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EV Charging Components and Standardization

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Abstract

Currently, infrastructure charging rates in India are similar to European conditions. In addition, the adoption of electric cars in India has been mainly in the category of light vehicles, with smaller battery packs and lower power requirements. Therefore, it is now time to specify the rates or charging modes for that type of vehicle. Normal positioning requires the links between EV and EVSE, as well as clarification of communication policies without specifying the voltage / power level. We look forward to deploying a modular charging infrastructure that offers all available options such as Bharat Charger, CCS, and CHAdeMO to the electric vehicle user applicant. So standardization is the most required concern at present which we need to address because for mass implementation it requires the address to be done in such front. If the standardization process is at loop hole, then cost and local manufacturing will not foster in India

Keywords—Charging, EV electric vehicle, EVSE. Mobility,RE renewable energy,

Introduction

The transportation component givesthe crucial link between an Electric Vehicle with a depleted battery and the electrical source that will recharge those batteries is the Electric Vehicle Supply Equipment or EVSE delivers electrical energy from an electric source to charge an EV battery. The EVSE communicates with the different vehicle (EV) to sure that aproper and safe flow of electricity supplied. EVSE units are frequently referred to as charging stations.

Charge stations integratelarge number of assemblies and controllers.

- The PE congregation is the guts of a charge station. Functionally, it supplies the power to the Electric vehicle onboard battery charger. Itmade up of wires, capacitors, transformers.
- The network controller provides the intellect of the charge station. It enables the station to converse with its network (via an on-board telecommunications device) so that managers can monitor it and review historical event data. It also controls user access to a charging station through a series of white (authorized) or black (unauthorized) lists.
- The charge station cable and connector plug into the target EV. These Element provide the conduit for a charge to be delivered

Electric Vehicle Supply Equipment (EVSE):
This EVSE provisions electrical energy from an electricity source to charge Electric Vehicle battery. This EVSE assist and manage to make sure that proper and safe flow of electricity. In other word; we can say it conclude that EVSE is a charging station.

Some Basic Components of E-Vehicle
The equipment, connected to the main electric supply that provide ac or dc for the charging of traction battery. EVSE charging capacity is the key factor as they have an interrelation on how fast the batteries can be recharged. As in additional proceeding theory we will come across

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how the level 2 EVSE is available in 20, 30, 40 amp capacities as advanced current rating is directly proportional to faster recharge time.

Electric vehicle connector:

There are various typical type of connectors available in the market, like SAEJ1772 (USA developed), the CHAdeMO(japan developed connector and recently Tesla developed supercharger Tesla electric automobiles.

Electric Vehicle Inlet:

This machine on the EV that offer the connection between the EV and EVSE connectors. EV has more than one inlets port and location &vary from one EV toanother EV.

Battery Charger:

Level 1 and 2 chargers uses the EV inside part of battery charger to convert the EVSE alternating current supply to the direct current. DCFC (dc fast charger) supply high current dc electricity directly to EV battery, the onboard charger conversion ac to dc is not required and this function of the on board is by- passed when a DCFC is used. On board battery charger option are good parameter.

Ev chargers:

EV chargers is also known as EVSE i.e. electric vehicle supply equipments ,different plug in is required for recharging the electric vehicle, as this in turn make us comprehend how to make it compatible on both ends .As we need to follow common specifications for various range of vehicle.]

Types of Chargers:

EV charger can be classified based on:

- Ac and dc type
- Different Power level.
- Speed level of charging and communication system.
- Different types of Connector

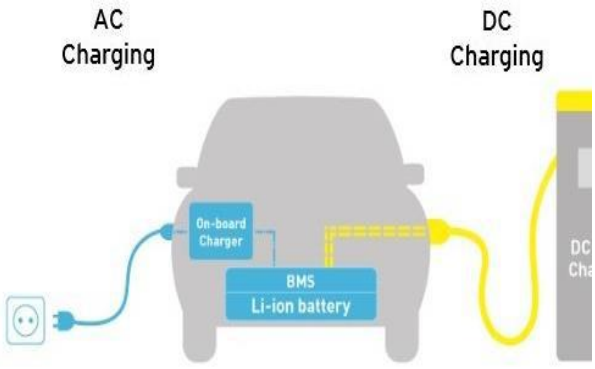

Figure:- Mechanisms of EVSE and Charging

From figure we know the basic mechanism of EVSE and charging as it depicts all the vital components of charging infrastructure .Here, we can comprehend that EV can be compatible with both type of supply at a time or simultaneously depends on the demand of usage and other factors

Working of EVSE:

In this, we have a provision of both dc and ac charging. The on board charger is connected to the ac supply which has an inbuilt rectifier /inverter circuit which in turns supply energy for recharging of the batteries. On the other hand, it has dc fast charging terminal, which is also connected to the battery for recharging it.

In this case, the type of battery, thermal management and other important factors like SOC (state of charge), DOD (depth of discharge) plays main role. BMS (battery management system) uses another communication interface, better network technologies (smart metering, remote control and automation system, smart sensor, optimization and aggregation technologies smart appliances and devices, IOT-internet- of- things).

Digitalization would be the best added value feature which would not only enhance the feature of end users but it also helps in better assessment of the power system, the Electric Vehicle Supply Equipmentdesires to communicate with BMS of battery pack in EV, so that it is charged with right rate with well-maintained SOH of batteries. Vehicle manufacturers in India use this physical layer for communication.

Communication among different EVSE and CMS in Utilities Company, this will bring a good reflection/resemblance of what rate to be maintain as per the grid supply or availability. As this would enable us to design and formulate metering at different rates, and to know- how to meet the large current demand during the charging and whether grid is able to supply for it.

AC Charging and Connector Components:

IEC 60309-1

Interpretation:

This gives the insight of different plugs, sockets-outlets & couplers for manufacturingpurpose of the system only. It applies to small equipment i.e. plugs and socket-outlets, cables couplers and appliance couplers, with a higher operating voltage range which not beyond 690 Volt Direct Current / Alternating Current and500HzAlternating Current ,andthe value of currentnotmore than 250 Amp.It is primarily or soul designed as per technical specifications specially intended for industrials use, which can be applicable for either indoors or outdoors of industry and factory.

Field of Scope:

It has field with defined parameters for:

- Standardrating voltage and current range
- High Electricshocksafety
- Earthingsrequirements

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- restrictives/c current(I) analysis
- Electromagnetic

IEC 60309-2
Interpretation:
The seriesof main criteriafrom the IEC for "plugs, sockets outlets and couplers for manufacturing purposes". highest voltage permissible is 1000 V DC or AC,and I_M is 125 Amp; and the greatest frequency,500 Hz. The ambient temperature range is −25 °C to 40°C.for 50–60 Hz AC power are yellow for 100–130 volts, blue for 200–250 volts, and red for 380–480 volts.

Field of Scope:
- Electricshocksafety.
- Earthing requirements. .
- Current hauling parts & different connections.
- RestrictedS/C current check

SAE J 1772 (Type 1)
Interpretation:
"J plug", is also defined as EV Conductive Charge Couplers and it is American standard for Electric - vehicles.The SAE J1772 groupplaned a DC connectors based on the SAE J1772-2009 AC connectors shape& size with other DC and ground pins to support charging at 200 v –450 V Direct Current and 80 A (36 kW) for **DC** Level 1 and highest up to 200 A (90 kW)

DC Level 2

once evaluating the J1772-2009 connectors besidedifferent r designs with the JARI/TEPCO connectors using by the CHAdeMO DC very fast chargers protocol.

Level	Voltage	Phase	Maximum current continuous
Level 1	120 volt AC	Single phase	12 and 16 AMP.
Level 2	208-240 Volt AC	Single phase	≤ 80 AMP
Level 3	208-600	3 phase	90–120 Amp.

Field of Scope:
Normallylevel lis conductive charge methodof E – vehicle, to control and data managed of,normal Electric Vehicle and EVSE necessities, and couplers requirements, etc

Direct current Charger level & Connector:

IEC-62196-3model rating

Dimensional compatibility &interchanges capacity need for Direct current and Alternating or Direct current pin and contact- tube vehicles and couplers planned for use in E- vehicle conductive charging systems which integrate control the system , with higher operation voltage level up to 1500 Volt Direct current and higher current up to 250 A, &1000 VAlternating current and high current up to 250 A.

Field of Scope:
- Connections between E-VSE and Electric Vehicle.
- Designs&constructions of sockets outlets.
- Plugs, E-vehicles connector.
- Vehicles inletssystem.
- Interlocking system
- Earthings'.
- Different Cables and their connections.
- S/C performance parameter

GB/T 20234.3-2015 models
Interpretation:
Connections sets to conduct charging of E-vehicles
Part 3: Direct Current charger uses for couplersand Itrelated to E-car couplers inmode4&connections modeC,ofwhich thehigh voltagewhich notgo higher up to 1,000Volt direct current andthehigher range current value which notbeyondmore than250A.direct current (DC).

Field of Scope:
- Normal need and operations ,
- Operational definitionsfor different parameters,
- High direct current charger couplers,
- specialFunctions to the vehicles couplers,
- The Parametric value anddifferent dimensional analysis ofdirect current charger couplers to conduct charger for electric vehicles,

Vehicles to Grid Standards:

ISO 15118-1

Interpretations:
Road vehicles and V to G communicationsline
Part 1 : Normal information's&description. It specifyprovisos&definition of need &uses on thesource for the another part of standard 15118 modules. It gives a general overviewandafrequentperceptiveofaspectand

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influenceon the charge process, payment &load leveling of the system.

Field of Scope:

- Need for information concept
- consumer oriented,
- OEM precise,
- Utility precise,
- For preparing charging progression,
- Different Cables and their connections.
- and charge arrangement,
- To stopcharging process.

ISO 15118-2
Road vehicles &Vehicle to grid interface–
Part2:Networkandtheir applications protocolneeds
Field of Scope:
Basic requirement need for Vehicle to Grid communication, service primitive concept of OSI layered architecture, security concept, Vehicle to Grid communication and data link handling, data, network and transport layer, Vehicle to Grid transfer protocol, Vehicle to Grid message definition, Vehicle to Grid communications session and body element definitions, Vehicle to Grid communications timing, info.Sequencing and inaccuracy handlingcapacity.

ISO 15118-3
Interpretation:
Road vehicles - vehicle to grid communication interface -Part 3: physical and data link layer requirements.
Field of Scope:

- System architectures
- Electric car and supply systemneeds.
- Connections system
- Loss of communications for Electric Vehicle and EVSE side.
- Different Plug-out phase, timings and different constants.
- Identical Electric Vehicle – EVSE process.
- Signals coupling system

ISO 15118-4
Interpretation:
Road side E -Cars- V to G communicationsinterface –
P- 4: Networks&applications protocolsinsure test .
Field of Scope:

- Test architecture referencesstructure, platform and SUT adapter's interfaces.
- Test suite conventions.
- Test case descriptions for 15118- 2 V2GTP.
- SDP messages and V2G applications layer information.

ISO 15118-5
Road side vehicles - V -G communicationsinterfaces–
Part 5:physical&datalinklayer for communication insure

Field of Scope:

- Test architecturesreferences models.
- EV and EVsystem needs.
- Checking of case descriptions for 15118- 3 signalsfor measurements
- Different Cables and their connections.
- Different Cables and their connections.

ISO 15118-8 standard
Interpretations:
Roadside E -Cars–The V to G communications
Interfaces–
Part8:physical&datalinklayer for communication
Field of Scope:

- System architectures design ,
- Wireless communication need for SECC,
- EVCC and securities, etc.

Conclusion

Itwill give faster market access; standardizationis importancefor charging system, It Establishthe relational between the vehicle and the chargers, standardization improve vehicle safety and safety of persons against electric shock. Standardization in Electric Vehiclesis ensuring that there are no barriers from this point of view to the EVs massive spread as a sustainable mobility solution.

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Author profile

Pawan Kumar Tiwari was born in 1991 in India. He completed B.Tech first class in Electrical Engineering in 2013 andM. Tech(Hons) in Energy Engineering from Suresh Gyan Vihar University, Jaipur India. His research interested on solar photovoltaic, electric vehicle. At present He is working as a Assistant professorat SBCET,jaipur, rajasthan, india-302013.