storage Procurement target provided a clear avenue for market development – absent a clear buyer for the services, it is unlikely that stakeholders would have coalesced around implementation solutions, nor developed innovative technology and business solutions. Controlled charging faces the same challenge.*

*While the Commission hoped to address controlled charging in R.13-11-007, this proceeding has yet to make progress on this issue, as the Commission is focused on addressing the significant issues with the utility plug-in electric vehicle charging infrastructure proposals. A simple way to jump-start this process would be to provide a clear 'path-to-market' by making controlled charging eligible for storage contracts. Inclusion of controlled charging as an eligible storage technology is necessary to generate the market transformation needed to make controlled charging happen at commercial scale. In the context of a clear market signal, it will be much easier for the Commission to address the implementation challenges with stakeholders separately through R.13-11-007.*

*Demand response offers some revenue for load curtailment, but the lack of opportunities for long-term contracts dampen any incentive for stakeholders to develop products in this space. Including controlled charging as a storage*

*resource will provide a viable business case that will help incentivize the electric vehicle industry to bring the same innovation and creativity to optimizing charging that the Commission has generated for stationary storage devices. The necessary catalyst for this collaboration is a definitive market signal that the utilities will pay for these services if available.<sup>26</sup>*

The Utility Reform Network, the Coalition of California Utility Employees, the Environmental Defense Fund, the Southwest Energy Efficiency Project, Western Resources Advocates and Sierra Club have all taken similar positions.<sup>27</sup> Here we reproduce a portion of comments recently filed at the Public Utilities Commission of Nevada by NRDC, the Southwest Energy Efficiency Project, Western Resources Advocates and Sierra Club:

*The Commission should take advantage of the storage, power, and flexibility of EV batteries as this resource can benefit all utility customers, and help Nevada achieve its renewable energy procurement goals at lower cost. Despite rapid growth in EV deployment, there has been limited growth in the use of aggregated management of electric vehicle charging as an energy storage resource. In order to encourage large-scale market transformation of VIG and unlock the potential of this energy storage technology, the market needs a clear signal. Including controlled charging of electric vehicles as an eligible form of energy storage pursuant to SB 145 would provide such a signal. This simple measure would alert the market of the potential long-term contracts, spur development and innovation, and potentially reduce costs. Nevada's utility customers are unlikely to realize the lower costs and widespread benefits of using EV batteries as an energy storage resource unless the Commission offers VIG technology the same market signal (i.e., eligibility for SB 145 incentives) as provided to stationary storage technologies.<sup>28</sup>*

Making VIG eligible as a form of energy storage would be a clear action that could be taken pursuant to Deliverable 3, which would send a durable market signal that would result in the

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<sup>26</sup> *Joint Opening Comments of Alliance of Automobile Manufacturers, and American Honda Motor Co., Inc. on Assigned Commissioner and Assigned Administrative Law Judge's Scoping Memo on Rulemaking 15-03-011*, February 5, 2016.

<sup>27</sup> *Opening Comments of the Utility Reform Network on the Proposed Decision on Track 2 Issues*, R. 15-03-011, March 16, 2017, p. 1-4; *Comments of the Natural Resources Defense Council, the Coalition of California Utility Employees, the Environmental Defense Fund, the Alliance of Automobile Manufacturers, and American Honda Motor co. ("Joint Parties") on Proposed Decision of Commissioner Peterman*, R. 15-03-011, March 16, 2017; *Comments of the Natural Resources Defense Council, Sierra Club, Southwest Energy Efficiency Project, and Western Resource Advocates*, Public Utilities Commission of Nevada, Docket No. 17-08021 December 18, 2017.

<sup>28</sup> *Comments of the Natural Resources Defense Council, Sierra Club, Southwest Energy Efficiency Project, and Western Resource Advocates*, Public Utilities Commission of Nevada, Docket No. 17-08021 December 18, 2017, p. 21.

investments needed for VGI services to materialize. Further analysis of the potential value of VGI is helpful and necessary, but potential profits motivate action.

### **G. The Working Group Should Incorporate the Findings of National Cybersecurity Research**

As was identified by stakeholders in the working group, there are vulnerabilities with respect to cybersecurity in the communication links between the EV and the EVSE as well as the EV and the battery charging control hardware and software. As noted by the Idaho National Lab (INL): “Vehicle systems are expected to be an attractive point of entry for cyber-attacks because of vehicles’ accessibility.”<sup>29</sup> As a result, a Department of Energy Grid Modernization Laboratory Consortium, which includes Argonne National Laboratory, NREL, INL, and Pacific Northwest National Laboratory, is currently investigating cybersecurity issues with regards to EV and EVSE. The INL team is developing a set of diagnostic security modules that allow the system operator (in the test case, a building energy management system) to intelligently determine whether a EV or EVSE should be allowed to operate. The consortium should work with standards organizations as well as vehicle and EVSE manufacturers to develop new standards for communications hardware, firmware, and software. The findings and recommendations of that national effort should be included in the definition of a communication protocol.

### **H. The Working Group Should Adopt International Best Practices and Findings**

The European Union (EU) has heavily funded research projects and working groups to investigate EVSE standards, frameworks and communication protocols to both accelerate EV adoption and futureproof current smart charging programs such as wholesale market integration, third-party access, automated control, V2G and DC smart charging. Given the maturity of EVSE infrastructure in countries such as the Netherlands, Norway, Germany and France, lessons learned from these countries should be considered when defining recommendations and mandates for EV charging infrastructure in California.

Specifically, there have been many large EU projects that include interaction with American universities, OEMs, aggregators and EVSE manufacturers. The VGI working group

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<sup>29</sup> Rohde, K. 2017. GMLC 0163 Diagnostic Security Modules. GITT Deep Dive Review Meeting, Idaho National Laboratory.

should incorporate the already large set of publicly available findings from other countries. For example, over a four-year period, two large consortiums Cotevos (<http://cotevos.eu/framework/>) and Green E-Motion (<http://www.greenemotion-project.eu/>) both investigated various standards and communication protocols for a wide set of use cases. Considering the heavy involvement of the national labs and communication protocol experts in this consortium, California's VGI working group should take advantage of those public findings. This could be accomplished either through the incorporation of public deliverables or by retaining consultants who worked on these projects. A few examples of key findings are:

- In the Netherlands, every public charging station (and many private stations) can now be operated and paid for using a single radio-frequency identification card or key fob.
- A consensus of using Open Charge Point Protocol (OCPP) and Open Clearing House Protocol (OCHP) for all publicly accessible charging infrastructure has been found. Further EN 61851, ISO 15118 are highlighted as the preferred standard for EV to EVSE communication protocol to enable all use cases for VGI.<sup>30</sup>
- The need for a cloud-based marketplace has been identified to enable business-to-business (B2B) exchange of data for interoperability of billing between providers. Research and implementation of these standards and such a marketplace are ongoing, with ElaadNLs' OCPI (Open Charge Point Interface) being a frontrunner for international adoption in Europe.

Collaboration with international VGI consortiums, especially with those that already have high penetrations of EVSE and EVs, can minimize costs in multiple ways. Using lessons learned from international parties can obviate the need to conduct duplicative pilots and demonstrations. The adoption of uniform communications standards internationally can also lower costs for international OEMs, and EVSE manufacturers and operators.

#### **IV. CONCLUSION**

NRDC would like to underscore the value of continuing the VGI working group, which has already made significant progress toward realizing the vision of VGI services that accelerate transportation electrification, facilitate the integration of variable renewable resources, and lower the costs of managing an increasingly dynamic grid. A collaborative approach to enabling and investigating VGI is the most effective route and will lead to a stronger future for an electrified transportation sector. We thank staff and the CPUC for the opportunity to provide these

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<sup>30</sup> ElaadNL. EV Related Protocol Study 2016. (<https://www.elaad.nl/research/ev-related-protocol-study/>)

comments and recommendations. We respectfully request the CPUC adopt the changes to the staff report and the path forward for the VGI working group as described in these comments.

Dated: April 4, 2018

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