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Review of Electrical charging station and its infrastructure

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Abstract: This paper is based on electrical vehicle charging station and its infra structure which give some information about charging station and how its work, The world transportation area is in the change state, it is moving from conventional to non-conventional energy source fuelled vehicles without internal combustion engine vehicles. Due to the growing demand of electrical vehicle the recent researchers needs to investigate the optimal location of electric vehicle charging stations. To help this change, a legitimate charging station framework in combination with information technology, smart distributed energy producing units, and good government approaches are required. Also structured analysis of parameters is performed for the commercial opportunities of electric vehicles in existing energy market. This paper provides an overview of electrical vehicle charging station, including their types, technologies, challenges, and structure.

Keywords: Introduction, types of EV charging stations, components of EV charging station, EV charging infrastructure, Conclusion.

I. INTRODUCTION

Today, the number of registered Electric Vehicles worldwide is increasing rapidly, and they introduce new challenges to the grid as they affect the load profile. This additional energy required for new EVs needs to be provided by the network; thus, electricity companies must find solutions to provide the vehicles with adequate power and prevent loads from unbalancing. Here a basics working of EV charging station by following block diagram.

- First a supply is taking form power grid
- After then using a transformer, a voltage be set on required level.
- Using rectifier and chopper we convert AC into DC and convert it from fixed DC to Variable DC
- Then a supply gives to EV, a voltage level is based on type of vehicle like low speed, medium speed and high speed. [1]

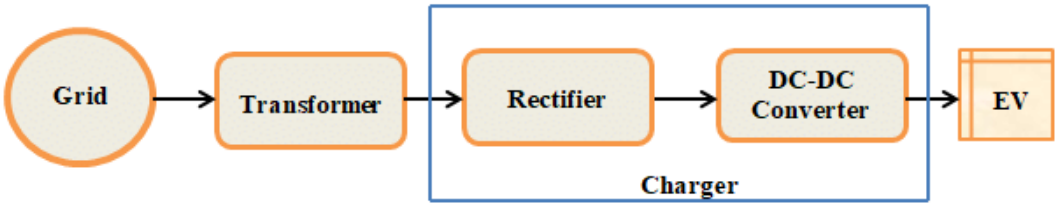

Fig 1 Block diagram of EV charging station

II. TYPES OF EV CHARGING STATIONS

There are three levels commonly used to describe the charging power of EVSE: Level 1, Level 2 and DC Fast Charging. The amount of range provided for each of these is shown in Figure 2. below with additional details in the following sections.

1. Level 1 Charging: Basic home charging using a standard electrical outlet

2. Level 2 Charging: Faster charging at home or public stations with dedicated equipment

3. DC Fast Charging: Rapid charging for long-distance travel or quick top-ups

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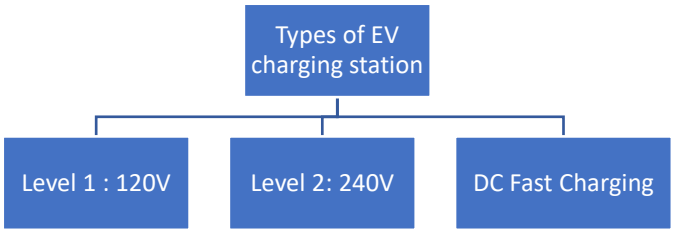

Fig 2. Types of Charging station

1. **Level 1- Charging:** This simplest form of charging uses a 120V AC connection to a standard residential/commercial electrical outlet capable of supplying 15-20 amps of current, for a power draw usually around 1.4 kW when charging. EVs come equipped from the manufacturers with portable Level 1 chargers. AEVs with 60-80 miles of range will require 10-14 hours for a full charge using Level 1 EVSE.

2. Level 2- Charging: Level 2 charging requires a 240V AC power connection and significantly reduces charging time. Home users commonly use 240 V power for electric clothes dryer appliances and many commercial customers have 3 phase electric service with 208 V power. Either voltage works well for "Level 2" charging. This charging level used by most EVs can theoretically provide up to 80 amps of current (19.2 kW), although most vehicles presently available only use up to 30 amps for 3.3 to 6.6 kW6 charging. AEVs with 60-80 miles of range will usually require 3-7 hours for a full charge using Level 2 equipment, depending on the capacity of the EVSE and the vehicle charging system. EVs with smaller batteries, such as a PHEV with 10 miles of range (e.g. Toyota Prius Plug-in) may require less than an hour to reach a full charge.

3. **DC Fast Charging:** Sometimes referred to as Level 3, DC fast charging equipment delivers high power directly into an EV's battery system, enabling rapid charging. Typically, an 80% charge can be provided in 30 minutes or less for many all-electric vehicles. DC fast charging does not same J1772 plug connectors as Level 2.[2]

III. COMPONENTS OF EV CHARGING STATION

A component required for EV charging station follow: [3]
Chargers are also classified by the kind of connector on the charging cord. There are currently two competing standards sold in the United States: SAE J1772, developed by SAE International, and CHAdeMO, developed by an organization of the same name. The connector inlets can be seen in Figure 3.

Fig 3. Charging connector

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The SAE J1772 standard covers both AC (J1772) and DC (J1772-CCS)2 charging, while the CHAdeMO connector is only used for DCFC charging. Tesla also has a proprietary connector for their charging 2CCS stands for Combined Charging System. 3 stations exclusively available to Tesla drivers, and is not covered here. In the US as of the release of this guide, CHAdeMO charging comprises the largest share of DCFC stations, while J1772 is the main standard for Level 1 and Level 2 charging, with a smaller share of DCFC charging. The SAE J1772 standard is expected to dominate the U.S. market in the future.

IV. EV CHARGING INFRASTRUCTURE

The characteristics of a good charging station placement model are as follows:

- The model must take into account both transport and distribution network parameters
- The model must have the ability to consider economic factors associated with the establishment of charging stations
- The model must consider Electrical Vehicles drivers' convenience
- The model must consider the security of the distribution network
- The model should be able to produce the output planning results with less computational costs

If EV owners charge the vehicle whenever and wherever they wish, utilities will have no choice but to expand the charging capacity and grow the number of charging stations Since this usually comes with uncontrolled charging, the energy will not be optimized, and the load profile will not be flattened, leading to many issues brought on the grid. Therefore, it is suggested for the utilities to invest in smart charging rather than installing new infrastructures. Developing new charging stations may be required for areas facing a few numbers of charging stations. However, the grid's capacity must be accounted for if a new station is planned to be installed. Besides, developing a new charging station requires financial investment. Therefore, there must be a tradeoff between developing new charging stations and energy optimization.[4]

Fig 4. Infrastructure of charging station

V. CONCLUSION

After reviewing this paper we can conclude that in which level we can use a EV charger for different commercial side and what are the components used for EV charger also, what important points need for infrastructure of EV charger.

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