	SURFACE VEHICLE INFORMATION REPORT	SAE	J2836/6™ MAY2013
		Issued	2013-05
	Use Cases for Wireless Charging Communication for Plug-in Electric Vehicles		

RATIONALE

The use cases described here identify the equipment (system elements) and interactions to support wireless energy transfer for plug-in vehicles, as further described in SAE J2847/6. Key system elements include the vehicle's rechargeable energy storage system (RESS), power conversion equipment (on-board and off-board), utility meter, optional advisory sub-meter (EUMD), load management system (LMS), and equipment for control, monitoring, and communication. System elements may be optionally packaged in various ways (either separately or in combination) to deliver implementations tailored to a given environment, such as a residential, public or commercial charging location. Implementations may also vary in relation to the vehicle itself. The charging control technology resides on the vehicle and premises.

Use cases are technology-neutral, leaving implementers free to choose technological solutions appropriate to specific scenarios. For example, depending upon the situation, communication may occur via local wireless (ZigBee, Wi-Fi, etc.), vehicle telematics, long-range wireless (GSM, CDMA, WiMax, etc.), Internet protocols, or a combination of these methods.

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TO PLACE A DOCUMENT ORDER:	Tel: 877-606-7323 (inside USA and Canada) Tel: +1 724-776-4970 (outside USA) Fax: 724-776-0790 Email: CustomerService@sae.org	**SAE values your input. To provide feedback on this Technical Report, please visit** http://www.sae.org/technical/standards/J2836/6_201305
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1. SCOPE

This SAE Information Report SAE J2836/6™ establishes use cases for communication between plug-in electric vehicles and the EVSE, for wireless energy transfer as specified in SAE J2954. It addresses the requirements for communications between the on-board charging system and the Wireless EV Supply Equipment (WEVSE) in support of detection of the WEVSE, the charging process, and monitoring of the charging process.

Since the communication to the charging infrastructure and the power grid for smart charging will also be communicated by the WEVSE to the EV over the wireless interface, these requirements are also covered. However, the processes and procedures are expected to be identical to those specified for V2G communications specified in SAE J2836/1.

Where relevant, the specification notes interactions that may be required between the vehicle and vehicle operator, but does not formally specify them. Similarly communications between the on-board charging sub-system and the on-board vehicle electronics is not formally specified in this document.

This is the 1st version of this document and completes step 1 effort that captures the initial objectives of the SAE task force. The intent of step 1 was to record as much information on "what we think works" and publish. The effort continues however, to step 2 that allows public review for additional comments and viewpoints, while the task force also continues additional testing and early implementation. Results of step 2 effort will then be incorporated into updates of this document and lead to a republished version.

1.1   Purpose

The purpose of SAE J2836/6™ is to specify the use cases and communications requirements that will allow access and control to wireless EV charging systems that comply with SAE J2954, independent of the precise technology used in implementing the wireless charging system.

SAE J2847/6 specifies the functional messaging required to support the use-cases and required in this document.

SAE J2931/6 specifies and profiles the protocols that will be used to communicate the messages between the EV and WEVSE.

2. REFERENCES

2.1   Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise specified, the latest issue of SAE publications shall apply.

2.1.1   SAE PUBLICATIONS

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J2735   Dedicated Short Range Communications (DSRC) Message Set Dictionary

SAE J2836/1™   Use Cases for Communication between Plug-in Vehicles and Utility Grid (Surface Vehicle Information Report).

SAE J2836/2™   Use Cases for Communication between Plug-in Vehicles and Off-Board DC Charger (Surface Vehicle Information Report).

SAE J2847/1   Communication between Plug-in Vehicles and the Utility Grid (Surface Vehicle Recommended Practice).

SAE J2847/2   Communication between Plug-in Vehicles and Off-Board DC Charger (Surface Vehicle Recommended Practice).

SAE J2931/1   Digital Communications for Plug-in Electric Vehicles

SAE J2954   Wireless charging for Plug-In Electric Vehicles (Surface Vehicle Recommended Practice).

2.2   Related Publications (Optional)

The following publications are provided for information purposes only and are not a required part of this document:

SAE J1772™   SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler

2.3   ISO/IEC Publications

ISO/IEC 151181-1   Vehicle to grid communication interface (Part 1: General information and use-case definition)

IEC61000   Electromagnetic compatibility (EMC)

61000-3-2   Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤16 A per phase)

IEC 61980-1   Electric vehicle inductive charging systems

3.   DEFINITIONS

3.1   AVAILABLE LINE CURRENT (ALC)

Available Line Current indicates to the vehicle the maximum current draw for this WEVSE. The purpose of this is for the vehicle not to request more current than this and to not trip the premises circuit breaker.

3.2   ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE)

PEV connects to the grid using an Electric Vehicle Supply Equipment (EVSE). Electric Vehicle Supply Equipment (EVSE) is the physical electrical cord and connectors that are specified by applicable SAE standards (e.g., SAE J1772™, J2836™ J2847, J2931 and J2954.) that provide transfer of electrical energy from the energy portal to the PEV.

3.3   ENERGY TRANSFER

Energy Transfer is the process of flowing energy to the EV from the EVSE.

3.4   FORWARD POWER FLOW (FPF)

Forward Power Flow means the direction of energy for Charging a Vehicle is from the source to the vehicle

3.5   HOME AREA NETWORK (HAN)

A HAN is an energy related network, contained within a premises used for communicating with devices within the premises. HANs do not necessarily require connectivity outside the premises, but may be connected to one or more external communication networks (e.g., Utility AMI, internet, cell phone network, etc.) using gateways, bridges and interfaces.

3.6   INTEROPERABILITY

The condition where components of a system, relative to each other, are able to work together to perform the intended operation of the total system. Information interoperability is the capability of two or more networks, systems, devices, applications, or components to share and readily use information securely and effectively with little or no inconvenience for the user.

3.7   OFF-BOARD/ON-BOARD BOUNDARY

Off-Board/On-Board Boundary is the point where the Energy Transfer System is divided into two physical parts. One part becomes realized within the off-board Electric Vehicle Supply Equipment (EVSE). The other part becomes realized within an Electric Vehicle. This boundary will be in different places, depending on the system architecture.

3.8   POWER FLOW

See Forward Power Flow (FPF), Reverse Power Flow (RPF), Grid to Vehicle (G2V), Vehicle to Home (V2H) and Vehicle to Grid (V2G) for further definitions.

3.9   REVERSE POWER FLOW (RPF)

Reverse Power Flow means the direction of energy for Discharging a Vehicle is from the vehicle to the load.

3.10   PLUG-IN VEHICLE

The term Plug-In Vehicle, when used in this specification, refers to a vehicle that can be recharged from an EVSE; though charged wirelessly and not using physical plug and socket the term has been retained to minimize terminology.

3.11   SMART CHARGING

Smart Charging describes a system in which the EVSE and/or PEVs communicate with the power grid in an effort to optimize vehicle charging or discharging rate with grid capacity and time of use cost rates.

3.12   UTILITY

Utility provides electrical energy and typically refers to a collection of systems that include the Customer Information System (CIS), the Advanced Metering Infrastructure (AMI), Rates and Revenue. The utility makes energy available to PEV through the pricing tables or discrete events. The utility also supplies information such as tariff rate, interval for metered kWhr consumption, and validation of PEV program for PEV ID, etc.

4.   TECHNICAL REQUIREMENTS

4.1   Architecture

4.1.1   Functional Architecture

(This text will be aligned to reflect the base text in J2954 and is included in this document to help in understanding of the communications use cases.)

The following figure illustrates the major functional components of a wireless charging system.
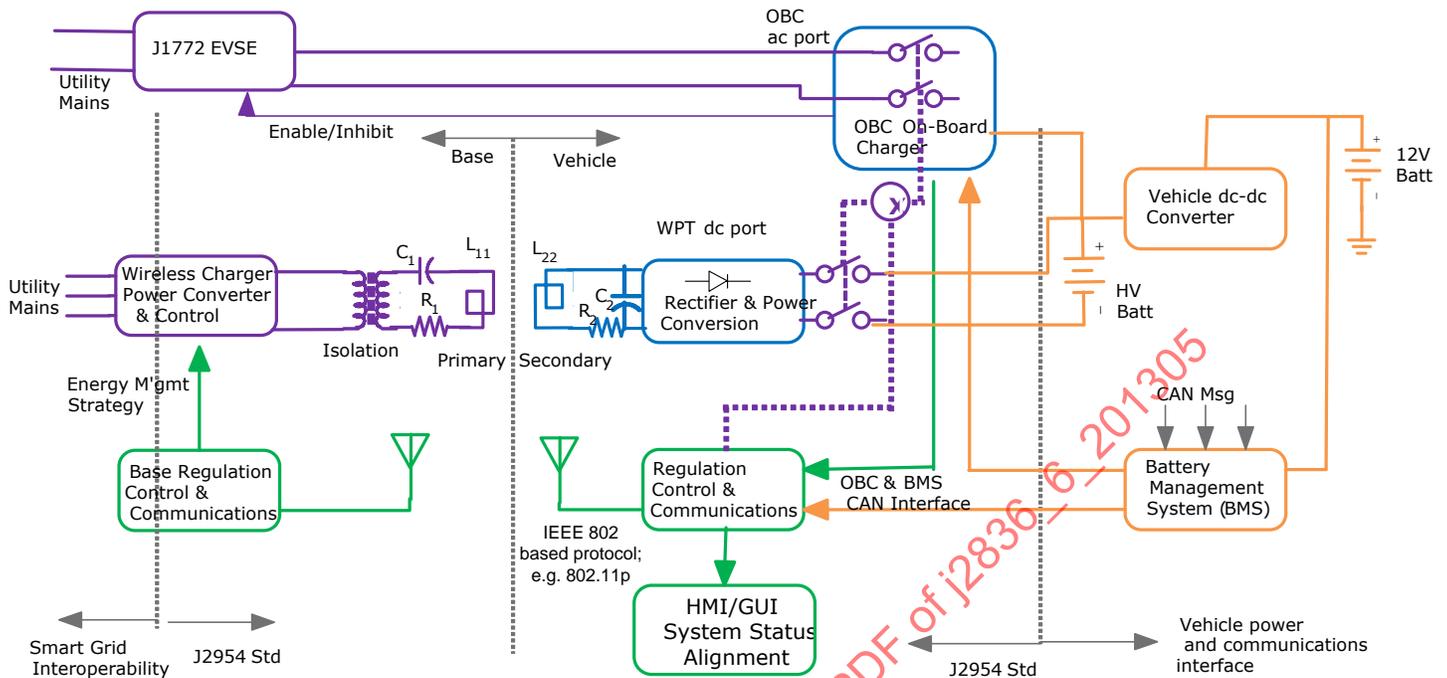

FIGURE 1 - FUNCTIONAL ARCHITECTURE OF A WIRELESS EV CHARGING SYSTEM

4.1.1.1   Physical partitions of the wireless charging system

Wireless charging technology for stationary vehicles consists of three major partitions: (1) the base station grid-connected converter with its attendant transmit coil for power coupling and IEEE 802 wireless type communications (e.g., 802.11p DSRC) to facilitate power regulation; (2) the vehicle mounted receiver or capture coil with rectification, filtering components and IEEE 802 wireless type communications to initiate power transfer and feedback of control messages; (3) The secondary energy storage system, battery management system components, and associated modules necessary for in-vehicle communications (CAN, LIN) and message sets for battery SOC, charge rate and other necessary information.

4.1.1.2   Main functional elements of the wireless charging system

Proceeding from left to right in the figure above, the grid connected converter will be situated in place of or nearby existing EVSE equipment in a residential or public parking space. The function of this converter will be to process utility supplied and metered electricity to high frequency current suitable for a magnetic resonance coupling. The converter power rating will be commensurate with the Level 1 or Level 2 charging needs of the vehicle under charge. This converter will also feature active front end power electronics to control the power factor to acceptable levels as specified in IEC61000 and power quality harmonic injection levels as specified by IEC 61000-3-2. The converter is matched to one (or more) primary charging pads (coils) located on, or embedded into, the residential garage floor or public parking space. The IEEE 802 wireless type communications system communicates vehicle information to the grid connected power converter for the purpose of regulating the level of transmitted power and to communicate enable and inhibit signals depending on vehicle energy storage system status. The vehicle system functional elements consists of a capture coil, also operating under magnetic resonance with the transmit coil, and adhering to the interoperability requirements of this standard, rectifier and filtering electronics to process the transmitted energy, and the interface to the vehicle energy storage system through either a dedicated wireless charger unit or via the existing secondary SAE J1772 charger. Commercially available secondary-chargers (OBC) may be modified to accommodate wireless charging via an additional dc input port. Typical specifications for OBC dc input port are typically in the range of $450V_{dc}$ in order to support various manufacturers' products capable of $220V_{dc}$ to $420V_{dc}$ charging. A communications module communicates message sets necessary for proper power level, timing and status to the grid converter. The secondary rectifier and filter electronics may themselves be proprietary designs suited to particular battery technology or manufacturer performance preferences.

4.1.1.3   Regulation requirements of the wireless charging system

During charging in a residential or public parking space, the vehicle secondary electronics detects the proximity of the primary charging pad and alerts the driver of positioning requirements to insure adequate alignment. Parking aides or visual feedback can also be used to insure proper alignment with the primary pad. Similar electronics, along with the communications module, can be used to alert the driver of obstacles that may interfere with proper power transfer or the presence of a biologic in the active zone.   Once the vehicle mounted capture coil is properly positioned the communications system will perform handshaking with the grid-side converter and will activate and commence power transfer according to the vehicle energy storage system capability to absorb it. Energy storage pack regulation is monitored by its secondary battery management system in coordination with an energy management strategy and this information is relayed to the grid side converter for power level set point for proper charging. Some regulation of the battery pack may be performed secondary by the dedicated charger, but minimization of additional circuitry is recommended. Vehicle energy storage regulation can also be performed cooperatively between the grid-side converter and the secondary charge regulator via the feedback messages provided to the communications module for communications to the grid converter.

4.1.1.4   Coexistence of conductive and wireless charging system on the same vehicle

It is envisioned that EVs will support both conductive charging and wireless charging; the interaction between these two systems and the control signals and internal communications is left to implementation and is not constrained by this specification.

4.1.2   Communications Architecture

The communications architecture as a whole addresses communications encompassing the vehicle to charger, vehicle to grid, charger to grid and vehicle to user requirements. As described in the Scope, this document focuses on the interactions between the EV and the WEVSE (Interface A in Fig. 2). However, to the extent that parameters are need on a more global basis they are included in this series of specifications.

4.1.2.1   Communications Interfaces

Figure 2 shows the various communications interfaces that may be involved in EV communications for the purposes of wireless charging.
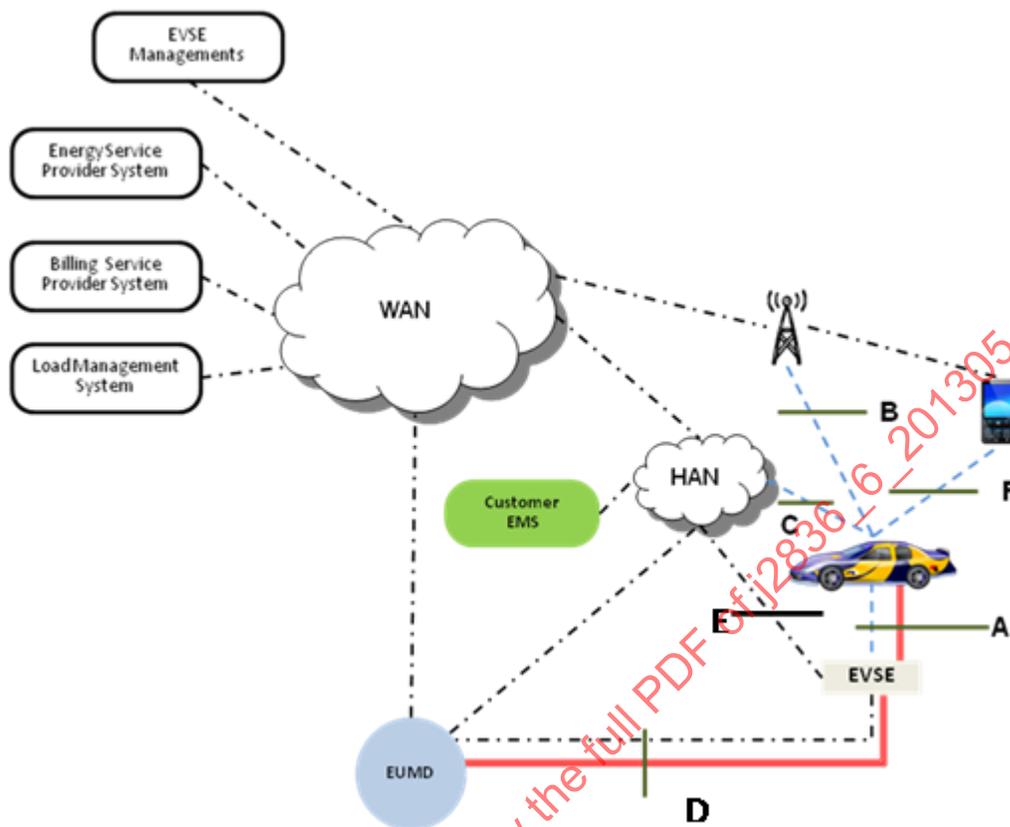
FIGURE 2 - COMMUNICATIONS INTERFACES

The interface addressed in this specification is interface A.

4.2   Overview of Wireless Charging Process

The wireless charging process differs in a number of aspects from the conductive process. In conductive charging the EVSE pylon is visible and the operator objective is to position and park the car park close enough to the EVSE that the vehicle power inlet is within reach of the plug at the end of the cable. The EVSE remains visible while the operator is positioning the vehicle. For the case of wireless charging the vehicle must be positioned with greater precision with respect to the primary pad. In public areas, the precise charging pad location may generally not be visible and will certainly not be visible as the vehicle positions itself over the pad. This difference dictates that the vehicle and operator rely on communications to achieve alignment between the primary and secondary pads.

The following clauses describe the overall wireless charging process.

4.2.1   Wireless Charging Spot Discovery

In its quiescent initialized state, the WEVSE does not transmit any power but the communications sub-system transmits a beacon signal that can be detected by the approaching vehicle. Detection of the beacon signal can be used by the vehicle to notify the vehicle operator that an available wireless charge point is nearby.

4.2.2   Service Discovery (Optional)

After having discovered the existence of the wireless charge spot the vehicle/operator may open a communications channel to request that the charge point provide additional information about its service capabilities; e.g. available maximum power output, average available output per hour, current rate plans, etc.

4.2.3   Vehicle Alignment Procedure

If the user decides to charge the vehicle at this charging spot, the user sends a message requesting that the charging spot turn its Vehicle Alignment Subsystem (VAS). Presently two methods are defined for the VAS

• RFID complemented with magnetic field detection

In response to the message the WEVSE shall turn on its RFID readers and provide triangulation information to the EV to facilitate the display of positioning information. The WEVSE shall also turn on a "sense current" in the primary coil (approximately 10% of its normal output) to allow the vehicle to sense the position of optimal coupling between the primary and secondary pads.

• Magnetic field detection

The WEVSE shall also turn on a "sense current" in the primary coil (approximately 10% of its normal output) to allow the vehicle to sense the position of optimal coupling between the primary and secondary pads.

NOTE: This mode would be compatible with a WEVSE that also provides RFID support if the absence of RFID response is not treated as an error.

Once the vehicle/operator has determined that the vehicle has reached its final position the EV shall indicate that positioning is completed.

The VAS is shut down and the system is ready to enter the Power Transfer state. Prior to that the user may negotiate the final charging parameters, e.g., maximum rate, maximum charge time, etc.

NOTE 2: If the two options are retained it is recommended that the WEVSE support both RFID and Magnetic field procedures. The vehicle has an option to follow either procedure.

4.2.4   Power Transfer Procedure

4.2.4.1   Power Transfer Initiation

After negotiating the charging options the EV issues the power transfer message specifying the initial power transfer parameters. The EV will ramp up the transfer current and also regulate the output to the car batteries. Note that though the EV is issuing commands to the WEVSE, the WEVSE remains in control of the power supply.

4.2.4.2   Power Transfer Monitoring and Regulation

During the power transfer process the WEVSE and EV charger monitor the process in order to:

a) Assure the charging process performs in accordance with the desired parameters

b) Operates within the defined regulatory and environmental parameters

The EV will request changes in the power flow from the WEVSE in order to maintain optimal performance and that the needs of the BMS are satisfied.

The EV and WEVSE will also monitor the air gap for live organic objects and thermal events. If any of the events specified in A.5 occurs the system may interrupt the charging process, as described in A.5.

4.2.4.3   Power Transfer Termination

Power transfer may be terminated normally or under a fault condition.

Fault termination occurs on detection of one of the defined fault conditions in section A.5

Normal termination may occur when the desired negotiated charge conditions have been met or initiated by the vehicle operator.
Upon termination of the power transfer current is turned off and the communications channel will be used to provide final detailed usage information for the current charging session. (Note: in case of termination due to a fault it may not always be possible to provide the full detailed information).

5.   DOCUMENT MAPPING

5.1   Summary

SAE has published multiple documents relating to PEVs and vehicle-to-grid interfaces. The various document series are listed below, with a brief explanation of each.

SAE J2954 – Defines the wireless charging interface PEVs and EVSEs.

SAE J2836™ – General Requirements and Use Cases. This document is divided into several sections. J2836/1™ is for Utility/Smart Grid messaging, J2836/2™ is for DC Charge Control, J2836/3™ is for Reverse Energy Flow. J2836/4™ is for Diagnostics. J2836/5™ is for Consumer Requirements and the HAN.

SAE J2847 – Functional Messaging Requirements. This document defines the functional messages required for a given function. This document is divided into several sections that correspond to J2836 above. J2847/1 is for Utility/Smart Grid messaging, J2847/2 is for DC Charge Control, J2847/3 is for Reverse Energy Flow. J2847/4 is for Diagnostics. J2847/5 is for Consumer Requirements.

SAE J2931 – Digital Communications for PEVs. This series of documents defines the requirements to enable digital communications for PEVs. It is divided into several sections. J2931/6 describes overall requirements.

Figure 3 shows the sequencing of these documents and their primary function (e.g., the /1 documents start with Utility information, /2 then adds DC charging, etc.). The intent is to have subsequent slash sheets complement each other as more functions and features are included. The /6 series of documents add wireless charging items not already included in the proceeding documents. These are all then included in Interoperability in J2953 and security in J2931/7.
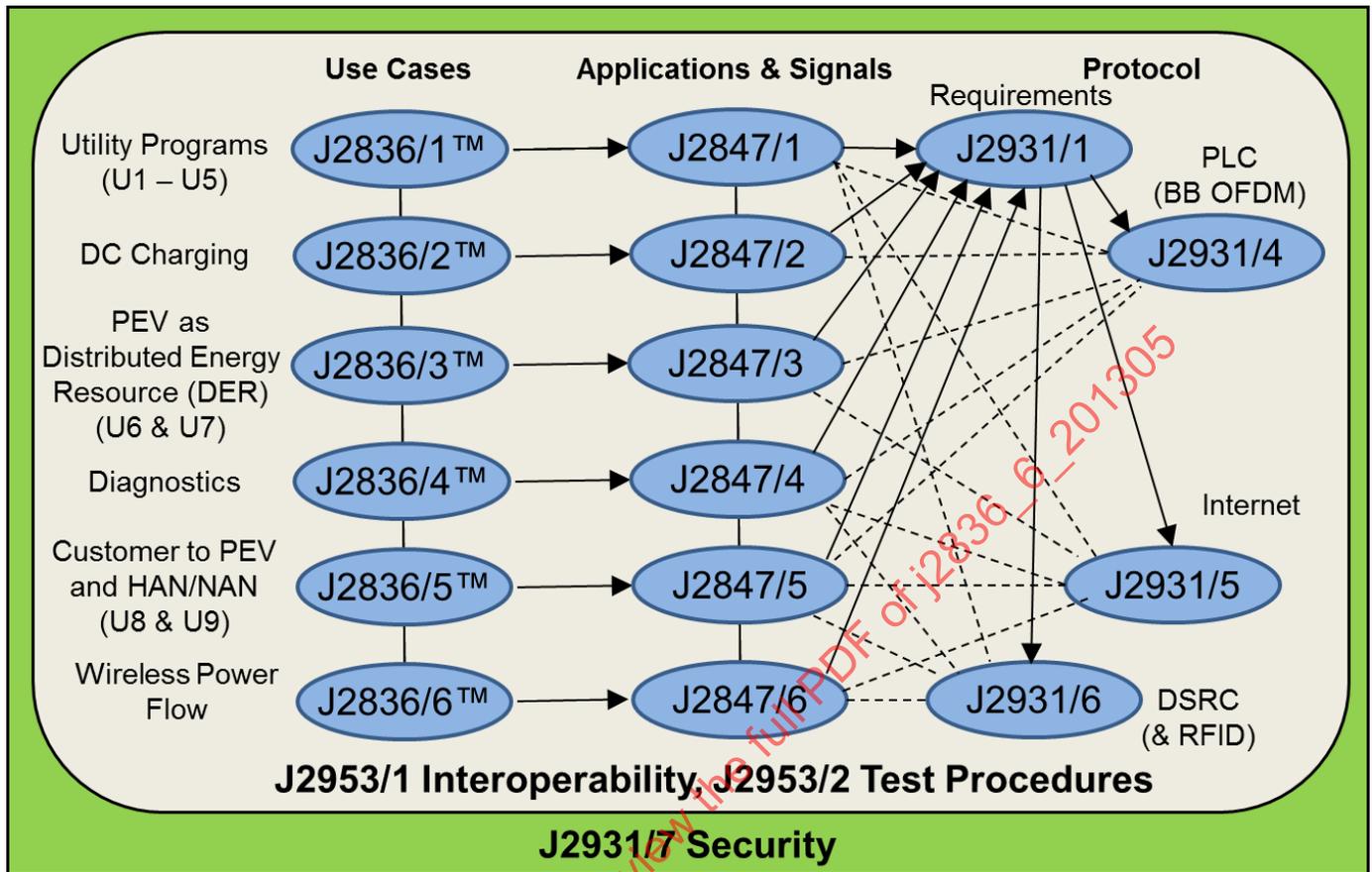
FIGURE 3 - DOCUMENT INTERACTION

APPENDIX A – WEVC USE CASES

This appendix describes the use cases unique to wireless charging of electric vehicles

A.1   USAGE SCENARIOS

A.1.1   Wireless Home Charging

This profile describes the situation of basic charging at home, where no identification, metering and payment is necessary.

Editor's Note: This may not be desirable as some "home chargers" may be in driveways or locations where non-authorized parties may have access. Also there may be separate meters for EV charging to allow for different charge plans. It would appear to be desirable to support the communications functions for this as an option, otherwise the user will be forced to program smart charging programs from an external device.

A.1.2   Wireless Public Charging with Payment

This profile describes the situation when charging at a public site. Payment may be done for received power. Vehicle identification an authorization is necessary.
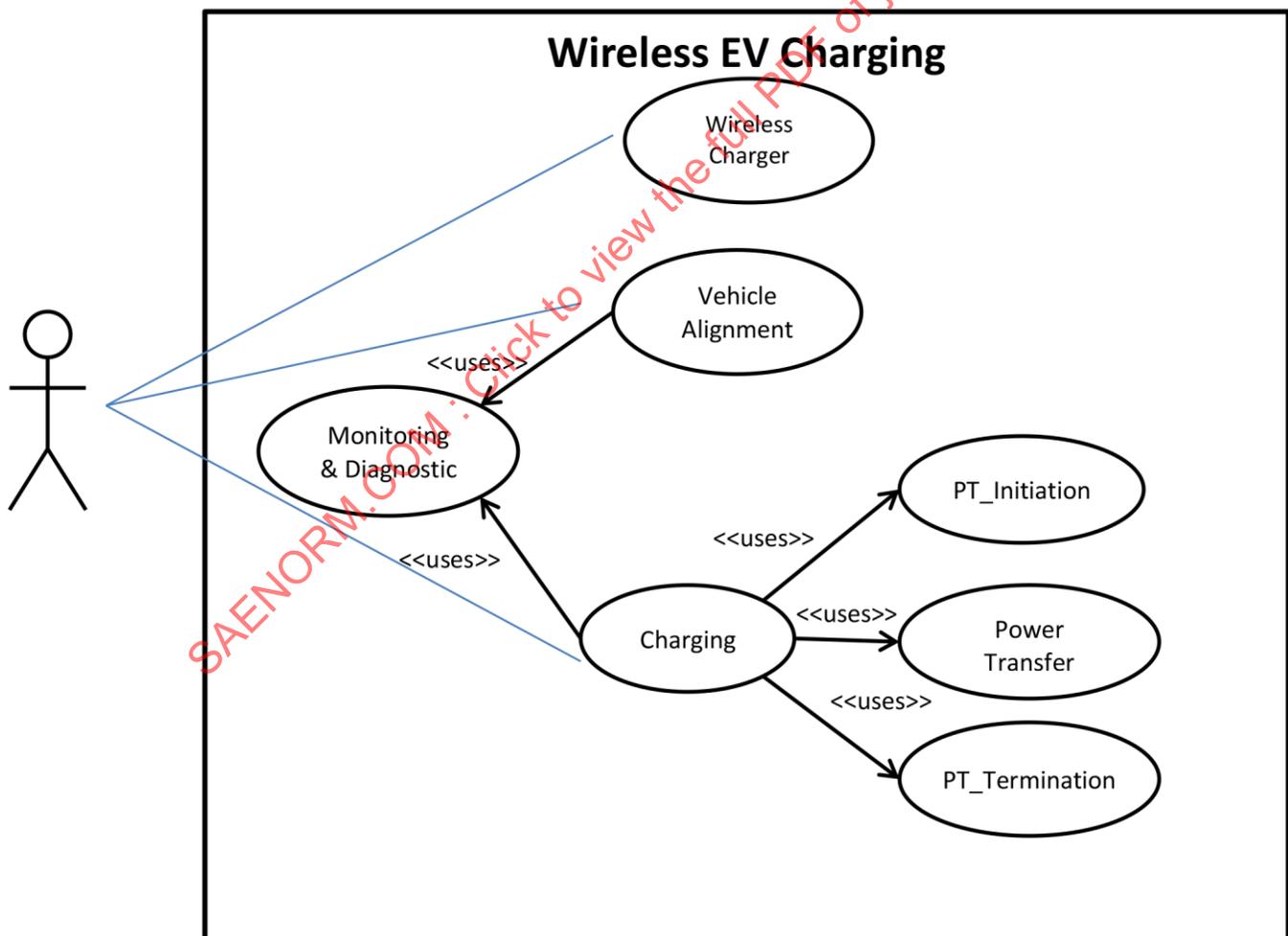

FIGURE A1 - USE CASES FOR WIRELESS CHARGING – EV-TO-WEVSE COMMUNICATIONS

A.2 WIRELESS CHARGER (EVSE) DISCOVERY

TABLE A1 - EVSE DISCOVERY USE CASE

Wireless Charger Discovery			
Triggering Event	**Primary Actor(s)**	**Pre-Conditions**	**Post-Conditions**
Vehicle operator searching for an available charging location in the immediate vicinity.	Vehicle Operator (customer)	• EVSE Beacon is active • EV is in vicinity (TBD) of charging spot	• Vehicle proceeds to vehicle alignment; or • Operator decides no to charge
Use Case Description			
General Overview	The EV driver is approaching an area which has wireless charging stations in its proximity (Distance TBD <30m?>. The driver instructs the vehicle to look for the presence of available charging stations. This Use Case applies only to public wireless charging installations. It does not apply to individual home installations.		

Scenario Description	• The WEVSE periodically broadcasts a "beacon" signal that provides its identity and that it is offering Wireless EV Charging services.
	• The EV detects that beacon and displays the information to the user.
	• The user may the have the EV set up a point to point association to obtain more detailed compatibility and service information. This information may include
	    o Technical parameters for energy transfer, e.g. compatibility information, maximum power available.
	    o Service data, such as payment options, etc.
	Note: This step is optional as it may be possible to infer that information from the beacon signal.
	• The user may place a reservation for the charging station or may simply park at the station or abandon his request. In an absence of an explicit indication from the user or a transition to the next stage of charging the point to point connection will time out after TBD <30sec?>		

Exceptions/Terminating Event	• Customer declines to proceed • Non-compatibility of EV and EVSE • Communications failure		
Open Issues to be addressed"	• How does this scale for parking complexes, where a large number of charging station may be available? • Timeslot reservations at charging stations seem useful, given the length of time that may be required for charging at level 1 and 2. This feature should be common across wireless and conductive charging. How should "reservations" be enforced? • How does the user know which parking space is being reserved? Location based information (may be parking lot specific) may need to be included as an option in communication. It may also be possible to reserve a slot within a complex and the user may supply a Reservation ID to get access. Note: This feature should be worked as a common charging infrastructure feature across wireless and conductive charging platforms. The reservation feature may possibly be a candidate for a later release of the standard.		

A.3   VEHICLE ALIGNMENT

This section presently considers an approach based on a combined RFID and Magnetic Field detection scheme.

NOTE: It is not clear that the preliminary phase of using RFID adds significant benefit for the additional complexity. A low level magnetic field could be turned on via the communications channel to assist during parking.

TABLE A2 - VEHICLE ALIGNMENT USE CASE

Vehicle Alignment			
Triggering Event	**Primary Actor(s)**	**Pre-Conditions**	**Post-Conditions**
Vehicle Operator/EV requests	Vehicle Operator/EV WEVSE	• Open communications channel between the EV and EVSE • Basic compatibility has been confirmed to the user	• Vehicle proceeds to charge; or • Operator abandons process
Use Case Description			
General Overview	To efficiently and successfully charge over the wireless interface the EV must be positioned over the WEVSE in an appropriate position. Depending on the respective technologies or coil topologies used in the EV and the WEVSE that position may not correspond to the geometric alignment of the centers of the two parts of the charging system. The vehicle alignment process provides the user with feedback on when optimal alignment has been achieved. The process may terminate with an error condition due to failure to achieve alignment, though the systems are otherwise compatible.		
Scenario Description	1. When a vehicle enters the parking space, whichever side (vehicle or infrastructure) has the RFID reader installed notifies the other side that the vehicle's presence in the parking space was detected. 2. A process begins whereby the vehicle and infrastructure perhaps share coil type information (i.e. circular vs. polarized and hence whether an alignment offset may be required). This exchange of information allows systems that have meet the basic J2954 specification and comply with the communications protocol to determine the correct alignment process for different primary charge pad configurations. 3. The RFID Readers provide feedback to the vehicle about the vehicles relative position within the parking space. Note: The use of the RFID method by the EV is optional. 4. When the vehicle is approaching the magnetic pad, the infrastructure (or off-board system) is notified to turn on the sense current. 5. The infrastructure (off-board system) turns on a low level magnetic field and informs the vehicle that a magnetic field is present. 6. The vehicle attempts to detect the low-level alignment field and to determine a "sweet spot" by determining a near optimal peak in the magnetic coupling. (Note: alternatively coupling coefficient estimation can be used which may require additional communication.) 7. The vehicle sub-system will send messages on the internal vehicle communications bus conveying positioning information.		

	a. For manual positioning this information is used to drive the vehicle and/or station display interface to assist the driver in parking the vehicle.
	b. For automatic parking systems, this information shall be integrated with the information of the parking sub-system, parking subsystem considerations (e.g., detection of a close-by vehicle) shall constrain the selection of the optimal location.
	8. Once the optimal vehicle alignment is determined and vehicle is stopped.
Exceptions/Terminating Event	• Inability to align within desired performance parameters • Communications failure
Open Issues to be addressed"	• This section needs further work in fleshing out the detection mechanism. • A support mechanism needs to be defined to assure that a vehicle is aligning and communicating with the parking spot in which it is trying to charge, when more than one parking spot is in close proximity.

A.4   CHARGING

The charging use case supports the transfer of energy from the EVSE to the EV; it consists of three sub-use cases:

- PT_Initialization

- Power Transfer

- PT_Termination

A.4.1   Sub-Use Case: Initiation

TABLE A3 - POWER TRANSFER INITIATION SUB-USE CASE

Power Transfer Initiation			
Triggering Event	**Primary Actor(s)**	**Pre-Conditions**	**Post-Conditions**
Vehicle Operator/EV request.	Vehicle Operator/EV	• The EV has successfully completed the alignment procedure and is ready to start charging. • Vehicle is in "Park"	• Vehicle and EVSE put in state where power transfer can commence
Use Case Description			
General Overview	Once the vehicle is aligned and the system indicates that it is in a state where a charge can be accepted; the vehicle operator may either issue a command to begin charging with system provided default parameters. Generally the user may specify particular parameters to be used for the charging session; the parameters negotiated during this phase enable "smart charging" that allow the charging infrastructure to optimize energy usage and minimize impact on the grid. Many of these parameters will be passed through from the EVSE to the supporting back-end infrastructure and the processes will follow those specified in SAE J2836/1.		
Scenario Description	1. The EV provides the EVSE with information about its capability and the desired service parameters, these include:		

	a. VehicleID
	b. Current SoC and final desired SoC and/or maximum total price.
	c. Duration over which it wishes to charge
	d. Maximum power charging rate
	2. The EVSE responds by providing the EV with an acknowledgement as to whether it can meet the desired session requirements and the cost for the session (the cost may be expressed in an average cost per kWh or total cost for the session if carried to completion). Error conditions may occur if the transfer rate available to the EVSE and the duration are not commensurate with the desired final SoC. The user decides whether to proceed charging with the parameters that are offered by the EVSE.
	3. Based on input from the driver the EV may accept the session. To accept the session the EV will transmit its user identity information and associated billing and security information. An option will allow an indicator in the message that an external charge information collection system is in use. This option will support entry via an external credit card reader, NFC reader, cell phone or attendant; if these options are supported b the charging location. These processes are designed to support the commercial use cases defined in J2836/1.
	4. The EVSE will clear the billing and security information with the appropriate back-end systems. (Note: the information flow should support various business models, such as charging to a general credit card, an affinity card, home electric bill or flat charge. Similarly the EVSE needs to support alternate means for inputting the charging information, such as via NFC enabled devices). Upon receiving a response from the back-end system the EVSE indicates to the EV that it is ready to start the charging process (in case of an affirmative response) or that the credentials have failed (in case of a negative response).
	5. Upon receipt of a positive response the EV will send to the EVSE the initial desired charging parameters and the process enters the charging phase.
Exceptions/Terminating Event	• Credentials check failure • Diagnostic/Monitoring triggered event • Communications failure
Open Issues to be addressed"	

A.4.2   Sub-Use Case: power transfer

TABLE A4 - POWER TRANSFER SUB-USE CASE

Power Transfer			
Triggering Event	**Primary Actor(s)**	**Pre-Conditions**	**Post-Conditions**
Vehicle Operator/EV request. EVSE Induced transition	EV WEVSE	• The EV has successfully completed the initialization phase • Communications channel is maintained. • Vehicle is in "Park"	• Vehicle and EVSE put in state where power transfer can commence
Use Case Description			
General Overview	Once initiation is successfully completed the EV had WEVSE enter the power transfer phase. The power transfer phase, under smart charging, my execute a complex program, consisting of periods of actual energy flow and quiescent periods where there is no active flow but the program is still active. During active power transfer the system monitors the power transfer process and controls and adjusts the power flow to meet the requirements of the grid and the EV BMS.		
Scenario Description	1. The power transfer process must match the needs of the BMS and the capabilities of the WEVSE. To that purpose messages are exchanged between the WEVSE and on-board sub-system. These secondary load regulation messages may include secondary load regulation percentage (for secondary side control), Load Voltage, Load Current and load power (for primary side control). To manage transient conditions the secondary load regulation information must be provided as "realtime" continuing feedback to the WEVSE. 2. The EV may request that the primary (WEVSE) modify its transfer current. 3. Update messages shall be sent at a TBD frequency. 4. During the power transfer phase the charging system shall monitor for the diagnostic consideration described in that use case 5. When the desired SoC determined by the BMS has been reached the power transfer phase shall terminate unless terminated earlier by user or grid requirements.		
Exceptions/Terminating Event	• Foreign object detection • Thermal events o Heating of a metallic object to 80° C with an ambient temperature of 40° C (**NOTE:** There are currently two additional values specified in J2954 in 10.6 and 12.5.6.2.2; these need to be reconciled) • Internal system malfunction in EVSE or EV • Vehicle moved out of "Park" • Communications failure		
Open Issues to be addressed"	• Identification of additional parameters that may be controllable under various control schemes		