



REQUIREMENT OF ELECTRIC VEHICLE CHARGING STATIONS IN INDIA

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Abstract— This Paper confers about the necessities of electric vehicles (EV), charging station (CS) infrastructure and its encounters for the Indian scenario. With upsurge in liberalization, privatization, and expansion of spread and renewable power production of Indian energy market, transmission and distribution, also as market developments associated with the distribution of energy and energy mix are enduring an increase in efficiency and consistency by evolution for the commercial scopes of alternative fuels in the current energy sector, a structured analysis of respective parameters is undertaken. Market-based and regulatory alarms are considered to specify a scenario where an aggregator controls the charging of electrical vehicles and provides auxiliary grid services. For drivers who really need the implementation of a smart charging substructure network, finding EVC stations for electric vehicles is a primary issue. Selecting the condition for installing EV charging stations is dynamic to make sure EV adoption and also to deal with a number of the integral risks like battery cost and degradation, economic risks, lack of charging infrastructure, risky maintenance of EVs, issues of its integration in keen network, extend uneasiness, assistant loads and driver state of mind.

Keywords— Electric vehicle, Charge scheduling, smart charging, charging stations, electric vehicle battery, charging stations location conditions, infrastructure.

I. INTRODUCTION

An electric car, also known as an EV, is driven by one or more electrical machines or footing engines. An electric vehicle may be identity with such a battery, solar power, or an alternator to process fuel to energy, or it may be fuelled by a converter framework by power in off supplies. EVs to begin with came into presence within the mid-19th century, when power was among the favoured strategies for engine vehicle drive, giving a level of consolation and ease of operation that may not be accomplished by the gasoline cars of the time. Advanced inner combustion motors have been the overwhelming drive strategy for engine vehicles for nearly 100 a long time, but electric control has remained commonplace in other vehicle sorts, such as trains and littler vehicles of all sorts. Commonly, the term EV is utilized to allude to an electric car. Within the 21st century, EVs saw a resurgence due to innovative advancements, and an expanded center on renewable vitality. An awesome bargain of request for electric vehicles created and a little center of do-it-yourself (DIY) engineers started sharing specialized subtle elements for doing electric vehicle conversions. Government motivating forces to extend appropriations were

presented, counting within the Joined together States and the European Union. Electric vehicles are anticipated to extend from 2% of worldwide share in 2016 to 22% in 2030. [1] Amid the final few decades, natural affect of the petroleum-based transportation framework, together with the fear of top oil, has driven to re-established intrigued in an electric transportation foundation. EVs contrast from fossil fuel-powered vehicles in that the power they devour can be produced from a wide extend of sources, counting fossil powers, atomic control, and renewable sources such as tidal control, sun based control, hydropower, and wind control or any combination of those. The carbon impression and other outflows of electric vehicles changes depending on the fuel and innovation utilized for power era. The power may at that point be put away on board the vehicle employing a battery, flywheel, or super capacitors. Vehicles making utilize of motors working on the rule of combustion can as a rule as it were infer their vitality from a single or some sources, as a rule non-renewable fossil powers. A key advantage of cross breed or plug-in electric vehicles is regenerative braking, which recuperates motor vitality, regularly misplaced amid contact braking as warm, as power re-established to the on-board battery. [2]

II. OVERVIEW OF CHARGING INFRASTRUCTURE

As an everyday hone and utilize design, it is likely that most of the time, individuals will have their electric vehicle charged some time recently they will begin a day. Within the nonattendance of stopping places at home, individuals would incline toward to charge their electric vehicles at their working environments. Amid the day, for the city commuting, individuals will need to top-up the EV battery at each sensible opportunity and put, say for e.g. at shopping complex or a commercial complex. We may anticipate that unless individuals have a stop-over of 2~3 hours or more, they will not need to charge at such places. Be that as it may, for taxi armadas for the need of running more kilometre per day, the require for open chargers (with inclinations for quick charging to diminish downtime) will ended up critical.

For the Domestic Communication, we need more Boost or fast chargers is required at the stop-overs to permit allow top-up. It may be famous that for quick charging in 30 minutes or less, electric vehicles will be got to be capable of

taking such tall voltage or current (or both), which is able increment the fetched of the EV and influence battery life.

III. CHARGING STATION FOR ELECTRIC VEHICLES IN INDIA

More than fair a control outlet, the charging terminal permits for charging electric vehicles securely with most extreme effectiveness. Not at all like a family outlet, which does not incorporate any particular work, the charging terminal is planned particularly for this operation which any demonstrate of an electric vehicle is associated to the terminal. The car is regularly prepared with one or more electric engines with add up to capacity extending from 15 to 100 kW depending on estimate, utilization and craved execution. The battery pack gives control either from the charge given by the cable from an outside source or when driving amid the deceleration of the vehicle, the motor working as a generator. The battery capacity ranges from 5 to 40 kWh with a add up to voltage of 300 to 500 V. Charging stations simply convey the vitality to the vehicle, more often than not within the frame of a tall voltage AC or DC supply. They do not ordinarily have the capacities of the charger which must change the electrical vitality into a shape that can be applied directly to battery. Broadly talking, three diverse control levels have been characterized but inside these levels, an awfully wide run of choices are accessible to suit the diverse existing control lattice measures of the national power creating utilities.

Charging station for electric vehicle is exceptionally critical calculate as without it individuals cannot travel longer separations utilizing electric vehicle. The charger given with electric vehicle is ordinary charger which needs more time to charge battery fully. But charging station gives rapid charging due to which battery gets charged completely in exceptionally less time compare to other charging mediums. As in electric vehicle ordinary chargers are AC chargers with one or three stages in which AC is changed over into DC utilizing possess converter whereas rapid or quick charger are DC charger where there's no necessity of change. Due to this most of the individuals will prefer charging their electric vehicle in charging stations as it can spare their time. Charging stations were set up because it was the as it were source for charging electric vehicle when voyaging. For developing a charging station expansive sum of space and fund is required. And as in India numerous fuel stations are built up due to which building up charging station is troublesome. The charging cable underpins both typical and quick charging. The cable is secure in blustery season moreover. As a few individuals think that it is unsafe to charge electric vehicles whereas it's sprinkling as water and power combination is destructive which can cause major mishaps. But EVC are strong enough to compete with the environmental challenges which protects vehicle and human both from electric shock [3].

There are four types of charging station for electric vehicle: -

A. Residential charging station

These are charging station construct in our private region where we will charge our vehicle at whatever point we need. It employments typical charging which takes around eight to nine hours. The association given is either two stage or three stage and charger utilized is AC charger. These charging stations are used when individuals are having free time for illustration, we will utilize this for charging our vehicle

every day when we come back from our work and charge vehicle in free time. In India Tata Company car Nexon EV is giving with possess charging station which ready to construct within the region where we stop our vehicle and charge there [3]. It moreover gives charging cable for typical charging as it were and on the off chance that we need to utilize quick charging innovation it is given at charging stations as it were [4].

B. Charging Station at Parking

We are able utilize this charging station by paying expense and charge our vehicle whereas in stopped zone. These charging stations are accessible in a few nations but not in India. India should make this station at shopping center stopping parcel which is able be made accessible to most of the individuals.

C. Fast Charging Station

It has capacity of more than 40 KW [4]. It can be utilized when somebody is having less time to hold up for charging vehicle. These are built in long course zones due to which individuals voyaging for a long separate can utilize it and avoid holding up in a que for charging their electric vehicles. These sorts of charging station are accessible in a few nations and exceptionally few in India. Quick charging has brought an extreme alter in charging field due to which individuals can spare their time.

Battery Swapping Centres

An elective for charging station issues a few vehicle businesses had set up battery substitution centers where individuals utilizing electric vehicle can allow their released battery and pay a few sum to require charged battery. Usually a robotized component which spare expansive sum of time conjointly it is some of the time way better than quick charging. For illustration, Revolt Company of bicycle has propelled this framework of battery substitution in India and other nations [5]. Many battery substitution centers of Revolt Company are set up in India which has made a difference to extend deal of this electric vehicle. This elective strategy is way better but it causes wastage of batteries additionally diminishes life of battery. Numerous nations are utilizing electric vehicles some time recently India due to which they have built up numerous charging stations in their ranges. But as India has not totally moved from fuel vehicles to electric vehicles they have exceptionally few charging stations due to which individuals cannot travel long Distances. Besides, run of electric vehicle is additionally less so individuals think that instep charging an electric vehicle once more and once more they select to use fuel vehicles. There's a have to be increment charging stations in India as government is planning to move towards green vitality which can as it were be conceivable by utilizing electric vehicle. Government is additionally executing distinctive approaches to develop charging stations. As less sum of charging station and moo extend of electric vehicle are major downsides in India which ought to be illuminated.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE)

Electric Vehicle Supply Equipment (EVSE) or charging equipment is prerequisites for electric vehicle (EV) adoption and they can be broadly classified as

- 1) AC charging devices
- 2) DC charging devices

Within the case of AC charging, the charging speed depends on the DC yield from the onboard AC-DC

converter. For case, a single stage 220V AC, 15 Amps supply (AC yield- 3.3 kW) associated to an EV with a 10 kWh battery and on-board AC-DC converter with an yield of as it were 1 kW DC may take 10 hours to completely charge the battery. AC chargers with tall control yield are accessible which can quick charge the batteries depending on the battery chemistry and battery management framework (BMS) within the EV.

DC Quick Chargers DCFC) with tall control yield can supply DC control to the battery and can charge the EV battery much quicker. A 50 kW DCFC can charge an EV with a 25 kWh battery in 30 minutes (hypothetically). DCFCs are more prudent as AC-DC conversion takes put within the EVSE itself instead of interior the vehicle. When an EV is connected to EVSE a hand-shake is set up between the EV and EVSE, and the BMS within the EV takes control over the charging process.

Table- 1 charging time and level of charging.[6]

Charging time for 100 km of BEV range	Power supply	Power	Voltage	Max current
6–8 hours	Single phase	3.3 kW	230 V AC	16 A
3–4 hours	Single phase	7.4 kW	230 V AC	32 A
2–3 hours	Three phase	11 kW	400 V AC	16 A
1–2 hours	Three phase	22 kW	400 V AC	32 A
20–30 minutes	Three phase	43 kW	400 V AC	63 A
20–30 minutes	Direct current	50 kW	400–500 V DC	100–125 A
10 minutes	Direct current	120 kW	300–500 V DC	300–350 A

A. Charging time:

The charging time depends on the battery capacity and the charging control. In basic terms, the time rate of charge depends on the charging level utilized, and the charging level depends on the voltage taking care of the batteries and charger gadgets within the car. The U.S.-based Society of Automotive Engineers Worldwide characterizes Level 1 (family 120V AC) as the slowest, Level 2 (upgraded household 240 VAC) within the center and Level 3 (super charging, 480V DC or higher) as the quickest. Level 3 charge time can be as quick as 30 minutes for an 80% charge, in spite of the fact that there has been genuine industry competition around whose standard ought to be broadly embraced. Charge time can be calculated utilizing the equation: Charging Time [h] = Battery Capacity [kWh] / Charging Control [kW]

The usable battery capacity of a first-generation electric vehicle, such as the first Nissan Leaf[7], is approximately 20 kWh, giving it a run of about 160 km. Tesla was the primary company to present longer extend mass generation electric vehicles, at first discharging their Demonstrate S with battery capacities of 40 kWh, 60 kWh and 85 kWh, with the last mentioned having an assessed extend of approximately 480 km. Plug-in half breed vehicles have capacity of generally 3 to 5 kWh, for an electrical extend of 20 to 40 kilometers, but the gasoline motor guarantees the complete extend of an ordinary vehicle. For typical charging (up to 7.4 kW), car manufacturers have built a battery charger into the car. A charging cable is utilized to associate it to the electrical organize to supply 230-volt AC current. For faster charging (22 kW, indeed 43 kW and more), producers have chosen two arrangements:

- 1) Use the vehicle's built-in charger, outlined to charge from 43 kW at 230 V single-phase or 400 V three-phase.
- 2) Use an outside charger, which changes over AC current into DC current and charges the vehicle at 50 kW (e.g. 120-135 kW Tesla Demonstrate S). [6]

Charging station selection criteria:

A variety of models designed for different uses are available on the market. When selecting a charging station, consider these factors:

- a) The power required (charging time, vehicle capacity, pricing).
- b) The communication requirements (access control, payment system, help system).
- c) The number of cables and plugs (for shared-access stations).
- d) Location or site of the station.

Public and private charging stations-

This area depicts the distinctive sorts of charging station establishments to help in selecting the foremost fitting for your needs. Since this Direct habitually notices private and open stations, it is vital to characterize these concepts. A private station may be a station purchased by a person for individual utilize. An open station may be a shared station; it may be introduced on open or private property by an open organization or a company. When introducing Level 2 charging stations for the representatives or clients of a trade in a building that's subject to Rate G, maintain a strategic distance from optimization charges by guaranteeing that the stations don't cause the greatest control request to surpass 50 k W (switch to Rate G-9 or M on the off chance that vital). In the event that the greatest control request as of now surpasses 65 k W and is hence charged beneath. Rate M or Rate G 9, the control utilization of charging stations might result in an extra fetched for each extra kilowatt. In this case, consider person associations or a littler number of charging stations. General EV charging station location arrange contemplations incorporate: 1. Control accessibility (240V for Level 2, 3 stage for DC quick charging). 2. Level stopping surface, ideally cleared so Electric Vehicle Service Equipment(EVSE) spaces can be stamped. 3. Lit, obvious region to address security concerns. 4. Availability for crippled clients. Obstructions or mounting alternatives to ensure EVSE gear from vehicles. 5. Signs and asphalt markings to assign destinations and confine their use.

IV. RESULTS AND APPLICATIONS

Lower costs empowering EV drivers to take an interest in utility request reaction programs and uncovering clients to request side administration will essentially lower costs for drivers and station proprietors. In expansion, dodging long term utility ventures through stack administration will lower costs over time for all ratepayers through more prominent utilization of utility era, dispersion and transmission resources.

More Charging Stations in More Places: Allowing utilities to consolidate into their common rate cases the costs of the framework required to introduce a charging station, nearby the other ventures that utilities make each year, will cut the cost per station by more than half. This could increment openings for work environments, retailers, clinics, schools, lodgings, homes and flats to include more stations in more places.

V. CONCLUSION & FUTURE SCOPE

India has the biggest advertise of EV within the world. With the advancement of framework. Technology and control source there's chances for a move towards EV's. To extend the open mindfulness in our nation, the beginning approach of central empower advertise players at universal level to carry out thinks about for finding potential areas for the improvement of EV charging framework and EV Supply gear. There's a wide scope for EV's in two wheeler showcase, auto rickshaw, products vehicle, transport as well as four wheelers. There has been no prove found in this limited inquire about that can back the target of 25,000 stations by 2020 in any case there's prove that shows 300 stations by 2016 may be a dependable probability. In Over research we find some places where we set up the charging station and as well as EV charging stations to permit EV driving anyplace within the nation to supply EV charging station at all petrol stations and shopping centers etc.

Within the close future, e-mobility would not be something of extravagance but it would be something vital for the survival since the contamination level is disturbing and the as it were arrangement is the green sources and transmission of vitality. Thus, EVs are unavoidable when it comes down to it, so it is way better to arrange and organize approximately how the improvements are attending to happen instead of evading the alter. The prior this realization happens, the way better. It is required to lay strict guidelines and a time overseen system as to how changes are getting to happen and how to create the foremost of it. There are qualities and shortcomings in each space which have to be considered upon and annihilated, separately.

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