Requirements Sub-group

Meetings

- Tuesdays and Thursdays 7:30am to 9:00am
- WebEX
- Group participants: Lance Atkins, Jeremy Whaling, Mike Bourton, Vincent Chen, George Bellino, Jordan Smith, Dean Taylor, Ralph Troute, Mike Ferry, Stephane Voit
- Agency Staff participation: Stephanie Palmer, Justin Regnier, Noel Crisostomo, Elise Keddie

Goal:

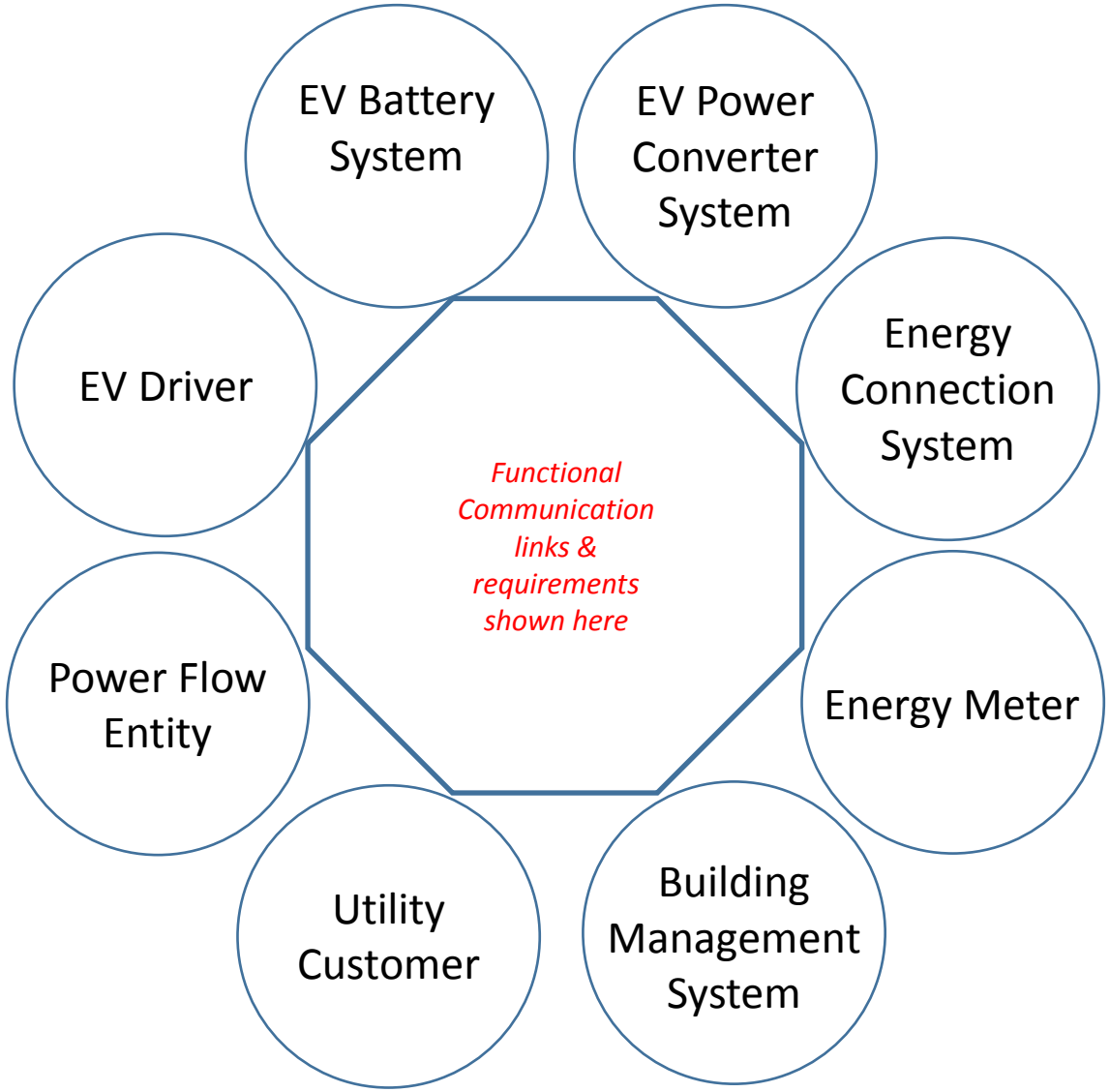
- To extract all of the functional, non-functional, customer, other and alternative requirements from the use cases submitted.
- These requirements will then be given to the mapping sub-group for the next phase of the project
- Functional requirements define specific inputs, behaviors, outputs or other functions needed to accomplish each use case. These include functions such as authentication, authorization, certification, reporting, and data collection.
- Non-Functional requirements define criteria about the use case's operation, rather than specific functions. These include attributes such as scalability, response time, reliability, data integrity, and interoperability.
- Customer requirements ensure the customer has control over accepting or rejecting VGI services. These requirements can include interaction with the EV charging equipment, a smartphone or computer app, a building management system or some other digital interface.

1. Normalize terms to actors

Power Flow Entity (PFE)	Building Management System (BMS)	EV Battery System	Energy Connection System (ECS)	EV Driver	Utility Customer of Record	Energy Meter
Clearing House	Energy Managmenet System	Electric Vehicle (EV)	Electric Vehicle Supply Equipment	Driver	Site host	End User Device (EUMD)
Aggregator	Building Site Controller	PHEV	Charger	End User	Ratepayer	Battery Energy Storage System (BESS)
Controlling Entity	Customer Energy Management System	PEV	Level 2 EVSE	Owner	Billpayer	Site Meter
Alterative Energy Supplier (AES)	Fleet Managmenent System	BEV	Charger (DC)		Home Owner	Sub Meter
Deman Clearing House	Home Energy Management System		Level 1 EVSE			
Electric Vehicle Service Provider (EVSP)	Site Controller					
Energy Portal (EP)						
Energy Sercies Communication Interface (ESCI)						
Energy Services Company (ESCO)						
Energy Service Interface (ESI)						
Independent Service Operator (ISO)						
Municipal Owned Uitilities						
OVGIP						
Publicly Owned Utilities (POU)						
Smart Energy Portal (SEP)						
Utility						

1. Normalize terms to Actors

- Intent:
  - Harmonize functional elements common to all use-cases
  - Provide a consistent set of general terms to use during discussion
  - Allow for all implementation approaches to be overlaid on the functional requirements
  - Provide a structure for the future communications standards protocol mapping sub-group to use



1. Normalize Terms to Actors

Use-case DC Flow Management

	Requirements				
Actors	**Functional Communication Requirements**	**Non-Functional Communications Requirements**	**Customer Requirements**	**Other Requirements**	**Alternatives**
EVSE,PEV	EVSE and EV exchange information to jointly manage the DC power flow between the EVSE and EV during a session. Channel can relay other useful information between EV and EVSE as needed to support EV customer.	EV receptacle and EVSE cable plug must be physically compatible for DC conductive transfer and provide interoperable communications.	(1) Customer authorizes participation in either DC Fast Charging or DC DER Mode. Could be by default for type of EVSE.	For discharging, site has DER interconnection agreement with utility for V2G-DC operation based on EVSE model number.	Communication between the EV and EVSE is required for DC transfer. Communication of either EVSE or EV with BMS or NSP are optional, but desired, and part of Use Case SAE V2G-DC

1. Normalize Terms to Actors

- Use-case DC Flow Management

	Requirements				
Actors	**Functional Communication Requirements**	**Non-Functional Communications Requirements**	**Customer Requirements**	**Other Requirements**	**Alternatives**
PCEV [EVSE], EVBS [PEV]	PCEV [EVSE] and EVBS [EV] shall exchange information to jointly manage the DC power flow between the PCEV [EVSE] and EVBS [EV] during a session. Channel could ~~can~~ relay other useful information between EVBS & EVD [EV] and ECS [EVSE] as needed to support EVD [EV customer].	EVBS [EV] receptacle and ECS [EVSE] cable plug shall ~~must~~ be physically compatible for DC conductive transfer and provide interoperable communications.	(1) EVD [Customer] shall authorize~~s~~ participation in either DC Fast Charging or DC DER Mode. Could be by default for type of ECS [EVSE].	For discharging, UCR [site] shall have ~~has~~ DER interconnection agreement with PFE [utility] for V2G-DC operation based on EVC [EVSE] model number.	Communication between the EVBS [EV] and ECS [EVSE] shall be ~~is~~ required for DC transfer. Communication of either ECS [EVSE] or EVBS [EV] with FMS [BMS] or PFE [NSP] are optional, but desired, and part of Use Case SAE V2G-DC

2. Sort Use Case

- Pricing Programs
- Demand Mitigation
- Load Control
- DC Flow
- V2G
- Inverter Control
- Customer Programs

3. Requirements

- Functional requirements

1.01	The BMS **shall** be able to send a command to the EVBS or EVC to reduce the energy in a deterministic manner
1.02	The BMS shall be able to obtain the current charging power for each vehicle
1.03	If the BMS is managing the Demand charge for the Site, the BMS shall be able to obtain the total site power level
1.04	The BMS should obtain the requirements for departure and/or desired energy amount from the EV driver
1.05	PFE [NSP] or FMS [BMS] shall sends DER commands to EVPC via the ECS [EVSE inverter] and receives status information from EVPC via the ECS [EVSE inverter] during session to perform some V2G application (such as facility demand charge management, AGC frequency regulation, or autonomous volt-VAR support). (Term normalization note: The EVSE used in this approach is a single product containing both the EVPC and the ECS. Communications between these elements is integral to the product but the EVPC and ECS components are separated here for normalization consistency.)
1.06	At connection of EVBS [EV] to EVPC [EVSE], EVPC [EVSE] shall engages EVBS [EV] in a DC DER mode. EVPC [EVSE] and EVBS [EV] shall exchange information to jointly manage the DC power flow between the EVPC [EVSE] and EVBS [EV] during a session.
1.07	EVPC [EVSE] and EVBS [EV] communication channel could ~~can~~ relay other useful information between EVBS & EVD [EV] and ECS [EVSE] as needed to support EVD [EV customer].
1.08	EVPC [EVSE] or FMS shall have input for Min & Max SOC of vehicle battery or a driving range based equivalent
1.09	EVPC [EVSE] or FMS shall have input for EVD [customer] operational mode preferences
1.1	ECS [EVSE] or FMS should have input for TOU Tariff rates / schedule
1.11	ECS [EVSE] or FMS should have input for EVD [customer] scheduling
1.12	ECS [EVSE] or FMS could have PFE [utility] communication for updating TOU pricing & schedule
1.13	ECS [EVSE] or FMS should have PFE [NSP] communication for updating TOU pricing & schedule

3. Requirements

- Functional Requirements

1.14	ECS [EVSE] or FMS shall have PFE [NSP] control communication to perform aggregation
1.15	For AC V2G the: 1) EVPC shall first obtain the site specific information for the correct operation of the on board inverter before discharging e.g. Line Voltage. 2) EVPC shall second communicate the make,model and approval status of the inverter to the PFE or via BMS 3) EVPC shall finally obtain permission and continue to obtain from BMS or PFE when discharging Energy 4) PFE or BMS shall send DER commands to EVBS and the EVPC and receives status information from EVPC
1.16	For DC V2G the: 1) PFE or BMS could send DER commands to EVBS and the EVPC and receives status information from EVPC
1.17	A)The PFE or BMS shall send to the EVBS and EVPC the following DER controls or regulation curves: I. Anti-Islanding Protection II. Low and High Voltage Ride-Through III. Low and High Frequency Ride-Through IV. Dynamic Volt-Var Operation V. Ramp Rates VI. Fixed Power Factor VII. Frequency/Watt VIII. Volt/Watt IX. Monitoring X. Connect/Disconnect XI. Set Max Active Output XII. Set Active Power Setpoint XIII. Scheduling XIV. Dynamic Reactive Current (optional) B) The EVBS or EVPC shall send to the PFE or BMS the following DER controls or regulation curves. I. Operational State II. Percentage of rated Capacity III. Operational Mode IV. The EVBS or EVPC shall send status information including power attributes to the BMS or PFE
1.18	PFE [NSP] or FMS [BMS] shall sends DER commands to EVPC via the ECS [EVSE inverter] and receives status information from EVPC via the ECS [EVSE inverter] during session to perform some V2G application (such as facility demand charge management, AGC frequency regulation, or autonomous volt-VAR support). (Term normalization note: The EVSE used in this approach is a single product containing both the EVPC and the ECS. Communications between these elements is integral to the product but the EVPC and ECS components are separated here for normalization consistency.)

3. Requirements

- Functional Requirements

1.19	At connection of EVBS [EV] to EVPC [EVSE], EVPC [EVSE] shall engages EVBS [EV] in a DC DER mode. EVPC [EVSE] and EVBS [EV] shall exchange information to jointly manage the DC power flow between the EVPC [EVSE] and EVBS [EV] during a session.
1.2	EVPC [EVSE] and EVBS [EV] communication channel could ~~can~~ relay other useful information between EVBS & EVD [EV] and ECS [EVSE] as needed to support EVD [EV customer].
1.21	EVPC [EVSE] or FMS shall have input for Min & Max SOC of vehicle battery or a driving range based equivalent
1.22	EVPC [EVSE] or FMS shall have input for EVD [customer] operational mode preferences
1.23	ECS [EVSE] or FMS should have input for TOU Tariff rates / schedule
1.24	ECS [EVSE] or FMS should have input for EVD [customer] scheduling
1.25	ECS [EVSE] or FMS could have PFE [utility] communication for updating TOU pricing & schedule
1.26	ECS [EVSE] or FMS should have PFE [NSP] communication for updating TOU pricing & schedule
1.27	ECS [EVSE] or FMS shall have PFE [NSP] control communication to perform aggregation
1.28	EVBS is connected to ECS and shall request from PFE or BMS the TOU, Tiered or EV Rate Tariff Scedule applied to the Customer of Record for the location of the ECS. Could be standard Pricing Rate Schedules (Price per hour, Price Non-Interrupted Charge, Price Interrupted Charge) determined by the BMS for its responsible ECS operation. EVBS shall request from the PFE or BMS up to a month worth of pricing data, if available.
1.29	PFE or BMS shall provide the TOU or EV Rate Tariff Schedule, or other Pricing Rate Schedule to the EVBS.
1.3	EV Driver shall set EVBS charging schedule preferences based on the PFE or BMS provided Pricing Rate Tariff Schedule, SOC required, and the time charge is needed.
1.31	PFE shall determine and provide the Dynamic Pricing Event parameters (locational parameters, date/day, time, duration, price). Three types of Dynamic Pricing are: - Real Time Price (RTP) hourly basis due to emergency conditions, - Variable Peak Pricing (VPP) Periods and pricing determined in advance. - Critical Peak Pricing (CPP) Increased prices for specific time periods due to wholesale energy prices or system emergency

3. Requirements

- Non-Functional Requirements

2.01	The communications between the BMS and the EVBS or EVC (as applicable) should be secure
2.02	BMS and EVBS or EVC could negotiate power levels based upon pricing curve (such as paying more for a higher power or earlier departure time).
2.03	The PFE,BMS, or EVCS shall provide site information to the EVBS and EVPC 2) The Communications shall be cybersecure and encrypted end to end.
2.04	The EVBS and EVPC shall exchange information to jointly manage the DC power flow during a session.
2.05	In the event of communication failure of any kind with the PFE or BMS, the EV shall default to a known default state and not the last state. The state shall be defined, for maximum safe operation for any grid condition.
2.06	UCR [EVSE Owner] shall enter a services agreement with PFE [DER operator] (which could be a V2G operator) for energy storage system type DER.
2.07	EVD [EV owner] shall authorize participation by EVBS [EV] with site ECS [EVSE] in a DER (V2G) service for session.
2.08	EVBS [EV] receptacle and ECS [EVSE] cable plug shall ~~must~~ be physically compatible for DC conductive transfer and provide interoperable communications.
2.09	ECS [EVSE] could have status and feedback information to EVD [user]
2.1	ECS [EVSE] should have status and feedback information to UCR [user]
2.11	Shall have security for customer data privacy and protection from external attacks.
2.12	Required permissions to access and share Utiity Rate Tariffs by the Customer of Record shall be obtained

3. Requirements

- Customer Requirements

3.01	EV Driver should have capability to set or change EVBS charge preferences remotely through the BMS - PFE communications pathway while EVBS plugged in at residence including TOU charge schedule settings or other time variables for start of charging or Charge at Departure or Miles Required according to customer needs.
3.02	EV driver should receive notifications/alerts about charging status based on PFE or BMS scheduled parameters from the EV Battery System
3.03	Customer should have capability to opt in/out of load management directive from the PFE or BMS based on energy or mileage reuq
3.04	EV Battery System should be able to make the opt in/out determination based on energy or miles required at departure time, power requriements, and other EV driver charge settings in response to a request from the PFE or BMS program.
3.05	PFE shall have capability to override customer opt out based on BMS priorities for optimized cost performance
3.06	Customer Should be able to opt in or out of event (system)
3.07	Should be able convey energy requirements
3.08	Utility customer and EV Driver could sign up for load control programs
3.09	The DER Controls and Regulation could be opted out by the EV driver directly or indirectly (EVBS or EVPC)
3.1	UCR [EVSE (site) owner] shall authorizes engagement in a specific DER/V2G application with FMS [BMS] (or PFE [NSP]) for defined interval.
3.11	EVD [EV owner] shall authorizes participation with site ECS [EVSE] in a DER/V2G Application during session.
3.12	EVD [EV owner] shall/should/could? defines the "Target SOC" and "Time Charge Needed" to support cooperative engagement with FMS/PFE [BMS/NSP].
3.13	EV Driver [Customer] shall authorizes participation in either DC Fast Charging or DC DER Mode. Could be by default for type of ECS [EVSE].
3.14	EVD [Customer] shall be able to set battery SOC limits or driving range at the EVPC
3.15	UCR [Customer] shall be able to set the operation mode and schedule of ECS [device]
3.16	EVD [Customer] shall be able to override ECS [system] settings or turn on/off device
3.17	EVD [Customer] shall be able to set battery SOC limits or driving range
3.18	UCR [Customer] shall be able to set operation mode and schedule preferences
3.19	EVD [Customer] shall be able to override system settings or turn on/off device
3.2	EV Driver shall have ability to review pricing rates through EVBS or Smart Phone APP or other.

3. Requirements

- Other Requirements

4.01	BMS could exchange data such as pricing or desired power level with the PFE regardless of how implemented onsite
4.02	The EVBS,EVPC and BMS ssystem shall be capable of islanding from the PFE
4.03	The EVPC shall be programmed with the site specific settings and be approved by permit
4.04	The EVPC shall return to the Inverter pre-programmed default state
4.05	CPUC shall update Rule 21 to define any unique requirements and an interconnection approval process which should apply to an ECS [EVSE] with an EVPC [inverter] engaging as a energy storage type of DER (V2G-DC).
4.06	Direct communication between EVBS [EV] and EVPC [EVSE] is required as described by Use Case DC Flow Management. The EVPC [EVSE] engages the DC DER Mode.
4.07	For discharging, UCR [site] shall have ~~has~~ DER interconnection agreement with PFE [utility] for V2G-DC operation based on EVC [EVSE] model number.
4.08	EVPC [EV] shall implement pre-programmed default Autonomous Inverter Functions that support the Grid in response to electricity line conditions as per SIWG Phase 1 if communication is not available . Bi-directional EVPCs [Evs] must be equiped with this capability. a) Anti-Islanding Protection b) Low & High Voltage ride-through c) Low & High Frequency ride-through d) Dynamic Volt-Var Operation (main point of this use-case) e) Ramp Rate requirements f) Fixed Power Factor g) Soft Start Reconnection See CPUC Decision: http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M143/K827/143827879.PDF See SIWG Recommendations: http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=3189
4.09	UCR [EVSE Owner] applies to PFE [Utility] for interconnection of ECS [EVSE inverter] based on model number of ECS [EVSE] in accorance with Rule 21 requirements. (Term normalization note: the Rule 21 reference identifies the ECS as a DC EVSE which combines a ECS and EVPC.) PFE [Utility] approves interconnection. (Term normalization note: Utility may be separate from the PFE, but in that case the approval of device connection is separate from the functional activity during VGI activity.)
4.10	ECS [EVSE] could be manually engaged to discharge or operate in an islanded home as backup generator (V2H-DC) which could eliminate need for communication between ECS [EVSE] and FMS/PFE [BMS/NSP]

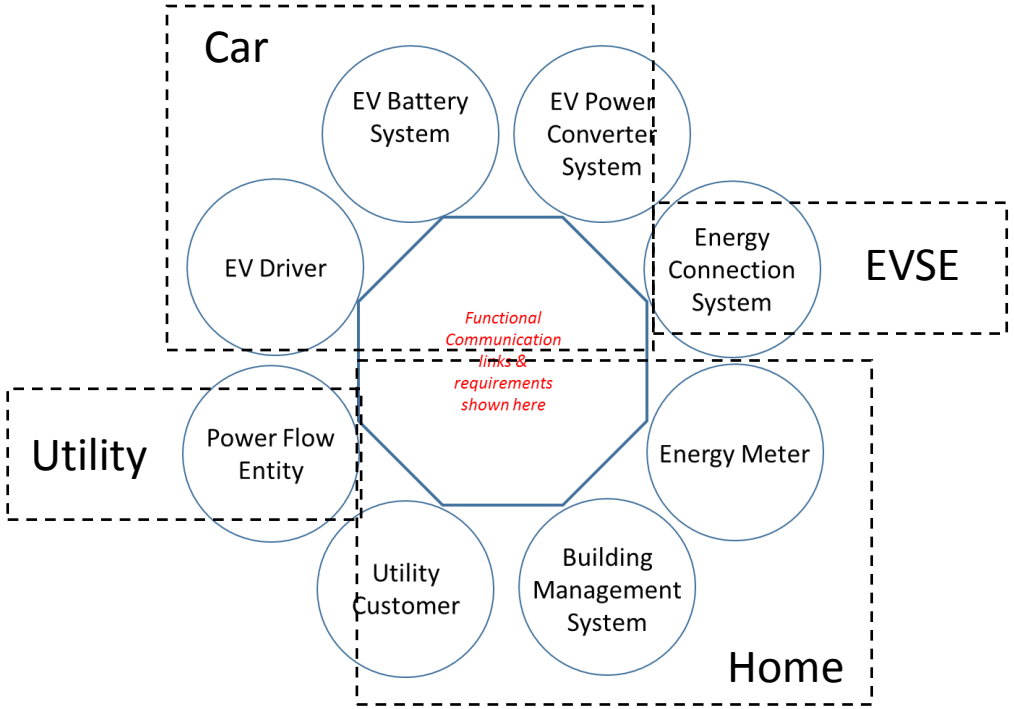
3. Requirements

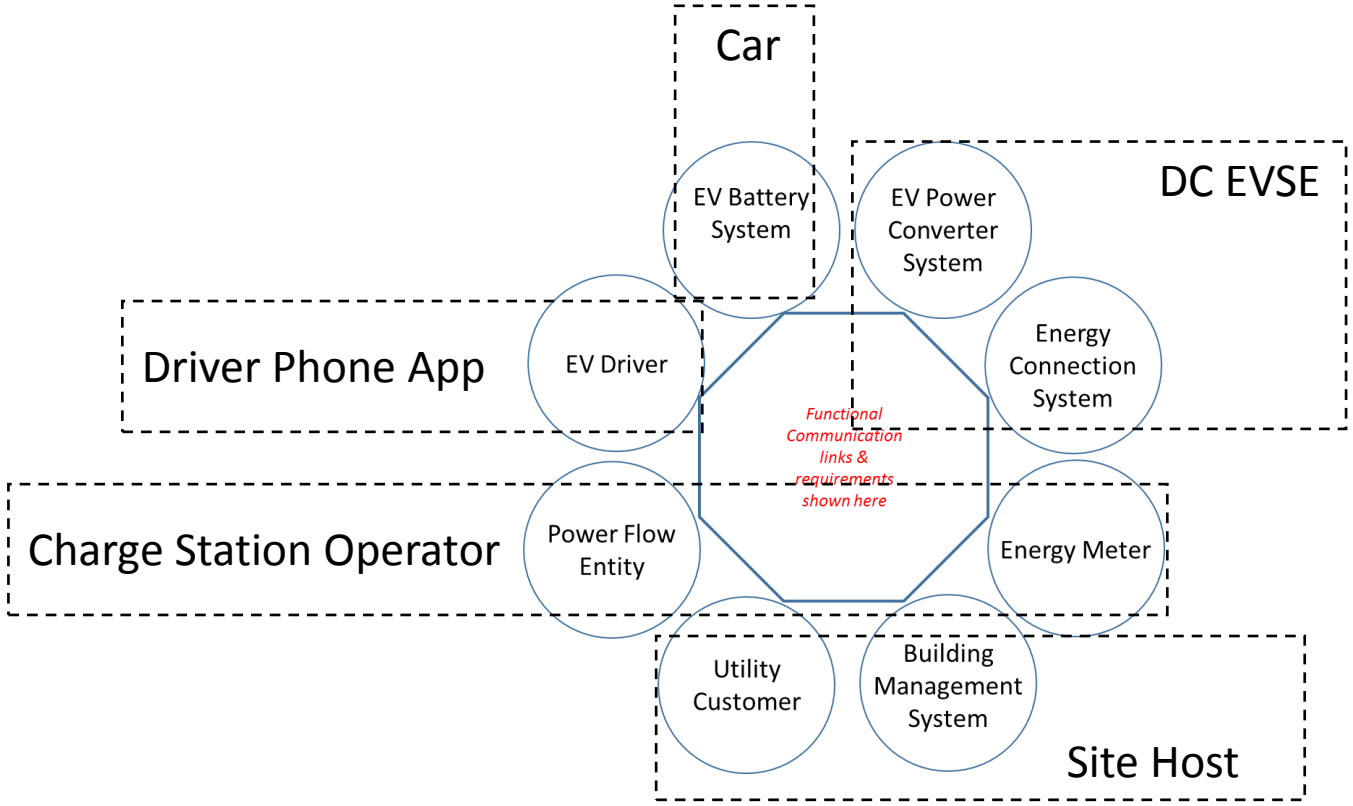
- Alternative Requirements

5.01	For non-communication PEV, BMS could manage the PEV load by using the EVSE J1772 Control
5.02	PFE energy meter could disconnect ECS in some instances to reduce power, typically in an emergency setting

Specific Implementation Overlay Examples

- The implementation specific products or business entity approaches can be identified by combining elements from the functional requirements skeleton.
- Your individual implementations of interest should be able to be overlaid





Next Steps

- Review final groups of use cases
- Make sure no requirements are duplicated