DOCKETED	
Docket Number:	18-MISC-04
Project Title:	Vehicle Grid Integration Roadmap Update
TN #:	225937
Document Title:	Tesla Post Workshop Comments VGI Roadmap Update
Description:	N/A
Filer:	System
Organization:	Francesca Wahl/Tesla
Submitter Role:	Public
Submission Date:	11/21/2018 12:37:35 PM
Docketed Date:	11/21/2018

Comment Received From: Francesca Wahl
Submitted On: 11/21/2018
Docket Number: 18-MISC-04

Tesla Post Workshop Comments VGI Roadmap Update

Additional submitted attachment is included below.

November 21, 2018

Eli Harland
California Energy Commission
Dockets Office – MS-4
Re: Docket No: 18-MISC-04
1516 Ninth Street
Sacramento, CA 95814

RE: Post Workshop Comments on Vehicle Grid Integration (VGI) Roadmap Matrix

Dear Mr. Harland:

Tesla appreciates the opportunity to provide feedback to the California Energy Commission (CEC) in partnership with the California Independent System Operator (CAISO), California Public Utilities Commission (CPUC), and the California Air Resources Board (CARB) in response to the two-day workshop on the update to the California Vehicle-Grid Integration (VGI) Roadmap.

As referenced in our previous comments to the CPUC regarding the VGI working group[1], Tesla supports an effort to update the VGI Roadmap, including identifying clear next steps for assessing the value and return to customers. A key outcome of the Roadmap update should be actionable next steps to help better understand the value of VGI including the net benefits.

When evaluating VGI, as a general matter it is important to support policies that drive EV adoption by lowering the total cost of ownership and significantly enhancing the customer experience in acquiring, owning, and operating an EV. These comments focus on the following topics:

- Customer experience, value and engagement must be further evaluated
- VGI value assessment needs to include discussion of both benefits and costs for integration
- Cross agency process and resource coordination is important
- Lack of a standard communication protocol is not the key barrier for VGI progress
- Additional workshops and discussions are appropriate

These comments are also reflected in response to the roadmap matrix spreadsheet attached hereto as Appendix A with feedback in red.

Customer Experience, Value and Engagement

During the workshop, one of the key topics raised by staff was customer experience and staff specifically asked what technologies and policies can simplify the charging experience for the mass market. Given the framing of several of the topics in the matrix spreadsheet, it appears a foregone conclusion that standards are a necessary component for improving the customer experience with charging technologies and VGI. There are many components beyond standards that can have an impact on customer experience. It is therefore important to study the customer acceptance and considerations of user experience to understand the impact of any VGI program design elements.

[1] Tesla Comments on VGI Communications Protocols Working Group ED Staff Report, R.13-11-007, March 21, 2018.

Tesla, Inc.
3500 Deer Creek Road, Palo Alto, CA 94304
p +650 681 5100 f +650 681 5101

Studying user preferences ensures that programs are not designed in a way that could impede EV uptake and customer experience, such as drivers feeling penalized given their specific circumstances of not having home charging. At the same time, VGI efforts should recognize that it is difficult to alter customer behavior unless there are direct customer benefits. For any VGI strategy to be effective, active customer engagement is necessary and benefits should be demonstrated.

Finally, it is important to maintain customer choice by not picking a technology specific pathway, whether via the EVSE or the vehicle, for VGI programs, but rather enabling various options to achieve a particular outcome and drive value to the customer.

VGI Value - Net Benefits

The 2014 VGI Roadmap states that "to spur investment in VGI and to promote customer adoption, the VGI value proposition must be understood and the benefits must outweigh the costs across the entire value chain."[2] Four years later, this sentiment continues to hold true and is one of the key outstanding questions from the work done by the VGI working group that needs to be addressed more fully. The draft CPUC Energy Division staff Report pointed out that stakeholders "determined that the potential value of VGI use cases needs further analysis, and potentially additional, largescale pilots that identify the business case for enabling VGI as a resource."[3] The Joint Utilities and Automaker comments recommended next steps for research and deployment pilots which could include: 1) large scale demonstrations including both EV-centric (telematics) and EVSE-centric solutions for grid integration and 2) VGI value study on net benefits.[4]

While there has been much discussion around the potential benefits of VGI, the potential impact of additional costs to implement VGI remains unclear. The VGI Roadmap update should therefore include a net benefit analysis as a recommended action item and clearly identify next steps for evaluating costs. This analysis should incorporate both EV and EVSE centric approaches.

In its presentation during the October 29-30, 2018 workshop, CalETC lists the various use cases that should be included in the Roadmap scope broken down further into user sectors, types of VGI, applications, control approaches, communication pathways, vehicle classes, and charger levels.[5] Tesla agrees that utilizing the comprehensive list of sub-criteria of various use cases is important for any net benefit analysis. At the same time, there will likely be several use case permutations where more advanced forms of VGI may not make sense given the current state of the market and long-term opportunities, such as V2G with light-duty DC fast charging. Tesla also recommends including in the net benefit evaluation specific criteria for determining what is important at this stage of deployment for each use case.

Cross Agency Process and Resource Coordination

First, given the number of requirements that are currently being proposed by the state that could increase the cost of charging infrastructure (EVSE measurement specification regulation, SB 454 etc.), it will be important to holistically evaluate the combined costs from the various state agencies' program requirements for charging infrastructure and the potential impact on EV uptake.

[2] 2014 VGI Roadmap, p.5. Available at: https://www.caiso.com/Documents/Vehicle-GridIntegrationRoadmap.pdf
[3] Energy Division draft Staff Report, p.19. Available at: http://www.cpuc.ca.gov/vgi/.
[4] Joint Utilities and Automakers Comments, December 18, 2017, p. 2. Available at: http://www.cpuc.ca.gov/vgi/.
[5] CalETC presentation, slide 6. Available at: https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=18-MISC-04.

Second, similar to the June 2017 Joint Agency Staff Workshop on the Review of the Actions and Status of State-level Energy Roadmaps, it is important for state agencies to continue to coordinate on how VGI efforts will be impacted by and will impact broad distributed energy resources (DER) integration, demand response (DR) programs, and planning efforts across the state. For instance, it may make sense to harmonize VGI programs with existing DR or grid services programs such that everyone is receiving the same signal and customers can decide on the best way to respond, whether it is curtailing their charging session, dispatching electricity from a stationary storage unit, or changing the temperature on their thermostat.

Finally, the VGI glossary developed by the VGI working group should continue as a living document and can also help serve as the basis for the application of consistent VGI terminology in the context of the VGI Roadmap update.

Standard Communication Protocol

In the context of the VGI working group, several of the comments by other stakeholders highlight that the lack of a uniform communication protocol is not the key barrier to VGI.[6] Furthermore, the draft report by Energy Division staff determines that "it is not advisable to require the investor-owned utilities to only use a single protocol, or specific combination of protocols, for their infrastructure investments at this time."[7] The discussion regarding communication protocols has already undergone a detailed stakeholder process. The VGI Roadmap update should not attempt to re-open this discussion but rather focus on more critical next steps in identifying the value of VGI. At the same time, any future communication protocols discussion should also recognize that communication protocols already exist for other DERs, such as smart inverters, and that the system will likely need to be able to communicate more holistically as customers adopt different types of DERs.

Additional Workshops

In their opening comments, the Joint Parties recommend holding additional workshops and discussions with stakeholders prior to releasing the draft Roadmap update.[8] Tesla agrees that additional dialogue with stakeholders in a workshop setting would be useful prior to releasing a draft Roadmap update.

***

The VGI Roadmap update is an opportunity to further determine the value of VGI including the net benefits to customers, the grid and other impacted stakeholders. It is critically important that any VGI discussions evaluate both EV and EVSE centric solutions and focus on the customer experience when deciding to make the switch to an EV including value and potential for engagement. At higher levels of EV deployment, it will become increasingly important to ensure charging is aligned with grid needs. It will therefore be necessary to continue the discussions of VGI net benefits as an action item coming out of the Roadmap update and evaluate the most effective mechanisms for integrating solutions that benefit customers and the grid.

Sincerely,

[6] Joint Utilities and Automakers Comments, November 14, 2017. Available at: http://www.cpuc.ca.gov/vgi/.
[7] Staff Report, p.12.
[8] Joint Parties Comments, October 4, 2018. Available at: https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=18-MISC-04.

Francesca Wahl
Sr. Policy Associate, Business Development and Policy

cc: Stephanie Palmer (CARB), Carolyn Sisto (CPUC), Peter Klauer (CAISO)

Number E=Economic; C=Customer; T=Technical; P=Policy	Goal	Problem/Issue - Initial Proposal (9/6/18)	Problem/Issue - Incorporated Comments (10/29/18)	Action
E1.1	Estimate the economic potential for Vehicle-Grid Integration under medium (2030) and long term (2050) scenarios.	Various scenarios of electric vehicle charging load shapes (system wide and disaggregated) are needed for effective utility resource planning. Planning frameworks must value grid integration and smart charging to minimize the costs of electrification.	Planning frameworks should account for one-way and two-way charging, yet limited data and data sharing of EV load shapes makes it challenging to characterize the various scenarios of electric vehicle charging load shapes.	
E1.2		Analyzing the supply push from solutions providers (i.e., automakers, equipment manufacturers, electric vehicle service providers, aggregators, and infrastructure installers) is needed to forecast the smart charging market and holistically assess the benefits of VGI to the state.	Resource planning does not fully reflect the technological capabilities of suppliers (automakers, equipment manufacturers, aggregators and infrastructure installers) including the potential for Vehicle-to-Grid (V2G) products. Assessments of the charging market do not yet include the demand from light, medium, heavy, and other types of transportation to allow for stakeholders to understand the scale of the problem.	
E1.3 (unchanged)		There is limited information on value to customers and ratepayers from V1G, V2G, and/or V2B. Some pilots have been completed and others are underway, however analysis is needed across user segments, across infrastructure design types, and under various policy scenarios for both direct beneficiaries and ratepayers at large.	There is limited information on value to customers and ratepayers from V1G, V2G, and/or V2B. Some pilots have been completed and others are underway, however analysis is needed across user segments, across infrastructure design types, and under various policy scenarios for both direct beneficiaries and ratepayers at large.	Develop a clear framework for analyzing net benefits/value of VGI. *Any discussion on the value of VGI should be framed to incorporate net benefits (benefits and costs). Furthermore, this should also consider different use cases, vehicle classes, customer engagement/impact, other stakeholder impact, etc.*
E1.4		There are various valuation tools for estimating how future energy scenarios, including those with high rates of PEV adoption, achieve equity/societal and decarbonization goals, however the effectiveness of such tools require a high-level assessment of how VGI is characterized.	Valuation tools examine VGI at different scales for varying purposes including: future scenarios with high decarbonized electrification, integrated resouce planning, and distribution resource planning. However effective valuation of VGI in each of those tools requires accurately characterizing how electric vehicles would act as a DER and the potential for them to offer services.	
E1.5			Utility electric tariffs are a core market signal for charging management, but may hinder electrification of various vehicle segments if design elements (e.g. non-coincident demand charges) pose uneconomic operations. Further, tariffs are not designed at sufficient locational or temporal resolution to avoid coincident loading, improve operational efficiency, or integrate renewables. Other market signals in addition to tariffs may be needed to provide stakeholders valuable opportunities to manage grid conditions.	Identify potential opportunities to harmonize VGI programs with existing DR or grid services programs such that everyone is receiving the same signal and customers can decide on the best way to respond, whether it is curtailing their charging session, dispatching electricity from a stationary storage unit, or changing the temperature on their thermostat
E2.1	Identify promising business models for self-sustaining private development of infrastructure and markets for VGI	A lack of seamless grid integration of mobile resources across utility service territories and their different rate structures and policies may hinder the interoperability of PEVs and the large scale adoption of PEVs. Analysis of this seamless integration is needed including the range of cost for the different ways of communicating utility schedules with vehicle charging schedules.	A lack of interoperable smart charging does not ensure that technologies employed in plug-in hybrid and electric vehicles work in a harmonious manner and across service territories. This may inhibit the large scale mobility of PEVs, which travel between charging networks and service areas. The cost impacts on vehicle and equipment manufacturing design for multiple ways of communicating between utilities, charing stations, and vehicles is unknown.	*It is unclear how the term "interoperability is being used in this instance and what exactly it is referring to. Also, the statement "lack of interoperable smart charging… work in harmonious manner"appears to make a premature conclusion without any additional details about the specifics of the problem. Near term action can focus on evaluating costs, which could be scoped into the larger net benefits/value framework action under E1.3*
E2.2		Limited aggregation models available to third-parties across the load serving entities (IOU, CCE, POUs) have inhibited the scale-up of managed charging.	Third parties do not have access to scalable managed charging models across the load serving entities. The creation or refinement of aggregation models (regarding baseline calculations, multiple program and use participation, resource scheduling) is needed.	
E2.3		There is limited understanding of "unbundling" (or the separate-purchase of) charging equipment and charging services, and the impact unbundling may have on the grid and market.	There is limited understanding of "unbundling" (or the separate-purchase of) charging equipment and charging services, and the impact unbundling may have on the grid and market and how unbundling charging aligns with unbundling other DERs."	

E3.1	Reduce cost of electrification by measuring how emerging opportunities can utilize vehicle-grid integration technologies	Autonomous, Connected, Electric, Shared (ACES) vehicles have unverified impacts on future electricity demand, traffic flow, and greenhouse gas emissions.	Traffic and driving pattern information could be utilized to improve the predictability of load planning and reliability of aggregation, bridging the divide between metropolitan transportation planning and utility planning and operations. Further, Autonomous, Connected, Electric, Shared (ACES) vehicles have unverified impacts on future electricity demand, traffic flow, and greenhouse gas emissions.	
E3.2		Electrification and charging infrastructure operations can positively impact the development of sustainable communities and smart cities, but viable models are unproven or developing.	Electrification and charging infrastructure operations can positively impact the development of sustainable communities and smart cities. For example, an aggregation of V2G vehicles connected to an electrified garage could provide cost management and resiliency services to a microgrid of surrounging buildings while reducing real estate allocated for stationary storage. However, viable models are unproven or developing given strong stakeholder interest.	
E3.3 (unchanged)		Characterizing the grid impacts of large scale transportation electrification for medium-duty and heavy-duty vehicles is needed to provide reliable service and minimize grid upgrade costs.	Characterizing the grid impacts of large scale transportation electrification for medium-duty and heavy-duty vehicles is needed to provide reliable service and minimize grid upgrade costs.	
C1.1	Prioritize and track the benefits of managed PEV charging to low-income consumers and disadvantaged communities.	Current utility resource planning does not take into account the environmental and air quality outcomes from shifting how power plants operate (in response to managed PEV charging) near low-income and disadvantaged communities.	A lack of data and analytical methods in current utility resource planning prohibits accounting for the environmental and air quality outcomes from electrifying transportation and changes to electric generator operations resulting from smarter PEV charging, particularly in and near low-income and disadvantaged communities.	
C1.2 (unchanged)		Current metrics, such as those in the SB 350 Equity Indicators, do not report all charging infrastructure investment or smart charging customer enrollment.	Current metrics, such as those in the SB 350 Equity Indicators, do not report all charging infrastructure investment or smart charging customer enrollment.	
C2.1	Enhance the consumer experience.	Important consumer information, such as optimal times for charging and managed charging methods, incentives, and utility bill savings, is not disseminated at the scale necessary to achieve PEV goals.	While important consumer information, such as optimal times for charging and managed charging and discharging methods, incentives, and utility bill savings, are being disseminated, consumers do not always understand the benefits of managing their charging behaviors without compromising their mobility.	Study the customer acceptance and considerations of user experience to understand the impact of any VGI program design elements. *Studying use preferences ensures that programs are not designed in a way that could hurt customer experience (such as them feeling penalized given their specific circumstances of not having home charging) or EV uptake.*
C2.2 (unchanged)		All makes of PEVs and charging equipment are not interoperable.	Not all makes of PEVs and charging equipment are interoperable.	
C2.3 (unchanged)		The charging and payment process for workplace and public charging is evolving, but needs to simplify for drivers as PEV infrastructure is deployed.	The charging and payment process for workplace and public charging is evolving, but needs to simplify for drivers as PEV infrastructure is deployed.	*It is unclear why this problem should be addressed in the context of the roadmap update. There are numerous efforts such as SB 454 and CA DMS draft regulation on EVSE measurement standards that can and are already addressing this issue. The roadmap can simply indicate these efforts are on-going rather than dedicating specific additional action to it.*
C2.4			Lack of a centralized state-wide information resource that provides relevant and up to date information on EV charging infrastructure across state agencies, regional and local governments, and other funding programs, including available smart chargers for the various customer segments.	
C2.5			Non-conformed electrical and automotive and safety standards prohibit the interconnection of V2G technologies. Utility service planning studies needed particularly for clustered charging load or high power installations are currently a critical path to deployment, but inhibit rapid customer installatoin and provision of bidirectional charging services.	

C3.1	Increase the potential number of and readiness of future EVSE site hosts.	Standardized "make ready" infrastructure plans are not part of new construction and not all customers are aware of the possibility of EVSE integration.	Standardized "make ready" infrastructure plans are not part of new construction and load management systems are being deliberated upon for compliance for larger installations. Furthermore, not all customers are aware of the possibility of easily installing EVSE atop capable infrastructure.	
C3.2		EVSE integration can be challenging and cost-prohibitive at existing buildings.	Dense installation of grid-connected EVSE can be challenging and cost-prohibitive at existing buildings, and DER supported or off-grid charging solutions may be necessary, particularly for vehicles with relatively lower power and energy requirements.	
~~C3.3~~		~~Large scale EVSE installations across the state may be challenging for installers that operate in multiple locations due to development codes that can vary across cities and counties.~~		
~~C3.4~~		~~Dense deployment of EVSE in specific locations can be challenging for utilities to integrate with the electric grid.~~		
~~C3.5~~		~~Information describing best practices for operating and maintaining EVSE from site hosts and EVSPs participating in publically funded programs is not readily available.~~		
T1.1.1	Improve cybersecurity	Low cost and robust cyber security measures between the PEV-charger and charger-aggregator may not be readily deployed in today's charging market, and commercialization of smart chargers must continue to ensure safe data transfers from malicious attacks.	Cost-efficient and robust cyber security measures between the PEV-charger and charger-aggregator may not be readily deployed in today's charging market, and commercialization of smart chargers must continue to ensure safe data transfers from malicious attacks. New technology solutions may not be timley integrated to maximize security and effectiveness.	
T2.1.1 (unchanged)	Advance communication and hardware technology standardization and interoperability	Wireless, V2G discharge, DC Fast Charging for light vehicles, and medium- and heavy-duty vehicle charging need to be prepared for advanced interoperability capabilities to enable the robust development of the charging network.	Wireless, V2G discharge, DC Fast Charging for light vehicles, and medium- and heavy-duty vehicle charging need to be prepared for advanced interoperability capabilities to enable the robust development of the charging network.	*It is unclear what "advanced interoperability capabilities" are being defined as in this context and why that is specifically relevant for the referenced charging use cases. Any disucssion on communication protocol needs should reference back to the staff report from the VGI working group and be looped into discussions on net benefits/value of VGI.*
T2.2.1		The lack of communication standardization for light-, medium, and heavy duty vehicle charging may inhibit the maximization of smart charging benefits and underutilize smart chargers and PEVs as grid resources.	The lack of implemented communication standards for light-, medium, and heavy duty vehicle charging may be inhibiting the utilization of smart charging and PEVs as grid resources. New services to manage power levels an innovations may be unnecesarily withheld from the market without readily available data enabled with communications standards.	*It is unclear what data is being utilized to conlude that lack of communication standards is inhibiting the utilization of smart charging and PEVs as grid resources. Similar to discussion in the VGI working group, it is unclear that lack of a standard is the primary barrier to VGI. Similar to comments above, further analysis is needed on the costs and benefits .*
T2.3.1		PEVs are unable to participate in charging-specific tariffs and/or monetary compensation programs without highly accurate metering and communications necessary to provide accurate reporting and settlement and knowledge about the availability of integrated low-cost metering and communication solutions is incomplete.	PEVs are unable to participate in charging-specific tariffs and/or monetary compensation programs without highly accurate metering and communications necessary to provide accurate reporting and settlement and knowledge about the availability of integrated low-cost metering and communication solutions is incomplete. EVSE-embedded submeters may be necessary to advance the state of the art beyond current implementations of whole-house TOU rates and separate electrical service specific to one or multiple EV chargers.	*Any action(s) regarding submetering should also evaluate customers who may be investing in other distributed energy resources such as solar and storage and who may prefer the opton to utilize whole house TOU rates. Any action on this issue should include the optionality for the customer to obtain the desired end result that drives value to the grid as well as the customer.*
T2.4.1		Integrated solutions providing advanced communication and control functions that connect the PEV and/or charger with grid operators are needed to reduce implementation costs.	Integrated solutions providing advanced communication and control functions that connect the PEV and/or charger with grid operators are needed to reduce implementation costs. Certainty in the use of integrated charging solutions are needed to achieve economies of scale cost savings.	
T3.1.1	Develop advanced battery and charging technologies	Manufacturers of solutions for MD/HD EVs need to accommodate high-voltage battery and charging systems to meet applicable vocational duty cycles.	Manufacturers of solutions for MD/HD EVs need to accommodate high-voltage battery and charging systems to meet applicable vocational duty cycles and provide grid stabilization services. Without tracking progress on this issue, forecasting the potential for heavy, and off-road vehicle electrification remains uncertain.	
T3.2.1		Users need to understand the relationships between battery life, range, operations and their overall impact on total cost of ownership.	Stakeholders need to understand the relationships between battery life, range, operations and their overall impact on total cost of ownership, particularly for V2G operations and the recyclability, reuse, and redeployment of batteries after their use in vehicles.	

T3.3.1	and charging technologies	The load and grid upgrade requirements of fast charging to support long distance travel for light personal and light/medium/heavy commercial vehicles are unknown.	The load and grid upgrade requirements of fast and/or high power charging to support long distance travel for light personal and light/medium/heavy commercial vehicles must be known to provide reliable service while reducing grid upgrades.	
T3.3.2			Electrical and safety certifications under SAE for onboard vehicle chargers capable of off-board energy discharge are not considered by UL. Regulatory acceptance of electrical standards but not automotive standards for V2G bar the use of behind-the-meter discharging technologies.	
T4.1.1	Improve technology transfer between stakeholders	Technology and knowledge transfer between local, state, and federal stakeholders (agencies, auto OEMs, charging technology providers, utilities etc.) is not yet occurring at a comprehensive scope or frequently enough to rapidly advance EV adoption.	Technology and knowledge transfer between local, state, and federal stakeholders regulatory agencies, auto OEMs, charging technology providers, utilities etc.) is not yet occurring at a comprehensive scope or frequently enough to rapidly prototype and advance adoption of VGI solutions. Meanwhile, technology transfers need to consider opportunities to create robust, competitive markets for vehicles, equipment and services, while protecting intellectual property.	
T4.1.2			State investments lack a comprehensive data warehouse to compile R&D learnings to determine how pilots can be extrapolated for regional or market-scale impact modeling. Research portfolios do not consistently identify connections between individual investments or a broader industry technology roadmaps in order to prioritize funds to pursue cutting-edge areas of research and analysis.	
T5.1.1* (unchanged)	Identify scenarios and cost targets for future technology research and	State agencies and stakeholders need a focused roadmap to direct VGI technology development, specified with technology metrics and informed by industry product roadmaps.	State agencies and stakeholders need a focused roadmap to direct VGI technology development, specified with technology metrics and informed by industry product roadmaps.	
P1.1	Frame the interactions between policy initiatives, market push, and demand pull factors that are required for achieving widespread deployment of managed charging and grid reliability goals and propose changes to EV	The interactions between the objectives and timelines of state transportation electrification and vehicle-grid integration policies and programs are unclear.	The interactions between the objectives and timelines of state transportation electrification and vehicle-grid integration policies and programs are unclear. State agency units implementing VGI-related policy measures are independent, yet require improved awareness of related activities. E.g. ZEV and Infrastructure Targets (B-48-18), Utility Transportation Electrification and Integrated Resource Planning (SB 350), CA Energy Demand Forecast and Transportation Energy Demand Forecast (IEPR), CARB Climate Change Scoping Plan and Mobile Source Strategy (Medium and Heavy assessment, Sustainable Freight, Innovative Clean Transit, Advanced Clean Trucks), Research Assessments (EPIC, ARFVTP, CARB Research), Rulemakings (R.13-11-007, Title 20, Rule 21 Interconnection, Open Access, Low Carbon Fuel Standard)	
P1.2		Agencies or stakeholders may unknowingly develop policies, business processes, and market initiatives concerning EVs that counteract or contradict VGI resource certification efforts.	Agencies or stakeholders may unknowingly develop electric transportation policies, business processes, and market initiatives that counteract or conflict with VGI efforts.	
P1.3		Rapidly evolving renewable portfolio standards, rate designs, and infrastructure incentive policies influence the usefulness of VGI, but utilities need certainty in charging infrastructure procurement policy and private companies need certainty in charging infrastructure technical specifications to successfully co-invest in charging.	Rapidly evolving renewable portfolio standards, rate designs, and infrastructure incentive policies influence the usefulness of VGI, but utilities need certainty in charging infrastructure procurement policy and private companies need certainty in charging infrastructure technical specifications to successfully co-invest in charging, including for V2G.	*Any action should continue to enable the opportunity for both the EVSE centric and EV centric pathways for VGI.*

~~P1.4~~	deployment plans and VGI policy to address gaps.	~~State agency units implementing VGI related policy measures are independent, yet require improved awareness of related activities. E.g. ZEV and Infrastructure Targets (B 48 18), Utility Transportation Electrification and Integrated Resource Planning (SB 350), CA Energy Demand Forecast and Transportation Energy Demand Forecast (IEPR), CARB Climate Change Scoping Plan and Mobile Source Strategy (Medium and Heavy assessment, Sustainable Freight, Innovative Clean Transit, Advanced Clean Trucks), Research Assessments (EPIC, ARFVTP, CARB Research), Rulemakings (R.13 11 007, Title 20, Rule 21 Interconnection, Open Access, Low Carbon Fuel Standard)~~		
P1.~~4~~5		Impacts of concentrated local and individual efforts related to smart EV charging (ZNE homes codes for EV and DR capability, Local Climate Action Planning, Fleet Procurements, Low-Income and Disadvantaged Community programs) are not readily transparent, which may result in poor estimates of charging demand and grid upgrades.	Impacts of concentrated local and individual efforts related to smart EV charging (ZNE homes codes for EV and DR capability, Local Climate Action Planning, Fleet Procurements, Low-Income and Disadvantaged Community programs) are not readily transparent or predictable, which results in uncertainty related to charging demand and grid upgrades.	
P2.1	Identify the current and emergent needs of the electric grid and where feasible, determine the potential benefits from managed electric vehicle charging	Utility programs, procurements, and tariffs could be served by the use of EVs as distributed energy and demand response resources, but requirements between utilities and service providers or participants may prevent robust participation in multiple markets.	Utility programs, procurements, and tariffs could be served by the use of EVs as distributed energy and demand response resources, but varied requirements between investor- and publicly-owned utilities, community choice aggregators, various balancing areas, and service providers or participants may prevent robust participation in one or multiple markets. Regulatory and market mechanisms need to be improved to incorporate and account for potential grid benefits, including over longer planning horizons, while considering how public expenditures on charging would enable the provision of grid services.	
~~P2.2~~		~~Some of the reliability needs of Balancing Authorities could be met by the use of EVs as distributed energy and demand response resources, but uncertain market size and pricing dampens market participant interest.~~		
P3.1	Align stakeholders' interests in robust open markets for smart infrastructure investment	The wide variety of terms to qualify charging technologies into different state, local, and utility charging or EV-related programs have fragmented equipment design and can inhibit the benefits of economies-of-scale production for charging equipment.	The wide variety of terms to qualify charging technologies into different state, local, and utility charging or EV-related programs may be precluding consistent equipment design and can inhibit harmonious charging operations across territories, while delaying the benefits of economies-of-scale production for charging equipment.	
P3.2		The traditional "rate of return" regulatory designs may cause utilities to underestimate the grid impact mitigation potential from smart charging infrastructure and grid upgrade planning methodologies may need to be updated. Regulatory changes that accommodate and encourage third party aggregation of charging may be needed.	The traditional "rate of return" regulatory designs may cause utilities to underestimate the grid impact mitigation potential from smart charging infrastructure and grid upgrade planning methodologies may need to be updated. Regulatory changes that accommodate and encourage third party aggregation of charging may be needed. It may be necessary to allow utilities to consider criteria for performance-based ratemaking or other incentive mechanisms to balance the objectives of infrastructure investments, renewable integration, minimizing ratepayer impact, and encouraging marketplace competition.	