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Docket 19-MISC-01 / DER Roadmap Draft Technical Assessment

Additional submitted attachment is included below.

Honda appreciates the opportunities to participate in the development of the Distributed Energy Resources (DER) Roadmap Draft Technical Assessment and provide feedback to the California Energy Commission on electric vehicle grid integration (VGI) technical issues. Honda is deeply involved in ensuring electric vehicles can integrate safely with the electric grid while creating economic benefits. For years, Honda has studied and tested VGI use cases. Assigning value to VGI services is key to market development, and in 2013, Honda joined the first project to demonstrate VGI revenue-generation through participation in the PJM Interconnection Regulation Market[1]. Furthermore, customer participation in VGI services is essential. While enrollment in time of use rates can shift the load, they may not fully match grid needs. To find solutions, Honda implemented controlled charging – in 2018 Honda rolled out the nation's first smart charging program, Honda Smart Charge[2]. Additionally, through pilots and demonstrations[3], Honda found that bidirectional charging (V2G) can provide additional grid benefits..

Electric Vehicle Integration and Smart Charging

Honda strongly supports identification of electric vehicles (EVs) as a key technology in the DER Roadmap. EVs are a flexible resource that can provide grid services in both the near term and the medium to long term.

Technology and Strategy Review

Honda generally agrees with the author's drafting of the "Characterization of Technology and Strategy", and the notion that PEVs are well-suited to provide ancillary services. In the description for V2G, the assertion that "it is not yet cost effective for personal-use PEVs", the authors should clarify for whom the cost-effectiveness is being assessed – the service provider, driver, manufacturer, etc. In Honda's view, V2G improves cost-effectiveness of the personal PEV business case by providing an additional revenue stream that increases PEV value to the customer.

Discussion of Advantages and Disadvantages

In this section, and throughout the technical assessment document, uncertainty about battery degradation is categorized as a disadvantage and a barrier to further adoption. Honda recommends the authors correct this assertion to reflect the conclusions reached in studies testing battery life in VGI use cases. In the 2015 SAE International Technical Paper, "Deployment of Vehicle-to-Grid Technology and Related Issues"[4], researchers found there was negligible impact to battery degradation by performance of V2G operations. Therefore, Honda recommends that references to concerns about battery life degradation and battery warranties in the technical assessment be removed.

Additionally, the concern about customer uncertainty over state of charge listed as a disadvantage for V1G should be removed. While customers may be concerned over battery state of charge at a given time, there is a simple solution – give customers control over their participation in VGI services. In the

[1] See http://www1.udel.edu/udaily/2014/dec/honda-delaware-v2g-120513.html

[2] See https://cleantechnica.com/2018/08/02/emotorwerks-honda-southern-california-edison-offer-nations-first-smart-charging-program/

[3] See https://chargedevs.com/newswire/evgo-partners-with-uc-san-diego-on-vehicle-to-grid-projects/

[4] SAE Technical Paper 2015-01-0306, 2015, doi:10.4271/2015-01-0306

Honda Smart Charge program, Honda Fit EV drivers have full control over the desired state of charge at any given time and the charging schedule. Using an app on their smart phones, customers in the Honda Smart Charge program had complete certainty over battery state of charge at any given time. Thus, customer concerns about battery state of charge is not a disadvantage or barrier.

Furthermore, several advantages should be added to V2G, such as addition of ancillary grid services, reduction of need for peaker plants, and improvement of the business case for increased proliferation of PEVs.

EV Integration Metrics

While the metrics identified in the draft technical assessment may provide some certainty to questions of capacity and the overall potential of V2G, Honda recommends expanding upon the single metric focused on the customer: Revenue opportunity available on average in the market per kWh energy for a given vehicle. Establishing a value chain is critical, because without value, customers will not enroll in programs to provide V2G services to begin with. Additionally, the authors may consider conducting qualitative sentiment indices, which benchmarks where manufacturers think the market is.

Metric	Honda comment
Percentage of EVs capable of bi-directional charging	Customer enrollment is more important – perhaps the percentage of customers who are/can be offered a V2G tariff.
Revenue opportunity available on average in the market per kWh energy for a given vehicle	Instead of $/kWh, should consider $/year, and identify what value is realized at each stage – generation, transmission, distribution, end customer.
Average number of EVs plugged into a charger during peak events	Customer enrollment is more important. This metric will not provide the necessary insight at the development stage, and is better suited to evaluation of later implementation stages.
Number of chargers currently installed capable of bi-directional charging	
Maximum MW output of all bi-directionally capable EVs at current penetration as a percentage of current peak	
Maximum MW consumed of all EVs/available chargers at current penetration as a percentage of current peak	

Assessment of Barriers to Further Adoption

1. **V2G vehicle costs**: Honda recommends being explicit in describing costs associated with V2G DC versus V2G AC, and to remove the discussion of EVSE from this section. The section is introduced with an erroneous statement that "V2G is expensive." Total costs to implement and operate V2G AC systems are far lower than costs for V2G DC systems, depending on power capacity and other factors, and both systems are relatively low cost to apply to vehicles. Additionally, whether or not cost acts as a barrier depends largely upon who bears that cost,

which is not included in the draft technical assessment. Generally, when considering the potential barriers to further adoption of V2G, cost is not the priority – rather, policy changes and market valuation present the most significant challenges.

2. **Valuation**: Honda agrees that valuation is a barrier, and recommends the authors spend significant time considering it. Honda recommends that market valuation of V1G/V2G be prioritized. As a technology, V2G is functionally operational, however, market issues must be decided first. Vehicles are developed to meet the needs of customers in use cases for which the vehicles are designed. If V2G use cases are identified, V2G vehicles will be developed to meet those needs. Further, if there is a market for the product, the product will be produced; without a market, V2G product benefits will not reach the grid or PEV customers.
3. **Coordination – Aggregation required**: While the technical assessment accurately points out that aggregation of V2G vehicles will be necessary, this is not a significant barrier to further adoption. Honda would like to see more detail behind why aggregation is considered a barrier to further adoption.
4. **Uncertainty – Battery warranty impacts; Vehicle battery availability**: as discussed in the above section, *Discussion of Advantages and Disadvantages*, neither of these battery concerns are barriers. Both of these barriers are customer-centric, yet the cited research provided no data on customer viewpoint[5]. In fact, the cited literature in this section of the draft technical assessment presented studies conducted by non-automakers applying the vehicles to use cases and purposes for which the vehicles were not designed. Thus, those studies should not form the basis of the conclusion ultimately reached in the final technical assessment. Furthermore, the authors of the two studies highlighting battery life degradation cited on Page 42 of the draft technical assessment jointly published an additional paper that reached the opposite conclusion[6]. Additionally, time spent at 100% state of charge is one of the largest degradation modes of lithium ion batteries. Both V1G and V2G reduce the amount of time spent at full state of charge, thereby reducing degradation compared to the uncontrolled charging mode. Low state of charge swing cycling for frequency regulation use cases minimally impact battery life. Deeper state of charge swing cycling can impact battery life, but degradation is easily avoided by appropriate system controls.

Other Barriers Not Identified

- Policy: Changes to regulations and administrative processes generally stand as barriers due to the time and analysis required to allow new technologies or different applications of technologies. However, since this is a technical assessment addressing technology feasibility and not implementation, rather than spend significant time assessing these policy changes, the authors should refer to the developments currently underway in CPUC proceedings or discussed in the CEC VGI Roadmap[7].
- Interoperability: i.e. ecosystem (interoperability is a problem)

Conclusion

Honda appreciates the opportunity to provide these comments, and looks forward to collaborating with the CEC and other stakeholders.

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[5] DER Integration Technical Assessment Draft, page 42, footnotes 63 and 64.

[6] Uddin, Kotub, Dubarry Matthieu, Glick Mark B., 2018. The viability of vehicle-to-grid operations from a battery technology and policy perspective. Energy Policy 113, 342-347

[7] See "Presentation – VGI Roadmap Update Workshop – Policy Panel", submitted in Docket 18-MISC-04 on October 31, 2018.