EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Electric Vehicle Supply Equipment Criteria

Criteria Checklist

3002018754

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Technical Update, December 2020

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NOTE

For further information about EPRI, call the EPRI Customer Assistance Center at 800.313.3774 or e-mail askepri@epri.com.

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The Electric Power Research Institute (EPRI) prepared this report.

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ABSTRACT

In early 2020, EPRI established the Electric Transportation Infrastructure Qualification Working Group (QWG). This public working group was designed to serve as a forum to gather industry input on a set of electric vehicle supply equipment qualifications. These qualifications will be used to develop a vetted equipment list that will be published on this web portal. The working group is open to all-electric vehicle stakeholders. This report documents the work to date of the public working group and captures feedback on the various criteria being proposed.

Keywords
Electric vehicle charging

Compliance

Standards based

Criteria

ACRONYMS AND ABBREVIATIONS

AC – alternating current

ANSI – American National Standards Institute[1]

CANENA - Council for Harmonization of Electrotechnical Standards of the Nations in the Americas[2]

CCS – combined coupler system

CISPR - International Special Committee on Radio Interference[3]

DC – direct current

DIN – German Institute for Standardization[4]

EMC – electromagnetic compatibility

EMF – electromagnetic fields

ESP – energy service provider

EV – electric vehicle

EVSE – electric vehicle supply equipment

EVSP – electric vehicle service provider

HAN – home area network

ICNIRP – International Commission on Non-Ionizing Radiation Protection[5]

IEC – International Electrotechnical Commission[6]

IEEE – Institute of Electrical and Electronic Engineers[7]

IP – internet protocol

ISO – International Standardization Organization[8]

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[1] https://www.ansi.org/

[2] https://www.canena.org/

[3] https://www.iec.ch/dyn/www/f?p=103:7:0::::FSP_ORG_ID:1298

[4] https://www.din.de/en/about-standards/din-standards

[5] https://www.icnirp.org/

[6] https://www.iec.ch/homepage

[7] https://www.ieee.org/

[8] https://www.iso.org/home.html

ITU – International Telecommunications Union[9]

NEC – National Electric Code[10]

NCWM - National Conference on Weights and Measures[11]

NFPA – National Fire Protection Association[12]

NHTSA – National Highway Traffic Safety Administration[13]

NIST – National Institute of Standards and Technology[14]

OCPI – Open Charge Point Interface[15]

OCPP – Open Charge Point Protocol[16]

OSHA – Occupational Safety and Health Administration[17]

OWM – Office of Weights and Measures[18]

PLC – power line carrier (communication)

SAE – SAE International (acronym previously stood for Society of Automotive Engineers)[19]

UL – Underwriters Labs[20]

WPT – wireless power transfer

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[9] https://www.itu.int/en/Pages/default.aspx

[10] https://www.nfpa.org/electricalsolutions

[11] https://www.ncwm.com/

[12] https://www.nfpa.org/

[13] https://www.nhtsa.gov/

[14] https://www.nist.gov/

[15] https://evroaming.org/

[16] https://www.openchargealliance.org/

[17] https://www.osha.gov/

[18] https://www.nist.gov/pml/weights-and-measures/about-owm

[19] https://www.sae.org/

[20] https://www.ul.com/

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OVERVIEW

There is a need to help support the development of standards and practices for charging equipment deployment to help fill gaps for light duty vehicle electrification and establish requirements for medium and heavy-duty electric vehicle charging infrastructure. EV charging equipment needs to meet relevant standards for safety and interoperability to ensure that the equipment is safe to use, rugged, interoperable, and meets all electrical and applicable networking standards. Utilities and other stakeholders may have requirements or opportunities to support deployment of infrastructure for electric vehicles and non-road electric equipment through direct deployments, incentive programs, rebates, and other programs. Where light duty infrastructure is commercially available, and standards are mostly established, there may still be gaps in the overall functionality, compatibility, and verification of the adherence of electric vehicle supply equipment (EVSE) to applicable standards, as well as its interoperability.

In early 2020, EPRI established the Electric Transportation Infrastructure Qualification Working Group (QWG). This public working group was designed to serve as a forum to gather industry input on a set of electric vehicle supply equipment qualifications. The work on these qualifications to date is documented in this report. The working group was opened to all interested electric vehicle stakeholders and has met several times in 2020[21].

The purpose of the public working group was to:

- Inform and involve electric power system and electric power sector stakeholders in an EPRI project to develop a qualifications matrix for electric vehicle charging equipment
- Seek industry input on a set of qualifications for electric vehicle supply equipment (EVSE) to be deployed in association with utility programs. The Qualifications will be consolidated in a database targeted to identify if equipment is safe, properly functioning and appropriately features the integration issues facing electric power stakeholders, utilities, vendors, and the public in reaction to a dynamic and evolving needs for EV charging participants with impact on customers of electricity products and services.
- Seek stakeholder input on a process to qualify and/or certify equipment to be qualified according to the developed criteria.

EPRI intends to use the criteria found in this report to vet electric vehicle charging equipment and to publish results of that vetting on the public facing web portal noted above.

Assumptions

The following assumptions were used in development of the criteria:

[21] https://www.epri.com/pages/sa/EVSE_Qualification_Working_Group

- The developed criteria were intended to apply to AC and DC charging hardware (separate sections) designed for use in North America
- The criteria are intended to cover electric vehicle supply equipment for vehicles that follow SAE J1772 and/or CHAdeMO charging interface protocols
- The criteria are a superset of those that may be needed in a particular application. It is left to the used of the vetted equipment list to decide which criteria are applicable for their application.
- Where possible we have avoided including optional equipment features within the criteria list (such as specific power level requirements, cable length, etc.)
- Some qualification elements are only applicable if an EVSE is so equipped (for example, payment module qualifications would only be applicable for a device that has a payment module installed)
- This is a living list and it is expected that criteria will be added/deleted/update over time

How the Qualification List was Developed

Working with the EPRI project funders, a short list of criteria was developed to be vetted by the public working group and to act as a basis for the work. It should be understood that the criteria listed **are not mandatory** – a purchaser of equipment would decide what criteria they consider mandatory for their procurement.

- Where possible, derived from existing standards or from industry input
- Working group input is needed where standards are lacking
- Need to be rigorous such that compliance metrics can be established

What is Excluded from this Effort?

It is expected that this document will be periodically updated to reflect changes in electric vehicle charging and industry direction. In order to limit the scope of the effort, the following elements were excluded from consideration at this time.

- Hardware installation is not covered (installation requirements, mounting, physical size, etc.)
- Americans with Disabilities Act (ADA) compliance cannot be guaranteed at equipment level and so is not directly addressed by these criteria. The vetting process will ask the vendor if product documentation supports ADA installation.
- Reverse power flow (also known as vehicle to grid) is not covered by these criteria (SAE J3072, SAE J2847/3, IEEE 1547.1, UL 9741)

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THE CRITERIA DEVELOPMENT PROCESS

The base list of AC and DC criteria has been reviewed with a public stakeholder group. Each criteria element has been discussed with the public working group. Comments received are summarized in section 3 for AC charging criteria and section 4 for DC charging criteria. Complete notes as taken on public calls (including email correspondence input) are provided in section 5.

For each criteria the goal has been to develop a well-defined metric or metrics for that criteria and whenever possible tie those criteria back to industry standards and practices. In some cases, there remains no simple way to vet that particular criteria. In those cases, an attempt has been made to describe a process of vetting that can be accepted on a consensus basis by industry stakeholders.

In sections 3 and 4, for each criteria a draft Vetting Method is listed. These are still a work in progress and subject to stakeholder review but reflect a best attempt at aggregating comments received from stakeholders at the public working group meetings. It is anticipated that these will be revised and updated as needed in early 2021 for application to equipment vetting.

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AC CHARGING ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE) QUALIFICATION CHECKLIST

#	Qualification	Description	Vetting Method/Notes
	EVSE ELECTRICAL		
1-1	Safety requirements	Unit listed by qualified Nationally Recognized Test Lab (NRTL) to UL 2594[22]; will include other UL standards as prescribed by the NRTL; other standards likely to be referenced: UL 2231-1, UL 2231-2, UL 2251, UL 1998	Vendor to provide name of NRTL used and a copy of the Certificate of Compliance. Proprietary information should not be included in the provided materials. The information should include a list of the UL standards used to vet the product and models covered by the listing. For Batch listed products, information must include serial number range or other product marking data that indicates equipment that falls under the batch listing. Field listing of equipment is not recognized in this process since it seeks to pre-qualify equipment.
Vetting method has been updated to reflect input from the public working group. NRTLs certified by ANSI and OSHA will be recognized			
1-2	Connector and charging interface standard	EVSE charging interface must be compliant with SAE J1772[23]	Vendor to provide documentation describing due diligence done to confirm compliance.
It was recognized that this is a critical element of the criteria, but that industry has not developed a clean way to address this to date. Will rely on vendor expressing how they have addressed this as a due diligence effort. Recognition that problems with interface can be due to vehicle behavior.			
1-3	Power quality criteria	EVSE must be compliant with applicable portions of SAE J2894/1[24] based on testing as described in SAE J2894/2[25]	Need to compare UL 2231-2 and J2894 – are there elements that need to be included here?
UL testing conducted as part of UL 2231-2 for testing of the charge current interruption device (CCID) requires tests that cover several aspects of the J2894 testing. Since AC EVSE are pass through			

[22] https://standardscatalog.ul.com/standards/en/standard_2594_2

[23] https://www.sae.org/standards/content/j1772_201710/

[24] https://www.sae.org/standards/content/j2894/1_201901/

[25] https://www.sae.org/standards/content/j2894/2_201503/

#	Qualification	Description	Vetting Method/Notes
devices, J2954 will have limited applicability. Need to compare UL 2231-2 and J2894 to understand if there are elements of J2894 not covered.			
1-4	RF emissions/susceptibility requirements	Compliance with Federal Communications Commission (FCC) Part 15; Code of Federal Regulations, Title 47, *Part 15*[26] (47 CFR *15*)	Vendor to provide proof of compliance. FCC database[27] or vendor to provide appropriate documentation
Understood that a product sold in the US must be compliant			
1-5	Electrical - installation	Compliant with requirements of National Electric Code; National Fire Protection Association (NFPA) 70 (NEC)[28]; focus on article 625	Vendor provided documentation
Was argued that a product that qualified to UL 2594 would be compliant with NEC requirements			
1-6	Energy Efficiency	Environmental Protection Association (EPA) EnergyStar for EVSE[29]; EPA program related to energy efficiency of end use products; reference current EnergyStar EVSE document	Verify listed on EPA EnergyStar website[30]
Optional criteria			
	EVSE PHYSICAL		
2-1	Enclosure suitable for application	Enclosure rating; National Electrical Manufacturers Association (NEMA)[31] or Ingress Protection (IP) a. Indoor – any NEMA rating b. Outdoor – 3R minimum Compliance with NEMA or IP standards as noted; ANSI/IEC 60529	Vendor provided documentation
Left to purchaser if higher level of protection is needed for outdoor units			
2-2	Operating Temperature Range	Equipment must be capable of normal operation over the temperature of xx deg F to XXX deg F (-30 deg C to 40 deg C)	Temperature range as specific in UL 2594 listing
UL 2594 runs tests at up to 40degC			
2-3	Physical Security	If enclosure can be opened without a tool – how is it secured?	Have not decided how to address this criterion
Live parts access is covered in safety testing; is this referring to the enclosure and for what purpose?			
2-4	Cybersecurity	Protection of data and integrity of firmware and operation of EVSE	Have not decided how to address this criterion
Input from August 11, 2020 No standards – there are some guidelines and Department of Energy funded projects looking at this – but not fully developed at this			
2-5	Durability	Paint, materials, displays	Have not decided how to address this criterion

[26] https://www.govinfo.gov/app/details/CFR-2010-title47-vol1/CFR-2010-title47-vol1-part15

[27] https://www.fcc.gov/oet/ea/fccid#helpSection

[28] https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70

[29] https://www.energystar.gov/products/other/evse

[30] https://www.energystar.gov/products/other/ev_chargers

[31] https://www.nema.org/Products/Documents/nema-enclosure-types.pdf

#	Qualification	Description	Vetting Method/Notes
Discussion focused on UL 2594 requirements and if they covered this sufficiently. Question – is this about appearance or functional durability?			
2-6	Minimum Display Requirements	Power indicator; graphic display?	Have not decided how to address this criterion
UL 2594 has a fault condition display requirement; Discussion that this might be considered a feature and not a criterion			
2-7	American With Disabilities Act (ADA)	Must be capable of being installed in compliance with ADA requirements	Vendor documentation (Does manual include ADA installation instructions?)
note that ADA is mostly an installation driven requirement, but equipment must provide features to support ADA			
	EVSE PAYMENT and AUTHENTICATION SYSTEMS	This focuses on requirements for local hardware	
3-1	Devices	Do we need to list specific interfaces (such as touchless credit card payment hardware)?	Have not decided how to address this criterion
Discussion that this might be considered a feature and not a criterion			
3-2	Protocol	If payments system uses an independent network, what protocol does it use?	Have not decided how to address this criterion
Expect this will be vendor dependent			
3-3	Security	Local hardware security requirements for payment system	Have not decided how to address this criterion
Is PCI compliance applicable at the hardware level? Should this be combined with network requirements? Noted that PCI compliance at system level would cover this. Discussion that this might be considered a feature and not a criterion			
3-4	Minimum payment options		Have not decided how to address this criterion
These may be covered under State Specific requirements			
	NETWORKING		
4-1	EVSE Data Available – Format	Detailed description of data that is required to be collected by the EVSE and format of reporting of the data	Have not decided how to address this criterion
May need to distinguish collecting versus reporting of data. For reference - see Section 6 for the Idaho National Lab requirements list from the DOE EV Project circa 2011. California has proposed data requirements – see criteria 8-9 Suggestion that we use Open Charge Point Interface[32] (OCPI) for real time data			
4-2	EVSE Data – communication (at the network level)	How is data communicated in reference to item 4-1	Have not decided how to address this criterion
Need standard for criteria 4-1 to feed into this.			
4-3	Location Map with Realtime Data – Utility Focused	Host or system operator tools for charging site management	Have not decided how to address this criterion
No consensus on approach.			
4-4	Location Map with Realtime Data – Consumer Focused	Consumer facing map tools	Have not decided how to address this criterion
No consensus on approach.			

[32] https://evroaming.org/

#	Qualification	Description	Vetting Method/Notes
4-5	Phone Support Services	Phone support services requirements	Have not decided how to address this criterion
On list due to California requirements – could move to State Specific criteria			
4-6	Cloud Based API Features for Utility Interaction - Data	API features and functions requirements	Have not decided how to address this criterion
Could this just require an API without specifics?			
4-7	Cloud Based API Features for Utility Interaction – Demand Response	API demand response requirements	Have not decided how to address this criterion
No standard to reference OpenADR2.0b? This would be for utility demand response programs Discussion that IEEE 1547 allow for three different protocols; OpenADR may be limiting			
4-8	Cloud Based API Features for Utility Interaction – User Event Notification	API notification requirements	Have not decided how to address this criterion
Discussion of what would be appropriate for this criterion – what is utility looking for? A number of options related to communications protocols. Needs more discussion.			
4-9	EVSE to Network Communications - Protocol	Protocol used to manage EVSE from by a charging network	Have not decided how to address this criterion
Example: Open Charge Point Protocol Version 1.6? Open Charge Alliance – certified via OCA compliance tool? If OCPP is reference, need to be clear what portion of protocol is referenced			
4-10	EVSE to Network Communications – Security - Communications	Network security requirements	Have not decided how to address this criterion
NIST 800-53? New seeing solicitation that are requiring Open Charge Alliance security tool compliance			
4-11	EVSE to Network Communications – Security - Data	Specific data security requirements	Have not decided how to address this criterion
4-12	EVSE to Network Communications – Security – Physical	System physical security requirements	Have not decided how to address this criterion
4-13	EVSE to Network Communications – Remote Firmware Maintenance	Remote firmware updating capability and related requirements	Have not decided how to address this criterion
How is this handled when EVSE maker and Network operator are not the same company? In discussion was mentioned that some customers are requesting data paths that are by definition unsecure and will have to rely on physical security			
4-14	Roaming	Requirements for roaming	Have not decided how to address this criterion
Covered by state specific language for California			

#	Qualification	Description	Vetting Method/Notes
OCPI – primary use is roaming; NREL/AFDC starting to use this for data on locations, by Plugshare (Recargo) for real time station status – may be a good standard to align around for roaming Discussion noted that making this a requirement – can be tricky in that it takes more than just a single vendor to make this happen; is OCPI best solution or better to leave open? This is happening organically as network vendors develop linking agreements.			
	Customer Experience	These are operation related requirements – not sure they belong in this list	
5-1	Customer Experience – Usability - Diagnostics	Required diagnostic	Have not decided how to address this criterion
Is this local or network based – should this be moved under network?			
5-2	Customer Experience – Usability – Uptime	Uptime requirements	Have not decided how to address this criterion
How defined? Discussion - Seeing uptime requirements in solicitations but generally vague as to what it means; often uses cell network or other parts of network uptime is reported; There is also a tie with maintenance and upkeep – being proactive to help address this			
5-3	Customer Experience – Usability – Repair Response	Repair response time to repair	Have not decided how to address this criterion
Would need detailed definition. Could be hardware related or network related or both.			
	In-Field Feedback from Equipment Performance		
6-1	TBD		Have not decided how to address this criterion
	Reliability		
7-1	MTBF	Some form of equipment reliability specification?	Have not decided how to address this criterion
Would this be for hardware only or hardware and network? Discussion - Even if you specified MTBF – it isn't likely to result in better field performance – there you need monitoring – sensors and inspection to achieve good MTBF in the field General construction requirements are covered in NRTL listing (such as flammability requirements) Reliability is different than "damage" or abuse in the field – reliability would be using the product as intended and looking at its life;			

State Specific Requirements for AC Charging

State of California

As these are being mandated by the state, the working group did not spend much time in discussion of these; compliance will be mandated by state

#	Qualification	Description	Vetting Method
	Public EVSE Equipment with a Network	Some requirements are not yet required – should they be included?	

#	Qualification	Description	Vetting Method
8-1	Labeling	California Code of Regulations Chapter 8.3, paragraph 2360.1[33],[34]; labeling requirements; required by July 1, 2023	Vendor provided documentation
8-2	Fee Disclosure	California Code of Regulations Chapter 8.3, paragraph 2360.1; fee disclosure requirements; required by July 1, 2023	Vendor provided documentation
8-3	Toll Free Number	California Code of Regulations Chapter 8.3, paragraph 2360.2; toll free number requirements; AC EVSE installed on or after July 1, 2023, shall comply	Vendor provided documentation
8-4	Subscription	California Code of Regulations Chapter 8.3, paragraph 2360.2; membership or subscription not required to use charging equipment; An AC EVSE installed on or after July 1, 2023, shall comply	Vendor provided documentation
8-5	Credit Card Reader	California Code of Regulations Chapter 8.3, paragraph 2360.2; credit card reader requirements; An AC EVSE installed on or after July 1, 2023, shall comply	Vendor provided documentation
8-6	Roaming Agreements	California Code of Regulations Chapter 8.3, paragraph 2360.3; EVSP requirements for roaming agreements; Required by no later than July 1, 2021	Vendor provided documentation
8-7	Reporting Requirements	California Code of Regulations Chapter 8.3, paragraph 2360.4; extensive list of information that must be provided to the State of California; Applies to all EVSPs operating or intending to operate one or more publicly available Level 2 EVSE installed in California; Complex set of reporting deadlines	Vendor provided documentation
8-8	NIST Handbook 44 Compliance	California Department of Food and Agriculture, Division of Measurement Standards[35] - Electric Vehicle Fueling Systems Specifications in the CCR Title 4, §§ 4001 and 4002.11.; requires compliance with NIST Handbook 44 sections pertaining to sale of electricity as a fuel (as amended by the State of California); include metering accuracy requirements and timeline for compliance	Vendor provided documentation
8-9	California Energy Commission – Title 20 EVSE Data Requirements	California Energy Commission proposed data collection requirements; Title 20; Docket number 18-OIR-01; paragraph 1386 See section 7 for the text of the Commission proposal.	Vendor provided documentation

[33] California Air Resources Board, https://ww2.arb.ca.gov/sites/default/files/2020-06/evse_fro_ac.pdf

[34] https://ww2.arb.ca.gov/our-work/programs/electric-vehicle-supply-equipment-evse-standards

[35] https://www.cdfa.ca.gov/dms/regulations.html

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DC CHARGING ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE) QUALIFICATION CHECKLIST

#	Qualification	Description	Vetting Method
	EVSE ELECTRICAL		
1-1	Safety requirements	Unit must be listed by qualified Nationally Recognized Test Lab (NRTL) to UL 2202[36]; will include other UL standards as prescribed by the NRTL; other standards likely to be referenced: UL 2231-1, UL 2231-2, UL 2251, UL 1998	Vendor to provide name of NRTL used and a copy of the Certificate of Compliance. Proprietary information should not be included in the provided materials. The information should include a list of the UL standards used to vet the product and models covered by the listing. For Batch listed products, information must include serial number range or other product marking data that indicates equipment that falls under the batch listing. Field listing of equipment is not recognized in this process since it seeks to pre-qualify equipment.
Vetting method has been updated to reflect input from the public working group. NRTLs certified by ANSI and OSHA will be recognized			
1-2	Connector and charging interface standard	EVSE charging interface must be compliant with SAE J1772[37] EVSE charging interface must be compliant with CHAdeMO	Vendor to provide documentation describing due diligence done to confirm compliance.
It was recognized that this is a critical element of the criteria, but that industry has not developed a clean way to address this to date. Will rely on vendor expressing how they have addressed this as a due diligence effort. Recognition that problems with interface can be due to vehicle behavior. CHAdeMO has a compliance certification process which could be referenced.			
1-3	Power qualify criteria	EVSE must be compliant with applicable portions of SAE J2894	Vendor provided documentation
UL testing conducted as part of UL 2231-2 for testing of the charge current interruption device (CCID) requires tests that cover several aspects of the J2954 testing. Need to compare UL 2231-2 and J2894 to understand if there are elements of J2894 not covered.			

[36] https://standardscatalog.ul.com/standards/en/standard_2202_2

[37] https://www.sae.org/standards/content/j1772_201710/

#	Qualification	Description	Vetting Method
Discussion - Suggestion that we add <5% harmonics per IEEE 519; J2894 has a specification for harmonics – IEEE 519 is more focused on the electric grid power quality and not product power quality			
1-4	RF emissions/susceptibility requirements	Compliance with Federal Communications Commission (FCC) Part 15; Code of Federal Regulations, Title 47, *Part 15*[38] (47 CFR *15*)	Vendor to provide proof of compliance. FCC database[39] or vendor to provide appropriate documentation
Understood that a product sold in the US must be compliant			
1-5	Electrical - installation	Compliant with requirements of National Electric Code; National Fire Protection Association (NFPA) 70 (NEC)[40]; focus on article 625	Vendor provided documentation
Was argued that a product that qualified to UL2202 would be compliant with NEC requirements			
1-6	Energy Efficiency	Environmental Protection Association (EPA) EnergyStar for EVSE[41]; EPA program related to energy efficiency of end use products; reference current EnergyStar EVSE document	Verify listed on EPA EnergyStar website
Energy Star for DCFC still a work in progress			
	EVSE PHYSICAL		
2-1	Enclosure suitable for application	Enclosure rating; National Electrical Manufacturers Association (NEMA)[42] or Ingress Protection (IP) a. Indoor – any NEMA rating b. Outdoor – 3R minimum Compliance with NEMA or IP standards as noted; ANSI/IEC 60529	Vendor provided documentation
Left to purchaser if higher level of protection is needed for outdoor units			
2-2	Minimum Operating Temperature Range	Equipment must be capable of normal operation over the temperature of xx deg F to XXX deg F (xx deg C to XXX deg C)	Temperature range as specific in UL 2202 listing
2-3	Physical Security	If enclosure can be opened without a tool – how is it secured?	Have not decided how to address this criterion
Live parts access is covered in safety testing; is this referring to the enclosure and for what purpose?			
2-4	Cybersecurity	Protection of data and integrity of firmware and operation of EVSE	Have not decided how to address this criterion
Input from August 11, 2020 No standards – there are some guidelines and Department of Energy funded projects looking at this – but not fully developed at this			
2-5	Durability	Paint, materials, displays	Have not decided how to address this criterion
Discussion focused on UL 2202 requirements and if they covered this sufficiently. Question – is this about appearance or functional durability?			

[38] https://www.govinfo.gov/app/details/CFR-2010-title47-vol1/CFR-2010-title47-vol1-part15

[39] https://www.fcc.gov/oet/ea/fccid#helpSection

[40] https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70

[41] https://www.energystar.gov/products/other/evse

[42] https://www.nema.org/Products/Documents/nema-enclosure-types.pdf

#	Qualification	Description	Vetting Method
2-6	Minimum Display Requirements	Power indicator; graphic display?	Have not decided how to address this criterion
UL 2202 may have requirements; Discussion that this might be considered a feature and not a criterion			
2-7	American With Disabilities Act (ADA)	Must be capable of being installed in compliance with ADA requirements43	Vendor documentation (Does manual include ADA installation instructions?)
note that ADA is mostly an installation driven requirement, but equipment must provide features to support ADA			
	EVSE PAYMENT and AUTHENTICATION SYSTEMS	This focuses on requirements for local hardware	
3-1	Devices	Do we need to list specific interfaces (such as touchless credit card payment hardware)?	Have not decided how to address this criterion
Discussion that this might be considered a feature and not a criterion			
3-2	Protocol	If payments system uses an independent network, what protocol does it use?	Have not decided how to address this criterion
Expect this will be vendor dependent			
3-3	Security	Local hardware security requirements for payment system	Have not decided how to address this criterion
Is PCI compliance applicable at the hardware level? Should this be combined with network requirements? Noted that PCI compliance at system level would cover this. Discussion that this might be considered a feature and not a criterion			
3-4	Minimum payment options		Have not decided how to address this criterion
These may be covered under State Specific requirements			
	NETWORKING		
4-1	EVSE Data Available – Format	Detailed description of data that is required to be collected by the EVSE and format of reporting of the data	Have not decided how to address this criterion
May need to distinguish collecting versus reporting of data. For reference - see Section 6 for the Idaho National Lab requirements list from the DOE EV Project circa 2011. California has proposed data requirements – see criteria 8-9 Suggestion that we use OCPI for real time data			
4-2	EVSE Data – communication	How is data communicated?	Have not decided how to address this criterion
Need standard for criteria 4-1 to feed into this.			
4-3	Location Map with Realtime Data – Utility Focused	Host or system operator tools for charging site management	Have not decided how to address this criterion
No consensus on approach.			
4-4	Location Map with Realtime Data – Consumer Focused	Consumer facing map tools	Have not decided how to address this criterion
No consensus on approach.			
4-5	Phone Support Services	Phone support services requirements	Have not decided how to address this criterion
On list due to California requirements – could move to State Specific criteria			

[43] https://www.ada.gov/

#	Qualification	Description	Vetting Method
4-6	Cloud Based API Features for Utility Interaction - Data	API features and functions requirements	Have not decided how to address this criterion
Could this just require an API without specifics?			
4-7	Cloud Based API Features for Utility Interaction – Demand Response	API demand response requirements	Have not decided how to address this criterion
No standard to reference OpenADR2.0b? This would be for utility demand response programs Discussion that IEEE 1547 allow for three different protocols; OpenADR may be limiting			
4-8	Cloud Based API Features for Utility Interaction – User Event Notification	API notification requirements	Have not decided how to address this criterion
Discussion of what would be appropriate for this criterion – what is utility looking for? A number of options related to communications protocols. Needs more discussion.			
4-9	EVSE to Network Communications - Protocol	Protocol used to manage EVSE from by a charging network	Have not decided how to address this criterion
Example: Open Charge Point Protocol Version 1.6? Open Charge Alliance – certified via OCA compliance tool? If OCPP is reference, need to be clear what portion of protocol is referenced			
4-10	EVSE to Network Communications – Security - Communications	Network security requirements	Have not decided how to address this criterion
NIST 800-53? New seeing solicitation that are requiring Open Charge Alliance security tool compliance			
4-11	EVSE to Network Communications – Security - Data	Specific data security requirements	Have not decided how to address this criterion
4-12	EVSE to Network Communications – Security – Physical	System physical security requirements	Have not decided how to address this criterion
4-13	EVSE to Network Communications – Remote Firmware Maintenance	Remote firmware updating capability and related requirements	Have not decided how to address this criterion
How is this handled when EVSE maker and Network operator are not the same company? In discussion was mentioned that some customers are requesting data paths that are by definition unsecure and will have to rely on physical security			
4-14	Roaming	Requirements for roaming	Have not decided how to address this criterion
Covered by state specific language for California OCPI – primary use is roaming; NREL/AFDC starting to use this for data on locations, by Plugshare (Recargo) for real time station status – may be a good standard to align around for roaming			

#	Qualification	Description	Vetting Method
Discussion noted that making this a requirement – can be tricky in that it takes more than just a single vendor to make this happen; is OCPI best solution or better to leave open? This is happening organically as network vendors develop linking agreements.			
	Customer Experience	These are operation related requirements – not sure they belong in this list	
5-1	Customer Experience – Usability - Diagnostics	Required diagnostic	Have not decided how to address this criterion
Is this local or network based – should this be moved under network?			
5-2	Customer Experience – Usability – Uptime	Uptime requirements	Have not decided how to address this criterion
How defined? Discussion - Seeing uptime requirements in solicitations but generally vague as to what it means; often uses cell network or other parts of network uptime is reported; There is also a tie with maintenance and upkeep – being proactive to help address this			
5-3	Customer Experience – Usability – Repair Response	Repair response time to repair	Have not decided how to address this criterion
Would need detailed definition. Could be hardware related or network related or both.			
	In-Field Feedback from Equipment Performance		
6-1	TBD		Have not decided how to address this criterion
	Reliability		
7-1	MTBF	Some form of equipment reliability specification?	Would this be for hardware only or hardware and network?
Would this be for hardware only or hardware and network? Discussion - Even if you specified MTBF – it isn't likely to result in better field performance – there you need monitoring – sensors and inspection to achieve good MTBF in the field General construction requirements are covered in NRTL listing (such as flammability requirements) Reliability is different than "damage" or abuse in the field – reliability would be using the product as intended and looking at its life;			

State Specific Requirements for DC Charging

State of California

As these are being mandated by the state, the working group did not spend much time in discussion of these; compliance will be mandated by state

#	Qualification	Description	Vetting Method
	Public EVSE Equipment with a Network		

#	Qualification	Description	Vetting Method
8-1	Labeling	California Code of Regulations Chapter 8.3, paragraph 2360.1[44]; labeling requirements; required by January 1, 2022	Vendor written certification of compliance
8-2	Fee Disclosure	California Code of Regulations Chapter 8.3, paragraph 2360.1; fee disclosure requirements; required by January 1, 2022	Vendor written certification of compliance
8-3	Toll Free Number	California Code of Regulations Chapter 8.3, paragraph 2360.2; toll free number requirements; A DCFC EVSE installed on or after January 1, 2022, shall comply	Vendor written certification of compliance
8-4	Subscription	California Code of Regulations Chapter 8.3, paragraph 2360.2; membership or subscription not required to use charging equipment; A DCFC EVSE installed on or after January 1, 2022, shall comply	Vendor written certification of compliance
8-5	Credit Card Reader	California Code of Regulations Chapter 8.3, paragraph 2360.2; credit card reader requirements; A DC EVSE installed on or after January 1, 2022, shall comply	
8-6	Roaming Agreements	California Code of Regulations Chapter 8.3, paragraph 2360.3; EVSP requirements for roaming agreements; Required by no later than July 1, 2021	Vendor written certification of compliance
8-7	Reporting Requirements	California Code of Regulations Chapter 8.3, paragraph 2360.4; extensive list of information that must be provided to the State of California; Applies to all EVSPs operating or intending to operate one or more publicly available DCFC EVSE installed in California. Complex set of reporting deadlines.	Vendor written certification of compliance
8-8	NIST Handbook 44 Compliance	California Department of Food and Agriculture, Division of Measurement Standards[45] - Electric Vehicle Fueling Systems Specifications in the CCR Title 4, §§ 4001 and 4002.11.; requires compliance with NIST Handbook 44 sections pertaining to sale of electricity as a fuel (as amended by the State of California); include metering accuracy requirements and timeline for compliance	Vendor written certification of compliance
8-9	California Energy Commission – Title 20 EVSE Data Requirements	California Energy Commission proposed data collection requirements; Title 20; Docket number 18-OIR-01; paragraph 1386 See section 7 for the proposed Commission language.	Vendor provided documentation

[44] California Air Resources Board, https://ww2.arb.ca.gov/sites/default/files/2020-06/evse_fro_ac.pdf

[45] https://www.cdfa.ca.gov/dms/regulations.html

5
FULL MEETING NOTES

This section includes the full notes as taken from the public working group calls.

AC Charging Electric Vehicle Supply Equipment (EVSE) Qualification Checklist

Updated July 16, 2020

#	Qualification	Description	Vetting Method/Notes
	EVSE ELECTRICAL		
1-1	Safety requirements	Unit must be listed by qualified Nationally Recognized Test Lab (NRTL) to UL 2594[46]; will include other UL standards as prescribed by the NRTL; other standards likely to be referenced: UL 2231-1, UL 2231-2, UL 2251, UL 1998	Verify NRTL is qualified Verify record of testing with NRTL and compliance; list all UL standards that were applied

Input from August 11, 2020
Certificate of Compliance; Authorization to Mark – provided by NRTL; this is an actual certificate; some have online directories of compliant equipment; NRTLs prefer online verification

Mention of automated connection (SAE J3105) – NRTLs don't have a standard to test against for these automated systems; NRTL can put together a test program (might not allow a listing mark, but classification or recognition mark – a type certification tuned to the product in question)

UL usually publishes a document as an Outline of Investigation based on input from a Standards Technical Panel; these eventually become standards

For North America – there is a process called CANENA – this is an activity that the US, Canada and Mexico develop "tri-national"

September 29, 2020
Jordan – how to deal with improper listing; vendor used a lab that is not qualified by OSHA to certify to a specific UL standard; use of an "unqualified NRTL"; how to deal with an NRTL that is no longer qualified (or had qualification removed due to poor practice) – would we then "delist" a piece of equipment?

Gary – would require periodic checking of NRTL status; on OSHA

Rich – from NRTL perspective; OSHA has a program – note that ANSI also certifies test labs; OSHA has been slow to respond so some vendors use ANSI as a back up; example – UL 2251 is not in the OSHA list; OSHA not the only entity that certifies NRTLs

Gary – the NEC leaves it the authority having jurisdiction to access if the listing of product is adequate

Rich – noted that field listing of equipment would not show up on website; comes down to AHJ to sign off on this type of field listing; they may or may not accept some NRTLs due to past experience

[46] https://standardscatalog.ul.com/standards/en/standard_2594_2

Gary – be careful that this process isn't too restrictive and eliminate valid equipment due to a limitation in this area (such as NRTL certified by ANSI)

Jordan – would like to have best flexibility; group might chose to exclude an NRTL

Gary – you as a utility would have the option to exclude an NRTL on your own

Rich – NEC uses "labeled or listed" this is to allow for field listing

1-2	Connector and charging interface standard	EVSE charging interface must be compliant with SAE J1772[47]	There is no formal compliance regime at this time; Review vendor provided method of vetting to J1772 requirements; This represents a critical item that has very shaky backing (most vendors test their hardware against a broad set of vehicles and assume they are good if the unit works across those vehicles)

Input from August 11, 2020
J1772 is standard – it is interpreted by engineers in different ways – each vehicle doesn't behave the same; this poses a challenge – proceed with caution trying to define compliance; CharIn – trying to develop a test "plug" for J1772

J2953 – has some language for compliance (and interoperability); has section on charging rate (/4); /3 has been idle for a while (test tools focus in /3); overall J2953 has been inactive for a while

Comemso – had a tool, but difficult to use; Argonne National Lab has done work in this area

Keysight – has test tools (golden test device approach)

Jeff S – will provide feedback on CharIn activity (is it including AC interface?)

CharIn has an implementation guide (15118 focused)

Test events are on hold due to COVID-19

September 29, 2020
Anyone on call know of test tool development?
Advait – difficult given the number of auto OEMs

Oleg – what type of test tool are we talking about? Keysight makes tools that do this

Foued – there are test tools, but they don't address variability of vehicles, so doesn't fully answer the issue of interoperability

Oleg – his company offers a test tool for 15118 to monitor communications to help with testing

[47] https://www.sae.org/standards/content/j1772_201710/

Jordan – interoperability is tough as you need the “whole” system; vehicle side is just as important as EVSE – becomes a system by system assessment; hard, costly, time consuming; through this group – intention is to leverage an ongoing assessment process – continual process where the group provides information about what’s happening in the field; example – issue with brand A car and brand B EVSE – group reviews (non-conformance process); only so much you can do in the lab

Jeff – test events can help address this (multiple auto OEMs and EVSE makers)

Mauro – potential for a “golden test tool”

Oleg – standards are great – many situations can be easily done through standards (like a mechanical tolerance); when you have a complex system with communications, this becomes much more difficult; the “plugfest” events are very valuable and are great ways to advance the technology

Mauro – past experience in wi-fi area; takes time and effort; maybe approach in pieces/segments

Jordan – this is a very valid point here – there will be time when vehicle side of system is not compliant (maybe even a safety risk) – this is a possibility; this should be within our scope here; use this group to address issues found in field

Eloi – Nissan has a new vehicle coming out; formerly with CHAdeMO they had a rigorous testing protocol in place to “certify” the CHAdeMO implementation; that is lacking for CCS

Jeff – could we get a measurement company (example – Keysight) could generate a “profile” for each vehicle type – that could be used to test EVSE without need to transport vehicles to a site

Oleg – challenges sometimes arise from causes that would be very difficult to “simulate” with a test tool; gave example of real world test that wouldn’t be resolved with a test tool; if you pose a golden test device – whatever problem it has, they will be instilled in all products; still thinks we need plugfest events

Glenn – Chroma gave a demo for their testing of EVSE (car simulator and EVSE simulator) – could look at what they’ve put together

Oleg – if you look at CharIN plugfest – maybe manufacturer could supply a report of what testing they’ve participated in

Jordan – like this idea; what vehicle systems would they guarantee that their hardware would work with; Question – what does it take to get “approval”?; for this group – one of the key things different here – active management system and we need to get this going quickly as it is needed ASAP; we need to get things moving – the theory is that EVSE could provide control capability or a vendor says they are compliant with 30 types of cars, but in the field that proves not to be the case, this group could review and give feedback to vendor on issues

Ted – 3rd party certification/confirmation (testing festivals have been “closed” and private); good to have a third party to vet compliance with testing; mentioned EnergyStar and 3rd party data verification; more than what J2953 addresses;

Oleg – we can extend the thought process – maybe talk to CharIN; option – report out positive results and key fails private – reasonable to develop a framework to report public testing

Foued – products used at Testivals may not be final products, so has concern about negative outcomes from testing events; an entity like CharIN could qualify some labs to do a certification to a agreed test plan

Oleg – glad you mentioned OCPP – interoperability testing/certification; don't want another opportunity for labs to make money from industry; example – OCA's OCPP test tool – success doesn't guarantee field performance or interoperability

Foued – semantics and interpretation can be the issue with test tools (especially related to communications protocols)

Oleg – something that at least documents testing that you've done would be good

Mention of OCA test tool having issues with bugs; could we help with that here? These things take time to iron out.

Foued – develops tool and provides – problematic; need a test plan or procedure or a conformance test, but not issued by same agency that promotes or certifies labs

Oleg – believes tools will develop but it will take some time

John – for near term, could we have vendors describe their due diligence to comply with J1772?

Comment – who certifies the testing tools?

Ted – example of test tool developed from a project; DC as a Service project – has tried to develop test hardware; Argonne National Lab has groups of AC chargers that they use to test

Jordan – may take more time, but we might need to add a test profile or a set of characteristics; list things that are beyond J1772; example – issue of pushing button on connector – should this interrupt the charge? In lab, they saw inconsistent behavior of this; maybe this is beyond J1772; not sure if J1772 should cover this; had a vehicle that didn't interrupt charging on push of latch switch

Foued – feel that when there is a problem – the EVSE is always blamed

Gary – J1772 was a "recommended practice" (John comment – now a standard); there are still elements not fully defined that challenge interoperability

Jordan – if J1772 was optional – this group could decide to make that a requirement (not so concerned about the document label)

Foued – this effort looks to qualify the EVSE and NOT the vehicle; this leaves open that vehicles can behave "badly"; can cause issues, like arcing on pins

Jordan – safety is prime; even though we won't look at vehicles, but we could call out specific issues as a group

Gary – noted that EVSE doesn't look at proximity wire in AC charging (not required), so issue noted that for proper function you must have vehicle work correctly

Eloi – J1772 should cover EV to EVSE, so it should cover issues noted above

Jordan – as a group could define safety standards

Gary – could this group add new safety standards beyond what UL has?

Mauro – we would at least provide feedback

Gary – what is scope of group? Don't know that we should write new safety standards in this group

John – EPRI would not support this group writing standards; we would want to inform existing standards to address gaps

Jordan – maybe we don't write a standard – but we might write a requirement

Some debate related to an example – arcing – is it a safety issue or a functional/damage issue; could propagate to many vehicle

Barbara – agree with Jordan; started this journey – Exelon helped put this effort together; many issues of concern (safety being one); arcing would be considered a safety issue on their part; these things come back to the utility; don't want to enable deployment of equipment that could have issues like this; as soon as there is an issue in the field – it comes back to the utility (if they have enabled fielding of equipment)

Gary – let's make proposals – rule – standard – requirement – that we would write, that would be applied to a charging station – for example to solve arcing problem – how would we do that?

Barbara – don't have answer – but we still need to take action

Gary – key point – how do we solve these issues in the context of the standards that we already have? Itemize issues/gaps and carry those back to standards

Mauro – field issues would need to be documented and addressed by this group

On arcing issue – if vehicle misbehaves, there is nothing that the EVSE can do to prevent this

Need to avoid assigning blame on EVSE makers and involve vehicle OEMs in the mix

Another example – some vehicles did not respond as expected when J1772 pilot was used to implement demand response curtailment of charging; vehicle did not behave as expected; Not an issue with J1772 – but was issue in vehicle

See this group helping to provide this feedback to address issues found in the field

We could record asks for the vehicle side as well; identify issues and right down proposals

Eloi – challenge that automakers have to deal with many EVSE; this can be a challenge

Jordan – don't agree that we have to only use someone else's standard – we can write a requirement that isn't in another standard; we agree here – we don't want to add more than is needed; do want to rely on existing/external standards as much as possible

Gary – we could ask for vendor documentation to address requirement (yes, I comply and here's what I did to comply)

Jordan – we want the added coverage of ongoing review of field performance to vet compliance claim

Gary – can address issue by asking for specific items to be required in warranty

Jordan – concern with warranty path with long delays in addressing issues

1-3	Power quality criteria	EVSE must be compliant with applicable portions of SAE J2894/1[48] based on testing as described in SAE J2894/2[49]	Vendor provided documentation; limited applicability for AC charging since AC-DC conversion power electronics are onboard the vehicle; may require that we list specific tests to be performed from J2894/2

Input from August 11, 2020
Cold start (cold load pick-up) – one of the parameters that would be important in this work; J2894 is active in updating some of the parameters – so not sure how you can vet compliance while things are in flux

This will likely matter more for DC fast charging hardware

EMC is extensively covered by UL requirements (makes J2894 almost irrelevant at least in the EMC area); J2894 come from EPRI Infrastructure Working Council in 1990s (at that time there were no standards and Power Quality was a big utility concern (based on computer power supply issues) – not that relevant now

NRTL certification to UL 2954 likely covers what J2894 provides (through UL 2231-2 which is required by UL 2594)

Good exercise – what is in J2894 that might not be covered by UL compliance?

Cold load pick-up – not without controversy; original EPRI work had a ten minute delay with randomized period following; when J2894 first developed, 10 minute delay was kept, but random timing start was eliminated; discussion of late in J2894 relates to how much concern utilities will have for EV load during a cold load pick-up event

Ramp rate (amps per second) is important (but this would not be controlled by the EVSE for AC charging)

All chargers have a ramp rate – but can't be set too aggressively (high A/s rate) – again – not an issue for an AC EVSE; the EVSE can't do this through the pilot signal

David Vanderlin provided this input via email:
EMC requirements for EVSE's are not in UL 2594, they are actually in UL 2231-2 which is a required component for a UL 2594 product.

The tests from UL 2231-2 Table of Contents are. If you want a synopsis of the limits and levels, let me know.

[48] https://www.sae.org/standards/content/j2894/1_201901/

[49] https://www.sae.org/standards/content/j2894/2_201503/

September 29, 2020
Gary – UL has expanded coverage of UL 2231-2 to include performance/reliability issues for abnormal grid conditions

Jordan – J2894 may have similarities – objective of J2894 is utility interaction; UL standards are not focused on this

1-4	RF emissions/susceptibility requirements	Compliance with Federal Communications Commission (FCC) Part 15; Code of Federal Regulations, Title 47, *Part 15*[50] (47 CFR *15*)	Verify listing on FCC qualification website (correction – FCC does not currently use website to identify equipment)

Input from August 11, 2020
Regulatory requirement for all products – in US – we follow FCC guidelines (somewhat harmonized with Europe); product must absolutely do this – but there is no verification or certification that you have complied; heavy fines for non-compliance; this is a self-certification done by the manufacturer (in-house or can use an outside lab) – generate an FCC report; vendor retains a permanent copy of this document

To vet this criteria – we could ask vendors to provide a copy of their FCC test report

NRTLs evaluating to a UL standard would not request or require this (unless it was specifically required in the UL standard); NRTLs can perform the FCC testing

September 29, 2020
Gary – would not want to release their test report; what could we ask for to show compliance? Test report would be proprietary; details of report would be proprietary

John – we just want the cover letter to prove you've done testing

Foued – we should trust EVSE vendor and FCC website

Gary – agree with this; key would be how do you weed out total fraud (those that would mark equipment without having done testing)

1-5	Electrical - installation	Compliant with requirements of National Electric Code; National Fire Protection Association (NFPA) 70 (NEC)[51]; focus on article 625	Vendor provided documentation

Input from August 11, 2020
Some NRTLs confirm compliance with NEC, but not part of standard

[50] https://www.govinfo.gov/app/details/CFR-2010-title47-vol1/CFR-2010-title47-vol1-part15

[51] https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70

UL 2594 – is designed to make sure a product meets the requirements of the NEC

We may be able to leave this element out as it is covered by NRTL testing

September 29, 2020
Jordan – this is a tricky area; not sure he wants to eliminate this; issue of states being on different version of NEC

Gary – thinks it would be safe to say that a product listed to the UL standard would be NEC compliant; the state level issue of varying code requirements (using different years of NEC) is still a potential issue

Jordan – NEC still has ventilation requirements; how does this align with UL 2594?

Gary – not aware of any EVSE that offers ventilation in commercial product space; pilot wire voltage would ensure that a vehicle that requires ventilation would not charge; UL requires station to be marked related to ventilation capability

1-6	Energy Efficiency	Environmental Protection Association (EPA) EnergyStar for EVSE[52]; EPA program related to energy efficiency of end use products; reference current EnergyStar EVSE document	Verify listed on EPA EnergyStar website

Input from August 11, 2020
There are about 35 EVSE models from about 14 manufacturers on the Energy Star Website

Note that Energy Star requires NRTL listing

#	Qualification	Description	Vetting Method/Notes
	EVSE PHYSICAL		
2-1	Enclosure suitable for application	Enclosure rating; National Electrical Manufacturers Association (NEMA)[53] or Ingress Protection (IP) c. Indoor – any NEMA rating d. Outdoor – 3R (IP14), 4 (IP56), 4X (IP56) Compliance with NEMA or IP standards as noted	Vendor provided documentation; ANSI/IEC 60529

Input from August 11, 2020
This just seems to be common sense – equipment should be designed for the application

UL 2594 requirement – device is properly rated for the application; required to be on nameplate

September 29, 2020
This is more along the lines of a “feature”

Noted that 3R and IP14 are not exact equivalent

For outdoor – specify “product is listed for outdoor use”

Jason Anderson of Eaton provided the following input via email, November 25, 2020:

2-1	Enclosure suitable for application	Compliance with NEMA or IP standards as noted	Wording should be amended to a minimum standard (i.e. 3R minimum) unless the installation calls for a stricter one.

[52] https://www.energystar.gov/products/other/evse

[53] https://www.nema.org/Products/Documents/nema-enclosure-types.pdf

	Enclosure rating; National Electrical Manufacturers Association (NEMA)[17] or Ingress Protection (IP) c. Indoor – any NEMA rating d. Outdoor – 3R (IP14), 4 (IP56), 4X (IP56)	Vendor provided documentation; ANSI/IEC 60529	

2-2	Minimum Operating Temperature Range	Equipment must be capable of normal operation over the temperature of xx deg F to XXX deg F (-30 deg C to 40 deg C)	Is there an accepted industry range? Could say “compliant with UL 2594”

Input from August 11, 2020
No industry de facto range

One product -30 deg C to 50 deg C (tested as part of NRTL process); believe this is a consistent range used industry

There are products that are outside of this range; temperature rating is an NRTL requirements and appears on the device markings

The value will be part of UL 2594 listing – maybe we just document range for a given product

September 29, 2020
UL 2594 range is -30 deg C to 40 deg C (minimum range)

Gary – would prefer not to list this if it is already covered

John – issue – users don’t know what they are getting when the use a piece of equipment “listed to UL 2594”; maybe a few sentences that describe at a high level what the safety standards get you at a minimum;

This would have to be updated at standards evolve

2-3	Physical Security	If enclosure can be opened without a tool – how is it secured?	No standard to reference

Input from August 11, 2020

UL 2594 – has accessibility of live parts requirements that would be met in listing; mounting means requirements are also covered in UL 2594

IEC and UL have a finger test (live parts access)

2-4	Cybersecurity	Protection of data and integrity of firmware and operation of EVSE	

Input from August 11, 2020
No standards – there are some guidelines and Department of Energy funded projects looking at this – but not fully developed at this

2-5	Durability	Paint, materials, displays	No standard to reference

Input from August 11, 2020
UL 2594 does have labeling durability requirements (markings); do not cover paint or display but required markings
UL 2594 does have paint/materials/construction analysis (focuses on enclosure)

There is a UV resistance for materials; polymer vendors know this; UL 2594 has a UV rating requirement, but it is functional and not cosmetic; corrosion is covered

This would get into being a fabrication standard (such as how you apply paint)

ASTM may have paint durability ratings

Is this about appearance or functional durability?

2-6	Minimum Display Requirements	Power indicator; graphic display?	No standard to reference

Input from August 11, 2020
UL 2594 has a fault condition display requirement (ground fault or grounding monitor fault)

This falls more in line with a customer feature requirement – probably best not to include on this list

Should we consider – is the "station available"? That would not be covered by UL doc and no existing requirement

We'll classify this as a feature

2-7	American With Disabilities Act (ADA)	Must be capable of being installed in compliance with ADA requirements	Vendor documentation; note that ADA is mostly an installation driven requirement, but equipment must provide features to support ADA; no standard to reference

Input from August 11, 2020
This is based on a height requirement for controls/displays/cable access; ADA has force requirements aren't in line with EV connector actual behavior (plug and un-plug force)

Lack of a pedestal option might impact ability to be ADA compliant but still very installation dependent

Vendor self-statement that their hardware CAN be installed in compliance

No third-party certification of ADA compliance at hardware level

#	Qualification	Description	Vetting Method/Notes
	EVSE PAYMENT and AUTHENTICATION SYSTEMS	This focuses on requirements for local hardware	
3-1	Devices	Do we need to list specific interfaces (such as touchless credit card payment hardware)?	Reference device standards?

Input from August 11, 2020
This feels more like a feature and not something that can be set in a requirement

Jason Anderson of Eaton provided the following input via email, November 25, 2020:

3-1 – 3-4	EVSE PAYMENT and AUTHENTICATION SYSTEMS		Wording should be amended to be optional depending on the solution.

3-2	Protocol	If payments system uses an independent network, what protocol does it use?	Should this be combined with network requirements?

Input from August 11, 2020
This is likely to be vendor dependent

3-3	Security	Local hardware security requirements for payment system	Is PCI compliance applicable at the hardware level?
Input from August 11, 2020 PCI compliance at the system level would cover this (assuming that payment is made at charging station); not all systems collect payment at charging system This may fall more along the lines of a feature			
3-4	Minimum payment options		Vendor documentation
Input from August 11, 2020 General comment – state level requirements – are they appropriate for this list? Will this become an undue burden to keep up with and maybe should not be included Or we can only reference state requirements and not try to vet those in this document			
#	Qualification	Description	Vetting Method/Notes
	NETWORKING		
4-1	EVSE Data Available – Format	Detailed description of data that is required to be collected by the EVSE and format of reporting of the data	No standard to reference; some use DOE EV project data format  INL Requirements for 3rd party EVSE d Suggestion that we use OCPI for real time data
Input from August 11, 2020 John H – contacted Idaho National Lab and was given a note they said could be considered a public document that includes INL data requirements from the DOE EV Project Might need to distinguish collecting the data and reporting the data Some elements of data are part of NIST reporting requirements Goal is to see if there is an industry de facto set of data being reported in hopes of avoiding custom data requirements in every deployment Likely that there will be unique customer needs in the data space This was the last item covered on August 11, 2020 meeting (ran out of time) Starting here for August 26, 2020 working group meeting There is no standard for this data content Could this be provided by OpenADR? Is there a way to standardize an API based approach? The INL data format is not universally used and vendors have been required to provide other data. Jason Anderson of Eaton provided the following input via email, November 25, 2020:			
4-1 – 4-14	NETWORKING		Wording should be amended to be optional depending on the solution.

4-2	EVSE Data – communication (at the network level)	How is data communicated in reference to item 4-1	No standard to reference

Input from August 26,2020
Generally done via web portal; group did not know of a standard form to provide data

Real time view versus downloading files record – this is focused on the large file downloads

Does Orange Button or Green Button standards deal with this type of data?

Also – approach of getting data from an individual device – not likely to be available at this level (includes metadata that a station may not have or know)

Need to define data – what data? See item 4-1

Would NOT include getting data directly from a single EVSE or at a site.

NIST process – inspectors may need to look at and obtain data from individual stations; that is not covered here; covered by other regulations (at state level)

Consumer – there may be data provided to the consumer (that is not covered here)

4-1 is not standardized – that likely needs to happen first before you address how data is provided.

See 4-1 about API method as possibility.

4-3	Location Map with Realtime Data – Utility Focused	Host or system operator tools for charging site management	No standard to reference

Input from August 26, 2020

Maps in general are driver focused; static data is on the AFDC website (DOE)

Realtime data is consumer focused – what would be different for utility? See next item.

4-4	Location Map with Realtime Data – Consumer Focused	Consumer facing map tools	No standard to reference
4-5	Phone Support Services	Phone support services requirements	No standard to reference

Input from August 25, 2020

On list due to California's requirements
Minimum requirement for availability? 24/7 for drivers for support? Tech support maybe only during specific business hours

This may be application specific – may not always be needed (say, for a behind the fence unit)

Customer call in number is only for publicly available charging stations

4-6	Cloud Based API Features for Utility Interaction - Data	API features and functions requirements	No standard to reference
Input from August 25, 2020 See discussion from 4-1 and 4-2; could reference API capability without need for specifics about communications specifics; does need to include security How do utilities connect to field devices now (such as thermostats) – is that anything we could pull from here to use with EVSE? Germany has established EEBus as means of connectivity – potential option here			
4-7	Cloud Based API Features for Utility Interaction – Demand Response	API demand response requirements	No standard to reference OpenADR2.0b? This would be for utility demand response programs
Input from August 25, 2020 There are some emerging standards but many utilities still "do their own thing" California has looked at OpenADR as an option Scope of demand response is broad – OpenADR may be limiting IEEE 1547 identified three different protocols – so the option could be to name multiple protocols Industry approaches still vary greatly			
4-8	Cloud Based API Features for Utility Interaction – User Event Notification	API notification requirements	No standard to reference
Input from August 25, 2020 See other API related items The biggest challenge for API based connectivity – manufacturers don't know what they should do Value may be in listing current approaches and scenarios and use that to define communications would be defined Could we just define what the things are? Is there a common list of data pieces that utilities want and in what format? Get this list first, then worry about to transport the data. Another approach is IEEE 1547 model – do we want all EVSEs need the same features/capabilities? I don't think we are in a mature enough situation to know what features and data might be needed and communicated at this point. Some of these elements are defined in protocols (like OCPP and OpenADR) – but are different IEEE 2030.5 and DNP3 are both working on EVSE comms (as is ISO 15118) We could reach out to CharIn and Open Charge Alliance for their input on this topic.			

4-9	EVSE to Network Communications - Protocol	Protocol used to manage EVSE from by a charging network	Example: Open Charge Point Protocol Version 1.6? Open Charge Alliance – certified via OCA compliance tool?
Input from August 25, 2020 OCPP is prevalent – but the problem comes in at implementation; not necessarily interoperability is at issue but what portions/parts of the OCPP profiles are implemented. Focus here is on trying to prevent stranded assets; OCPP 1.6 might be good for today – but need to be flexible (and expect change) The goal would be to have something we can reference from a standards development organization (SDOs) Example – "must only use OCPP core profile" – would that lock out other features or prevent innovation – we don't want that This might be use case dependent – commercial versus residential installations – do we need to distinguish residential from commercial; May also want to separate AC and DC charging here Could refer to "Open Network Protocol" to be flexible If we do reference OCPP – we need to be clear what part of the profile is referenced; how do we deal with extensions used by vendors (DataTransfer messages)			
4-10	EVSE to Network Communications – Security - Communications	Network security requirements	No standard to reference NIST 800-53?
Input from August 25, 2020 PCI compliance is often referenced SOC2 compliance is also gaining some traction			
4-11	EVSE to Network Communications – Security - Data	Specific data security requirements	No standard to reference
Input from August 26, 2020 Security requirements are likely to vary as to security requirements based on the data content Experience that some users are now asking for compliance to the security requirements that OCA has defined for OCPP 1.6 (there is an OCA white paper on the topic)			
4-12	EVSE to Network Communications – Security – Physical	System physical security requirements	No standard to reference
Input from August 26, 2020 This may belong in the physical requirements list and not in networking Vendor mentioned that some customers are requesting data paths that are by definition unsecure and will have to rely on physical security			

These might be redundant requirements for a secure facility (where this is covered by the physical installation)

4-13	EVSE to Network Communications – Remote Firmware Maintenance	Remote firmware updating capability and related requirements	No standard to reference How is this handled when EVSE maker and Network operator are not the same company?
4-14	Roaming	Requirements for roaming	Covered by state specific language for California OCPI – primary use is roaming; NREL/AFDC starting to use this for data on locations, by Plugshare (Recargo) for real time station status – may be a good standard to align around for roaming

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Is OCPI adequate and well accepted?

Most major networks are building this interconnectivity

Need to make clear this is for Public Charging

Making this a requirement – can be tricky in that it takes more than just a single vendor to make this happen

While many use OCPI – is it the best method or better to leave more open ended and focus on end result that consumers can roam

#	Qualification	Description	Vetting Method/Notes
	Customer Experience	These are operation related requirements – not sure they belong in this list	
5-1	Customer Experience – Usability - Diagnostics	Required diagnostic	No standard to reference Is this local or network based – should this be moved under network?

Jason Anderson of Eaton provided the following input via email, November 25, 2020:

5-1 – 5-3	Customer Experience		Wording should be amended to be optional depending on the solution.

5-2	Customer Experience – Usability – Uptime	Uptime requirements	No standard to reference How defined?

Input from August 26, 2020

Seeing uptime requirements in solicitations but generally vague as to what it means; often uses cell network or other parts of network uptime is reported

Have seen requirements for station to maintain access and function during short duration network outage; maybe think about this from consumer perspective and not network

Could address this with a requirement for memory (or buffering) to support network connectivity gaps (outages)

There is also a tie with maintenance and upkeep – being proactive to help address this

5-3	Customer Experience – Usability – Repair Response	Repair response time to repair	No standard to reference Would need detailed definition. Could be hardware related or network related or both.

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	In-Field Feedback from Equipment Performance		
6-1	TBD		
#	Qualification	Description	Vetting Method/Notes
	Reliability		
7-1	MTBF	Some form of equipment reliability specification?	Would this be for hardware only or hardware and network?

Input from August 26, 2020

This may be more tied to service contracts and terms of that contract than upfront requirement

Preventative maintenance and field inspection or automate inspection

System complexity will vary greatly (single AC EVSE versus a multi-charger DC installation with interconnected charging buses and cooling systems)

Even if you specified MTBF – it isn't likely to result in better field performance – there you need monitoring – sensors and inspection to achieve good MTBF in the field

One response to this would be to define sensors or automated monitoring; not desirable if this would impact existing equipment in the field – need to be very careful if you went down this path

This should focus on "used and useful" – a normal utility requirement

General construction requirements are covered in NRTL listing (such as flammability requirements)

Reliability is different than "damage" or abuse in the field – reliability would be using the product as intended and looking at its life;

Jason Anderson of Eaton provided the following input via email, November 25, 2020:

7-1	Reliability/MTBF		Wording should be amended to allow for a defined warranty period by the product manufacturer to cover this qualification.

State Specific Requirements for AC Charging
State of California

#	Qualification	Description	Vetting Method
	Public EVSE Equipment with a Network	Some requirements are not yet required – should they be included?	

8-1	Labeling	California Code of Regulations Chapter 8.3, paragraph 2360.1[54],[55]; labeling requirements; required by July 1, 2023	Vendor provided documentation
8-2	Fee Disclosure	California Code of Regulations Chapter 8.3, paragraph 2360.1; fee disclosure requirements; required by July 1, 2023	Vendor provided documentation
8-3	Toll Free Number	California Code of Regulations Chapter 8.3, paragraph 2360.2; toll free number requirements; AC EVSE installed on or after July 1, 2023, shall comply	Vendor provided documentation
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8-7	Reporting Requirements	California Code of Regulations Chapter 8.3, paragraph 2360.4; extensive list of information that must be provided to the State of California; Applies to all EVSPs operating or intending to operate one or more publicly available Level 2 EVSE installed in California; Complex set of reporting deadlines	Vendor provided documentation
8-8	NIST Handbook 44 Compliance	California Department of Food and Agriculture, Division of Measurement Standards[56] - Electric Vehicle Fueling Systems Specifications in the CCR Title 4, §§ 4001 and 4002.11.; requires compliance with NIST Handbook 44 sections pertaining to sale of electricity as a fuel (as amended by the State of California); include metering accuracy requirements and timeline for compliance	Vendor provided documentation
8-9	California Energy Commission – Title 20 EVSE Data Requirements	California Energy Commission proposed data collection requirements; Title 20; Docket number 18-OIR-01; paragraph 1386  Proposed data collection requireme	Vendor provided documentation

[54] California Air Resources Board, https://ww2.arb.ca.gov/sites/default/files/2020-06/evse_fro_ac.pdf

[55] https://ww2.arb.ca.gov/our-work/programs/electric-vehicle-supply-equipment-evse-standards

[56] https://www.cdfa.ca.gov/dms/regulations.html

DC Charging Electric Vehicle Supply Equipment (EVSE) Qualification Checklist

This section includes the full notes as taken from the public working group calls.

Updated August 11, 2020

#	Qualification	Description	Vetting Method
	EVSE ELECTRICAL		
1-1	Safety requirements	Unit must be listed by qualified Nationally Recognized Test Lab (NRTL) to UL 2202[57]; will include other UL standards as prescribed by the NRTL; other standards likely to be referenced: UL 2231-1, UL 2231-2, UL 2251, UL 1998	Verify NRTL is qualified Verify record of testing with NRTL and compliance; list all UL standards that were applied
Input from August 11, 2020 Certificate of Compliance; Authorization to Mark – provided by NRTL; this is an actual certificate; some have online directories of compliant equipment; NRTLs prefer online verification Mention of automated connection (SAE J3105) – NRTLs don't have a standard to test against for these automated systems; NRTL can put together a test program (might not allow a listing mark, but classification or recognition mark – a type certification tuned to the product in question) UL usually publishes a document as an Outline of Investigation based on input from a Standards Technical Panel; these eventually become standards For North America – there is a process called CANENA – this is an activity that the US, Canada and Mexico develop "tri-national"			
1-2	Connector and charging interface standard	EVSE charging interface must be compliant with SAE J1772[58] EVSE charging interface must be compliant with CHAdeMO	There is no formal compliance regime at this time; Review vendor provided method of vetting to J1772 requirements; CHAdeMO alliance maintains standard – may have compliance tools
Input from August 11, 2020 J1772 is standard – it is interpreted by engineers in different ways – each vehicle doesn't behave the same; this poses a challenge – proceed with caution trying to define compliance; CharIn – trying to develop a test "plug" for J1772 J2953 – has some language for compliance (and interoperability); has section on charging rate (/4); /3 has been idle for a while (test tools focus in /3); overall J2953 has been inactive for a while Comemso – had a tool, but difficult to use; Argonne National Lab has done work in this area Keysight – has test tools (golden test device approach) Jeff S – will provide feedback on CharIn activity (is it including AC interface?) CharIn has an implementation guide (15118 focused)			

[57] https://standardscatalog.ul.com/standards/en/standard_2202_2

[58] https://www.sae.org/standards/content/j1772_201710/

Test events are on hold due to COVID-19

1-3	Power qualify criteria	EVSE must be compliant with applicable portions of SAE J2894	Vendor provided documentation; limited applicability since AC/DC conversion power electronics are onboard the vehicle Suggestion that we add <5% harmonics per IEEE 519 Note that SAE J2894 has a spec for harmonics

Input from August 11, 2020
Cold start (cold load pick-up) – one of the parameters that would be important in this work; J2894 is active in updating some of the parameters – so not sure how you can vet compliance while things are in flux

This will likely matter more for DC fast charging hardware

EMC is extensively covered by UL requirements (makes J2894 almost irrelevant at least in the EMC area); J2894 come from EPRI Infrastructure Working Council in 1990s (at that time there were no standards and Power Quality was a big utility concern (based on computer power supply issues) – not that relevant now

NRTL certification to UL 2954 likely covers what J2894 provides

Good exercise – what is in J2894 that might not be covered by UL compliance?

Cold load pick-up – not without controversy; original EPRI work had a ten minute delay with randomized period following; when J2894 first developed, 10 minute delay was kept, but random timing start was eliminated; discussion of late in J2894 relates to how much concern utilities will have for EV load during a cold load pick-up event

Ramp rate (amps per second) is important (but this would not be controlled by the EVSE for AC charging)

All chargers have a ramp rate – but can't be set too aggressively (high A/s rate) – again – not an issue for an AC EVSE; the EVSE can't do this through the pilot signal

David Vanderlin provided this input via email:
EMC requirements for EVSE's are not in UL 2594, they are actually in UL 2231-2 which is a required component for a UL 2594 product.

The tests from UL 2231-2 Table of Contents are. If you want a synopsis of the limits and levels, let me know.

1-4	RF emissions/susceptibility requirements	Compliance with Federal Communications Commission (FCC) Part 15; Code of Federal Regulations, Title 47, *Part 15*[59] (47 CFR *15*)	Verify listing on FCC qualification website
Input from August 11, 2020 Regulatory requirement for all products – in US – we follow FCC guidelines (somewhat harmonized with Europe); product must absolutely do this – but there is no verification or certification that you have complied; heavy fines for non-compliance; this is a self-certification done by the manufacturer (in-house or can use an outside lab) – generate an FCC report; vendor retains a permanent copy of this document To vet this criteria – we could ask vendors to provide a copy of their FCC test report NRTLs evaluating to a UL standard would not request or require this (unless it was specifically required in the UL standard); NRTLs can perform the FCC testing			
1-5	Can be safely installed	Compliant with requirements of National Electric Code; National Fire Protection Association (NFPA) 70 (NEC)[60]; focus on article 625	Vendor provided documentation
Input from August 11, 2020 Some NRTLs confirm compliance with NEC, but not part of standard We may be able to leave this element out as it is covered by NRTL testing			
1-6	Energy Efficiency	Environmental Protection Association (EPA) EnergyStar for EVSE[61]; EPA program related to energy efficiency of end use products; reference current EnergyStar EVSE document	Verify listed on EPA EnergyStar website
Energy Star for DCFC still a work in progress			
	EVSE PHYSICAL		
2-1	Enclosure suitable for application	Enclosure rating; National Electrical Manufacturers Association (NEMA)[62] or Ingress Protection (IP) e. Indoor – any NEMA rating f. Outdoor – 3R (IP14), 4 (IP56), 4X (IP56) Compliance with NEMA or IP standards as noted	Vendor provided documentation; ANSI/IEC 60529
Input from August 11, 2020 This just seems to be common sense – equipment should be designed for the application			

[59] https://www.govinfo.gov/app/details/CFR-2010-title47-vol1/CFR-2010-title47-vol1-part15

[60] https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70

[61] https://www.energystar.gov/products/other/evse

[62] https://www.nema.org/Products/Documents/nema-enclosure-types.pdf

UL 2202 requirement – device is properly rated for the application; required to be on nameplate			
2-2	Minimum Operating Temperature Range	Equipment must be capable of normal operation over the temperature of xx deg F to XXX deg F (xx deg C to XXX deg C)	Is there an accepted industry range?
Input from August 11, 2020 No industry de facto range One product -30 deg C to 50 deg C (tested as part of NRTL process); believe this is a consistent range used industry There are products that are outside of this range; temperature rating is an NRTL requirements and appears on the device markings The value will be part of UL 2202 listing – maybe we just document range for a given product			
2-3	Physical Security	If enclosure can be opened without a tool – how is it secured?	No standard to reference
Input from August 11, 2020 UL 2202 – has accessibility of live parts requirements that would be met in listing; mounting means requirements are also covered in UL 2202 IEC and UL have a finger test (live parts access)			
2-4	Cybersecurity	Protection of data and integrity of firmware and operation of EVSE	
Input from August 11, 2020 No standards – there are some guidelines and Department of Energy funded projects looking at this – but not fully developed at this			
2-5	Durability	Paint, materials, displays	No standard to reference
Input from August 11, 2020 UL 2202 does have labeling durability requirements (markings); do not cover paint or display but required markings UL 2202 does have paint/materials/construction analysis (focuses on enclosure) There is a UV resistance for materials; polymer vendors know this; UL 2202 has a UV rating requirement but it is functional and not cosmetic; corrosion is covered This would get into being a fabrication standard (such as how you apply paint) ASTM may have paint durability ratings Is this about appearance or functional durability?			
2-6	Minimum Display Requirements	Power indicator; graphic display?	No standard to reference
Input from August 11, 2020 UL 2202 has a fault condition display requirement (ground fault or grounding monitor fault) This falls more inline with a customer feature requirement – probably best not to include on this list Should we consider – is the “station available”? That would not be covered by UL doc and no existing requirement We’ll classify this as a feature			

2-7	American With Disabilities Act (ADA)	Must be capable of being installed in compliance with ADA requirements[63]	Vendor documentation; note that ADA is mostly an installation driven requirement, but equipment must provide features to support ADA; no standard to reference
This is based on a height requirement for controls/displays/cable access; ADA has force requirements aren't in line with EV connector actual behavior (plug and un-plug force) Lack of a pedestal option might impact ability to be ADA compliant but still very installation dependent Vendor self-statement that their hardware CAN be installed in compliance No third party certification of ADA compliance at hardware level			
#	Qualification	Description	Vetting Method/Notes
	EVSE PAYMENT and AUTHENTICATION SYSTEMS	This focuses on requirements for local hardware	
3-1	Devices	Do we need to list specific interfaces (such as touchless credit card payment hardware)?	Reference device standards?
Input from August 11, 2020 This feels more like a feature and not something that can be set in a requirement			
3-2	Protocol	If payments system uses an independent network, what protocol does it use?	Should this be combined with network requirements?
Input from August 11, 2020 This is likely to be vendor dependent			
3-3	Security	Local hardware security requirements for payment system	Is PCI compliance applicable at the hardware level?
Input from August 11, 2020 PCI compliance at the system level would cover this (assuming that payment is made at charging station); not all systems collect payment at charging system This may fall more along the lines of a feature			
3-4	Minimum payment options		Vendor documentation
Input from August 11, 2020 General comment – state level requirements – are they appropriate for this list? Will this become an undue burden to keep up with and maybe should not be included Or we can only reference state requirements and not try to vet those in this document			
#	Qualification	Description	Vetting Method/Notes
	NETWORKING		
4-1	EVSE Data Available – Format	Detailed description of data that is required to be collected by the EVSE and format of reporting of the data	No standard to reference; some use DOE EV project data format
Input from August 11, 2020 John H – contacted Idaho National Lab and was given a note they said could be considered a public document that includes INL data requirements from the DOE EV Project			

[63] https://www.ada.gov/

Might need to distinguish collecting the data and reporting the data

Some elements of data are part of NIST reporting requirements

Goal is to see if there is an industry de facto set of data being reported in hopes of avoiding custom data requirements in every deployment

Likely that there will be unique customer needs in the data space

This was the last item covered on August 11, 2020 meeting (ran out of time)
Starting here for August 26, 2020 working group meeting

There is no standard for this data content

Could this be provided by OpenADR?

Is there a way to standardize an API based approach?

The INL data format is not universally used and vendors have been required to provide other data.

4-2	EVSE Data – communication	How is data communicated?	No standard to reference

Input from August 26,2020
Generally done via web portal; group did not know of a standard form to provide data

Real time view versus downloading files record – this is focused on the large file downloads

Does Orange Button or Green Button standards deal with this type of data?

Also – approach of getting data from an individual device – not likely to be available at this level (includes metadata that a station may not have or know)

Need to define data – what data? See item 4-1

Would NOT include getting data directly from a single EVSE or at a site.

NIST process – inspectors may need to look at and obtain data from individual stations; that is not covered here; covered by other regulations (at state level)

Consumer – there may be data provided to the consumer (that is not covered here)

4-1 is not standardized – that likely needs to happen first before you address how data is provided.

See 4-1 about API method as possibility.

4-3	Location Map with Realtime Data – Utility Focused	Host or system operator tools for charging site management	No standard to reference

Input from August 26, 2020

Maps in general are driver focused; static data is on the AFDC website (DOE)

Realtime data is consumer focused – what would be different for utility? See next item.

4-4	Location Map with Realtime Data – Consumer Focused	Consumer facing map tools	No standard to reference
4-5	Phone Support Services	Phone support services requirements	No standard to reference
Input from August 25, 2020 On list due to California's requirements Minimum requirement for availability? 24/7 for drivers for support? Tech support maybe only during specific business hours This may be application specific – may not always be needed (say, for a behind the fence unit) Customer call in number is only for publicly available charging stations			
4-6	Cloud Based API Features for Utility Interaction - Data	API features and functions requirements	No standard to reference
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IEEE 2030.5 and DNP3 are both working on EVSE comms (as is ISO 15118)

We could reach out to CharIn and Open Charge Alliance for their input on this topic.

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Focus here is on trying to prevent stranded assets; OCPP 1.6 might be good for today – but need to be flexible (and expect change)

The goal would be to have something we can reference from a standards development organization (SDOs)

Example – "must only use OCPP core profile" – would that lock out other features or prevent innovation – we don't want that

This might be use case dependent – commercial versus residential installations – do we need to distinguish residential from commercial;

May also want to separate AC and DC charging here

Could refer to "Open Network Protocol" to be flexible

If we do reference OCPP – we need to be clear what part of the profile is referenced; how do we deal with extensions used by vendors (DataTransfer messages)

4-10	EVSE to Network Communications – Security - Communications	Network security requirements	No standard to reference NIST 800-53?

Input from August 25, 2020
PCI compliance is often referenced

SOC2 compliance is also gaining some traction

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		See section 7 for the proposed Commission language.	

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IDAHO NATIONAL LAB REQUIREMENTS LIST

This section contains the data requirements list published by Idaho national Lab (INL) for the Department of Energy (DOE) EV Project undertaken in the 2011 timeframe. This in reference to Criteria 4-1 for network data collection.

Idaho National Laboratory Charging Infrastructure Data Collection Requirements

Background

The EV Project is an electric drive vehicle charging infrastructure deployment, demonstration and evaluation project led by ECOtality North America and major project partners Nissan North America, General Motors and the Idaho National Laboratory (INL). This project focuses on the evaluation of charging infrastructure placement, utilization, practices, use patterns and behaviors by drivers of 5,700 Nissan Leaf electric vehicles (EVs) and 2,600 Chevrolet Volt extended-range electric vehicles (EREVs). These drivers will charge their EVs or EREVs at approximately 15,000 private, fleet and public chargers that will be deployed as part of ECOtality's EV Project, which is an American Recovery and Reinvestment Act (ARRA) funded activity sponsored by the U.S. Department of Energy's (DOE) Vehicle Technologies Program.

The primary requirement of the ECOtality EV Project is the evaluation of the deployed charging infrastructure which requires significant data collection, analysis and reporting by the Project partners, with INL having final analysis and reporting responsibility. In addition to data collected from the 8,300 onboard-vehicle data collection systems, all of the EV Project's charging infrastructure will be instrumented with data collection and data transmission capabilities. The vast majority of the charging infrastructure will consist of Level 2 (208/240 volt) electric vehicle supply equipment (EVSE) along with some DC fast chargers. The Level 2 EVSE will provide electricity to the Leaf's and Volt's onboard Level 2 chargers, while the DC fast chargers will be located off-board the vehicles.

INL Data Collection Requirements

If non-EV Project organizations, such as local or state government entities, educational institutions, or Clean Cities organizations wish to deploy additional charging infrastructure and provide charging information data, this participation is welcome by the INL. However, any Level 2 EVSE or DC fast chargers deployed by 3rd party organizations must be deployed with data collection, handling, and transmission capabilities similar to the infrastructure deployed by the ECOtality EV Project participants. These 3rd party-funded and provided capabilities must include:

- Maintaining their own data collection servers for storing charging infrastructure events information
- Managing and conducting the data transfer communications between charging infrastructure (i.e. EVSE units) and data collection servers
- Providing staff to maintain their own data server(s), the data communications process, and their portion of this data collection effort
- Each 3rd party EVSE must provide the following parameters per charging event (this is a mandatory requirement):
  - Unique ID for Plug-in Event
  - Unique ID for Charge Event(s)
  - Unique ID Identifying the EVSE – may not change

- Vehicle Connect Time (this is the start of the Plug-in Event)
- Vehicle Disconnect Time (this is the end of the Plug-in Event)
- Charge Start Time (i.e. time stamp when EVSE begins to transfer power)
- Charge End Time (i.e. time stamp when EVSE stops transferring power)
- Average Power (AC kW) per charging event
- Total Energy (AC kWh) per charging event
- 15-Minute Interval Start Time (where the first 15-Minute Interval Start Time is equal to the Charge Start Time)
- 15-Minute Interval End Time (where the last 15-Minute Interval End Time is equal to the Charge End Time; and the last interval may not last the full 15 minutes)
- Rolling 15-Minute Average Power (AC kW, captured for each 15-minute interval)
- Rolling 15-Minute Peak Power (AC kW, captured for each 15-minute interval)
- All Time Stamps are defined as a year, month, day, hour, minute, and second at the time of each entry. The time zone should be local time for EVSE. If it is not possible to log local time, all vehicles shall have a common time zone (GMT time zone is preferred). Time zone must be identified.

- Provide a data transfer portal that either 1) allows INL to initiate contact and download (i.e. pull) charging infrastructure data or 2) pushes charging infrastructure data to an INL server per a fixed schedule.

Before data collection begins, the INL also requires the following information:

- Unique Identifier for the EVSE
- GPS Location of the EVSE in latitude and longitude in decimal degrees to 5 decimal places
- Standard time zone offset from GMT for the time zone in which EVSE is installed
- EVSE specifications
  - EVSE voltage and current rating
  - EVSE type (residential or commercial/public)
- Assurance that the EVSE meets all applicable codes and standards, and is UL or other test laboratory listed. See Appendix A for Level 2 applicable requirements.
- 3rd Party Contact Information responsible for maintaining the data collection and transfer process – Contact Person, Contact Email, Contact Physical Address, Company Name, Contact Phone Number.

The goal of the above capabilities is the requirement for each 3rd party installing infrastructure to be able to provide INL with data in the same exact method as the core EV Project participants, and this requires each 3rd party to manage and maintain their own data and data collection efforts from each individual EVSE to the 3rd party data collection system.

EVSE units will transfer data to a 3rd party data collection organization in a manner and frequency of their choice. However, this data must be provided as weekly data transfers to INL via SFTP (Secure File Transfer Protocol). The file format will be CSV (comma separated value). This is the preferred method for the INL to receive data from organizations installing EVSE provided by 3rd party companies.

If the 3rd party company installing the additional EVSE wishes to provide INL with real time data, the 3rd party will be required to have an IT programmer to develop and maintain a real time interface to the EVSE and will also be required to fund the INL to provide this capability. However, this funding to the INL will require full cost recovery. This interface will enable the INL to "call" the unit and retrieve data. INL will communicate with your IT programmer regarding additional requirements. However, this is not the preferred method of data collection and it will be the most costly to the 3rd party companies.

The ARRA funding provided by DOE is limited and targeted, and it does not provide for data collection efforts beyond the specific scope in the award to support the original 15,300 EVSE and fast charger infrastructure deployment.

Summary

Additional charging infrastructure deployments, installed by 3rd parties, are welcome as this will provide a more infrastructure-rich charging environment. However, all charging infrastructure must be safe and capable of providing the same charging event information, in the same format, and at the same frequency as the infrastructure installed by the ECOtality EV Project participants. The DOE- provided scope for this ARRA funded project has very defined data collection, evaluation, and dissemination requirements for a massive amount of charging infrastructure. These requirements and the mass of instrumented vehicles and charging infrastructure necessitate that the data handling and reporting be conducted in the most economical and similar manner possible.

INL Contact

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PROPOSED DATA COLLECTION REQUIREMENTS FROM CALIFORNIA ENERGY COMMISSION

Proposed data collection requirements from California Energy Commission[66]. Proposed language for California Title 20 – snip of language for electric vehicle supply equipment (paragraph 1386):

DOCKETED	
Docket Number:	18-OIR-01
Project Title:	Energy Data Collection - Phase 2
TN #:	235223
Document Title:	Proposed Language
Description:	Chapter 3. Data Collection Article 1. Quarterly Fuel and Energy Reports
Filer:	Barbara Crume
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	10/13/2020 11:55:19 AM
Docketed Date:	10/13/2020

§1386 EVSE Session Data Reporting and Criteria
(a) Information defined in this section shall be submitted quarterly. Reports filed pursuant to this section shall be submitted no later than thirty (30) calendar days following the end of each quarter as defined:

(1) Quarter one reporting will be all of January, February, and March

(2) Quarter two reporting will be all of April, May, June

(3) Quarter three reporting will be all of July, August, and September

(4) Quarter four reporting will be all of October, November, and December

(b) This "dynamic" data is related to charging sessions for each EVSE. For each charging session, report the following information:

(1) EVSP Station ID – a station identifier used by the EVSP

(2) EVSE ID

(3) EVSE Port ID – unique identifier of the port associated with the EVSE at the charging station for the port or transmitter

[66] https://www.energy.ca.gov/event/workshop/2020-10/commissioner-workshop-title-20-data-collection-regulations-support-new

(4) Session: Start Date and Start Time

(5) Session: End Date and End Time

(6) Port Standard Used (e.g. J-1772, CCS1 Combo, CCS2 Combo, CHAdeMO, Tesla, wireless, etc.)

(7) Duration of Charging: Start Date and Start Time

(8) Duration of Charging: End Date and End Time

(9) Sustained Peak Power (kW) Output – The highest power output provided to the EV during the charging session

(10) Total Energy Discharged (kWh) by EVSE – Total energy that passed through from the EVSE into the EV

(11) Payment Method Used (e.g. cash, credit card, subscription, mobile payment, etc.)

(12) Session Price Paid (US dollars) – Total price that the user paid for the session

(13) Total Energy (kWh) Discharged by EV – Energy transferred from EV battery to EVSE for V2X services

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