

VGI Requirements Sub Group Final Report

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Introduction

The Requirements Sub-group was tasked with extracting the requirements from each of the use cases submitted in the Use-Case Sub-group. This process started on July 20, 2017 and concluded on September 1, 2017. The group held 16 meetings, for a total of 23 hours, and reviewed all of the requirements submitted from the use cases.

Process

Once all use cases were submitted with their requirements, a master excel sheet was created and uploaded to Google drive. The team followed these steps:

1. Normalize terms to actors

3 entities			5 equipment items				
Decision & Choice Entities			Acting Equipment & Hardware				
EV Driver (EVD)	Power Flow Entity (PFE)	Utility Customer of Record (UCR)	EV Battery System (EVBS)	DC Power Converter system (DCPC)	Electric Vehicle Supply Equipment (EVSE)	Energy Meter (EM)	Building Management System (BMS)
<i>Examples of common names used in use-case descriptions:</i>							
<ul style="list-style-type: none"> • Driver • End User • Owner • Fleet transportation operator 	<ul style="list-style-type: none"> • Aggregator • Utility • EV Service Provider • Energy Service Co. • Alt. Energy Supplier • Energy Portal • Clearing House 	<ul style="list-style-type: none"> • Site Host • Ratepayer • Bill Payer • Home Owner 	<ul style="list-style-type: none"> • Electric Vehicle • EV • BEV • PHEV • PEV 	<ul style="list-style-type: none"> • Inverter • Rectifier • Bi-directional inverter 	<ul style="list-style-type: none"> • Electric Vehicle Supply Equipment • Charger • Level 2 EVSE • Level 1 EVSE 	<ul style="list-style-type: none"> • End-user meter device (EUMD) • Site meter • Sub meter 	<ul style="list-style-type: none"> • Site controller • Building site controller • Energy management system • Home Energy Management System (HEMS)

2. Create definitions for entities

- a. EV Driver - Individual or entity with authority to determine PEV charging preferences and priorities to meet transportation needs.
- b. Power Flow Entity - An offsite entity that is requesting or mandating VGI activities from other actors downstream.
- c. Utility Customer of Record - Individual or entity identified as the meter customer account holder on the utility records with the authority to determine constraints on the utilization of energy at the meter account location
- d. EV Battery System - The vehicle energy storage management and charge control system that will provide direct interface and communications to process and execute VGI functions.
- e. DC Power Converter System - The off vehicle Power Converter that controls DC energy flow to or from the EV Battery System.

- f. EV Supply Equipment - The equipment that inter-connects the AC electricity grid at a site.
 - g. Energy Meter - The energy meter is responsible for measuring the PEV charge or discharge (or site) energy.
 - h. Building Management System - A collection of sensors and controls intended to automate management of energy flow and use at a site location or facility.
3. Split use cases into categories
- a. Pricing Programs
 - b. Demand Mitigation
 - c. Demand Response
 - d. Load Control
 - e. Monitoring and Measuring
 - f. Direct Current Flow
 - g. Vehicle to Grid
 - h. Inverter control
 - i. Customer Programs
4. Category analysis
- a. Normalized all terms to actors created
 - b. Identified duplicate requirements from each use case
 - c. Consolidated duplicates and added clarity where appropriate
 - d. Separated requirements from use cases
5. Sorted Requirements into groups
- a. Functional
 - b. Non-functional
 - c. Customer
 - d. Other
 - e. Alternative
6. The group then reviewed each requirement again to check for clarity, duplicity and to confirm each one was sorted into the correct group.

Category/ Requirement ID	Functional Requirements	Direction	Should Shall Could	PFE and BMS	BMS and EVBS	BMS and DCPC	BMS and EVSE	PFE and EVBS	PFE and DCPC	PFE and EVSE	EVBS and DCPC	PFE and EV Driver	BMS and EV Driver	EVBS and EV Driver	Acknowledge (receive)	Opt-out (receive)	Notes:	
1- Rule 21																		
For Generation control, send DER Curves and Controls (Rule 21) as Events or controls with start time and duration																		
F.1.01	Low and High Voltage Ride-Through	>	Shall	✓	✓	✓	✗	✓	✓	✗	✓	✗	✗	✗	✓	✗	* is alternative to ISO up/down regulation The Shall may not apply in all circumstances (e.g. utilities)	
F.1.02	Low and High Frequency Ride-Through			✓	✓	✓	✗	✓	✓	✗	✓	✗	✗	✗	✗	✓		✗
F.1.03	Dynamic Volt-Var Operation			✓	✓	✓	✗	✓	✓	✗	✓	✗	✗	✗	✗	✓		✗
F.1.04	Ramp Rates			✓	✓	✓	✗	✓	✓	✗	✓	✗	✗	✗	✗	✓		✗
F.1.05	Fixed Power Factor			✓	✓	✓	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓		✓
F.1.06	Frequency/Watt*			✓	✓	✓	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓		✓
F.1.07	Volt/Watt			✓	✓	✓	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓		✓
F.1.08	Connect/Disconnect			✓	✓	✓	✗	✓	✓	✗	✓	✗	✗	✗	✗	✓		✗
F.1.09	Set Max Active Output*			✓	✓	✓	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓		✓
F.1.1	Set Active Power Setpoint			✓	✓	✓	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓		✓
F.1.11	Scheduling			✓	✓	✓	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓		✓
F.1.12	Dynamic Reactive Current (optional)			✓	✓	✓	✗	✓	✓	✗	✓	✗	✓	✓	✓	✓		✓
F.1.13	Site information (e.g. Line Voltage)			✓	✓	N/A	✗	✓	N/A	✗	N/A	✗	N/A	✗	✗	✓		✗
F.1.14	Permission to Discharge			✓	✓	N/A	✗	✓	N/A	✗	N/A	✗	N/A	✗	✗	✓		✗
F.1.15	Contain Dispatch Location Information			Should	✓	✓	✗	✗	✓	✗	✓	✗	✓	✓	✓	✓		✗
F.1.16	Provide Inverter Make, Model and Approval status	Shall	✓	✓	N/A	✗	✓	N/A	✗	N/A	✗	✗	✗	N/A	N/A			
F.1.17	DER Status information	Should	✓	✓	✗	✗	✓	✓	✗	✗	✓	✗	✗	N/A	N/A			
2- Pricing																		
Send Pricing or Tariff																		
F.2.01	Tiered	>	Shall	✓	✓	✗	✗	✓	✗	✗	✗	✗	✓	✓	✓	✗	N/A	
F.2.02	Toll			✓	✓	✗	✗	✓	✗	✗	✗	✗	✗	✓	✓	✓	✗	N/A
F.2.03	Critical Peak Pricing			✓	✓	✗	✗	✓	✗	✗	✗	✗	✗	✓	✓	✓	✗	N/A
F.2.04	Real Time Pricing (Hourly)			✓	✓	✗	✗	✓	✗	✗	✗	✗	✗	✓	✓	✓	✗	N/A
F.2.05	Special Tariffs (e.g. Price Interrupted)			✓	✓	✗	✗	✓	✗	✗	✗	✗	✗	✓	✓	✓	✗	N/A

Wrap-up

A function requirements matrix was developed to provide the results to the mapping group. The matrix shows the directional flow of information, the communication between actors that (shall, should or could) happen, which two actors are interacting and any notes that were needed. The requirements were grouped into seven categories for better clarity. The seven categories are miscellaneous, restart, monitoring, smart charging, load control, pricing and Rule-21.

The requirements sub-group has completed the task of extracting the requirements from the use cases. The group has handed over the actor definitions, functional requirements matrix and the rest of the requirements to the mapping group. All documents will be published at www.cpuc.ca.gov/vgi/