

## DOCKETED

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## Track 1: Determine VGI Value and Potential

Current Priority	Goal	Activities Supporting Goal	Forum/Process/Proceeding	Status	Timing Considerations
High	<b>Confirm VGI electrical system impacts</b>	<p>Refine VGI use cases</p> <p>Develop tools and methods to assess VGI impacts to the electricity system</p> <p>Assess VGI impacts by</p> <ul style="list-style-type: none"> <li>• VGI type</li> <li>- V1G, V2G, V2B, B2G</li> <li>- aggregated, individual</li> <li>- unified, fragmented</li> <li>• approach (e.g., variable pricing, control, etc.)</li> <li>• application (distribution, wholesale, etc.)</li> <li>• technology (e.g., charger, controls type, etc.)</li> </ul> <p>Assess interaction with other capabilities</p> <p>Assess simultaneous effects throughout the grid</p>	Modeling efforts, pilot projects	Several current pilots including: Power Your Drive, Smart Charging, PG&E BMW, ChargePoint, CSE Demand Clearinghouse, Los Angeles Air Force Base	
High	<b>Determine VGI value</b>	<p>Develop tools and assess value from impacts</p> <p>Assess VGI value by</p> <ul style="list-style-type: none"> <li>• VGI type</li> <li>- V1G, V2G, V2B, B2G</li> <li>- aggregated, individual</li> <li>- unified, fragmented</li> <li>• approach (e.g., variable pricing, control, etc.)</li> <li>• application (distribution, wholesale, etc.)</li> <li>• technology (e.g., charger, controls type, etc.)</li> </ul>	Valuation tools, rate design considerations, infrastructure deployment considerations	VGI-Soft, E3/LBNL DR Potential, NREL Nat'l Economic Value Assessment of PEVs	
Medium	<b>Confirm VGI market potential</b>	<p>Explore market certainty for grid services</p> <p>Study potential for adoption</p>	Location-specific valuation tools, assessments of location-specific and regional grid needs	VGI-Soft, SEPA Managed Charging report, DRP/IDER/IRP, CAISO initiatives including Distributed Energy Resource Provider (DERP) and Metering Rules Enhancements (MRE)	
High	<b>Formulate VGI business models</b>	<p>Assess stakeholder needs for developing business models</p> <p>Develop programs to address needs</p>	Industry implementation within policy framework, informed by research / demonstrations	NSI Buses, EMW, ChargePoint, BMW, Oxygen Initiative, Proterra and BYD, Nuuve	
High	<b>Research, development and demonstration (RD&amp;D)</b>	<p>Some pilot studies are already underway in California</p> <p>Coordinate existing RD&amp;D</p> <p>Ensure results are published</p> <p>Identify additional research gap for further study</p> <p>Scale up pilots as necessary</p>	ARFVTP, EPIC (Energy Commission + utilities), DOE, international efforts	Submetering Protocol, SCE Smart Charging, BMW/PG&E DR, GMLC- VGI Soft, EV Pilot Survey	

## Track 2: Develop Enabling Policies, Regulations and Business Processes

Current Priority	Goal	Activities Supporting Goal	Forum/Process/Proceeding	Status	Timing Considerations
High	<b>Ensure coherence between state policies, programs and national standards</b>	Identify process interaction and dependencies Identify and implement adjustments to existing processes, or establish processes for coordination	CPUC AFV proceeding, stakeholder initiatives, investment plans, research roadmaps	VGI Working Group, haven't completed any deliverables yet	
Medium	<b>Define VGI-related products and programs</b>	Define VGI eligible utility programs Define VGI eligible wholesale market products	CAISO and utility initiatives	SDG&E VGI Rate, V2G Storage Procurement (+V1G?), ESDER/DERP Initiative	
Medium	<b>Define VGI program or product eligibility</b>	Specify definition for VGI resources participating in ISO regulation market, accounting for "Pay for Performance" Review DR market rules and define participating VGI resources Define other or additional products and programs for VGI Establish metrics for success	CAISO and utility initiatives	ESDER/DERP, IOUs qualify EVSPs independently per charging program	
High	<b>Clarify VGI-related product and program requirements</b>	Specify interconnection rules Specify telemetry and metering requirements Specify communication requirements	CPUC AFV and Rule 21 proceedings, stakeholder initiatives	Submetering Protocol, Rule 21 DER/Smart Inverters, VGI Working Group	
Medium	<b>Clarify settlement</b>	Define billing processes, incorporate lessons learned from PEV subtractive billing pilots Define enrollment processes and eligibility Define penalties and payment mechanisms	CAISO and agency initiatives	ESDER/DERP, Subtractive Billing, LCFS Credit Estimation (modifications?)	
Medium	<b>Define verification and conflict resolution protocols</b>	Review and define conflict resolution processes specific to VGI Review and define verification processes specific to VGI	Utility pilots, industry/standards activities, stakeholder initiatives	Submetering Phase 1+2, VGI Working Group	
High	<b>Define signals and messaging</b>	Define charging and discharging signals by product and program	Industry/standards activities, stakeholder initiatives, utility requirements	Industry Standards + VGI Working Group	
Medium	<b>Research, development and demonstration (RD&amp;D)</b>	Coordinate existing RD&D and ensure results are published for public consumption Identify additional research gap for further study and scale pilots as needed	Stakeholder initiatives, investment plans, research roadmaps	All applicable	

### Track 3: Support Enabling Technology Development

Current Priority	Goal	Activities Supporting Goal	Forum/Process/Proceeding	Status	Timing Considerations
Medium	<b>Develop enabling technology requirements</b>	Develop grid operator requirements Research existing standards and identify any gaps Develop additional standards & protocols by <ul style="list-style-type: none"> <li>• VGI type: V1G, V2G, V2B, B2G</li> <li>• application (distribution, wholesale, etc.)</li> </ul> Develop specifications for state procurement of VGI technologies	Ongoing research and stakeholder initiatives, CPUC AFV proceeding	VGI Working Group, Specifications for state procurement of VGI technology	
Medium	<b>Improve performance</b>	Reduce costs of enabling technologies Enhance performance of enabling technologies	Ongoing research / demonstration and industry innovation	Networks cost competitive with unintelligent charging (hardware), economy of scale production, Costs from SDG&E wholesale market	
High	<b>Identify and inform about performance</b>	Test performance of VGI enabling technologies Trial technologies, approaches and applications	Ongoing research / demonstration and technology transfer / assessments	V2G fleet accuracy in response to CAISO AGC, latency and metrology in SCE & PG&E, DR	
High	<b>Research, development and demonstration (RD&amp;D)</b>	Coordinate existing RD&D Ensure results are published for public consumption Identify additional research gap for further study Scale up RD&D as necessary	ARFVTP, EPIC (Energy Commission + utilities), DOE, international efforts	ARFVTP (V2G Base + ALT), CEC EPIC (1st IP: Smart Charging/V2G/Fleets; 2nd IP Advanced Fleet Management, Larger Demos, HDV in DACs, Heterogeneous V2G Vehicles in Microgrids, Military Fleets V1/2G; Proposed 3rd IP: Grid-Friendly Mobility (V2I/V2V), Battery Second Life), IOU EPIC, NRG Settlement (HPFC, PV/ES for DCFC), DOE and international research	