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Impact consideration of electric vehicle charging stations on urban infrastructure

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Abstract. One of the major growing concerns of this era is environmental protection, our ecosystem being partially degraded by various factors, among which a quarter of global greenhouse gas emissions come from transportation.
The convenience factor in recharging electric vehicles has a major impact on the decision-making process regarding the purchase of electric vehicles. Factors such as population density, demand for charging facilities, accessibility of energy sources, etc. are the main contributors in determining the locations of EVCS. Thus, the demand and supply of EVCS must be met in an optimal manner for the benefit of both EV owners and EVCS operators. Considering these factors and many other information, many literature reviews.
Keyword. *electric vehicles, urban charging stations, CO_2 emissions reduction.*

Introduction

Electric vehicles are an innovative transportation technology that uses electricity to propel vehicles, equipped with an electric motor and a battery that stores the energy needed to operate. The development dimension of the market and charging infrastructure for electric vehicles begins in 2021 and can be presented as figure 1. [2]

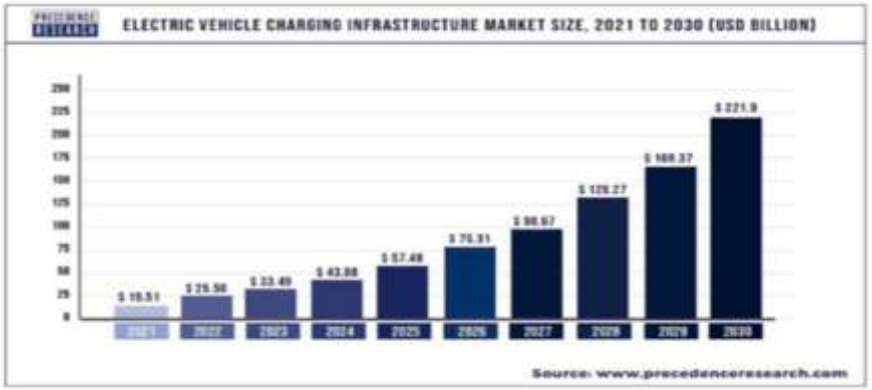

Fig 1. The size of the electric vehicle charging infrastructure market

Charging stations integrated into the publictransport network and in urban areas contribute to a more efficient and accessible transport system.The development of charging stations stimulates innovation in the field of fast charging technologies and energy management solutions, contributing to improving energy efficiency.

The concept of electric vehicles and charging stations

Electric vehicles are a category of automobiles that use an electric motor to move, replacing the internal combustion engine of traditional vehicles. These vehicles can be powered by rechargeable batteries or, in some cases, fuel cell propulsion systems that use hydrogen. The main types of electric vehicles include:

- ✓ Battery Electric Vehicles (BEV): These operate solely on energy stored in electric batteries. Examples include the Tesla Model S, Nissan Leaf, and BMW i3.
- ✓ Hybrid Electric Vehicles (HEV): These vehicles combine an electric motor with an internal combustion engine, using electric power to improve efficiency and reduce emissions. A notable example is the Toyota Prius.
- ✓ Plug-in hybrid electric vehicles (PHEV): These are similar to HEVs, but can be charged from an external source of electricity, providing a longer range on electric power. Examples include the Mitsubishi Outlander PHEV and the Chevrolet Volt.
- ✓ □ Fuel cell electric vehicles (FCEV): These vehicles generate electricity through the chemical reaction between hydrogen and oxygen, with zero tailpipe emissions. An example is the Toyota Mirai.

Fig. 2 Electric vehicle charging

Electric vehicle (EV) charging is a critical aspect of electric mobility infrastructure, and charging technologies have evolved significantly in recent decades. Here are some of the main EV charging technologies:

- ✓ Level 1 Charging. This is the simplest type of charging, using a standard 120V (in North America) or 230V (in Europe) outlet. Charging can take between 8-20 hours, depending on the size of the vehicle's battery. It is ideal for home use, especially for those who have a short daily commute

- ✓ .Level 2 Charging.This type of charging uses a 240V (in North America) or 400V (in Europe) outlet. It can complete a charge in 4-8 hours, depending on the battery capacity and the power of the charger. It is commonly used in public and commercial parking lots, as well as at home
- ✓ DC Fast Charging. This type of charging uses direct current (DC) to quickly charge electric vehicle batteries. It can provide an 80% charge in 30 minutes or less, depending on the vehicle battery capacity and the power of the charging station.
- ✓ Ultra-fast charging. This type of charging is an extension of fast charging, offering charging powers of 150 kW or more. It allows charging the electric vehicle in about 15-30 minutes to achieve a considerable range. It is mainly used for high-capacity electric vehicles and in fast charging networks.
- ✓ Wireless (inductive) charging. This technology allows charging the electric vehicle without cables, through electromagnetic induction. It can vary, but is generally slower than wired charging. It is still in development, but may become a convenient option for use in urban environments

With the adoption of the European Green Deal announced in December 2019, the EU is now aiming to reduce greenhouse gas emissions from transport by 90% by 2050 compared to 1990 levels, as part of a broader effort to become a climate-neutral economy. A key element of the effort to reduce emissions from road transport is the transition to alternative, lower-carbon fuels. Of these fuels, electricity is the most widely used new source, in particular for passenger cars, in figure 3 shows greenhouse gas emissions in 2025 by economic sectors.

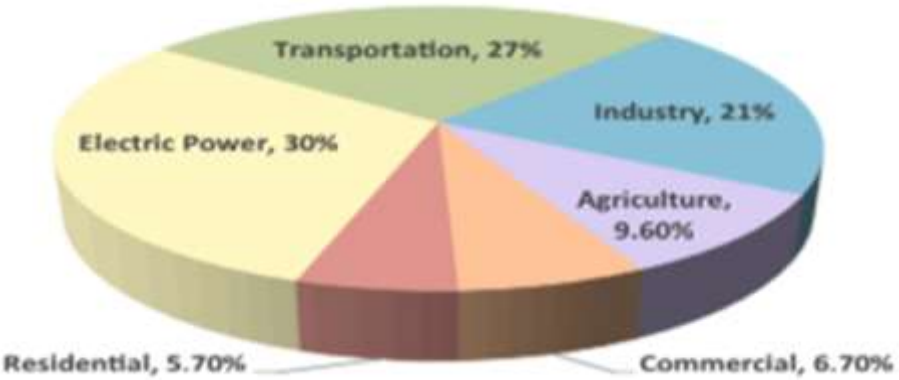

Figure 3.Greenhouse gas emissions in 2025

Public perception of electric vehicles

Providing an extensive network of charging stations in disadvantaged areas can reduce disparities in access to mobility. In addition, initiatives to promote electric vehicles through purchase subsidy programs or rental facilities can encourage social inclusion, ensuring that all citizens have access to sustainable transport options.

Awareness campaigns that highlight the economic, environmental and social benefits of electric vehicles can stimulate their adoption and help create a culture of electric mobility in cities.

Impact analysis in each case study:

- ✓ Carbon emission reduction: Due to the expansion of charging infrastructure, a significant decrease in CO2 emissions can be recorded.
- ✓ Increased adoption of electric vehicles: due to charging facilities and government subsidies.
- ✓ Improved air quality: Air quality has improved considerably and the city has reported a reduction in noise pollution.

The electric vehicle (EV) charging ecosystem is one of the most fundamental factors influencing the growth of electric vehicle adoption. Rapid developments in energy storage systems, power converter topologies, and other technologies, along with constant and positive efforts from governments and other organizations, have helped humanity move towards sustainable transportation.

Conclusions

Among the experimental data corresponding to compression from the calculated data we have considered the following observations upon the behavior of materials at request:

- Impact on public space: The installation of charging stations has led to the reconfiguration of public space use, including changes in public parking lots and on city streets, which can create conflicts between EV users and other traffic participants.
- Sustainability: Implementing an efficient network of EV charging stations contributes to achieving sustainable development goals, reducing carbon emissions and supporting the transition to cleaner energy sources.
- The need for smart infrastructure: Integrating smart city technologies into the planning and management of charging stations is essential to optimize energy flows and reduce the load on the electrical grid.
- The challenges related to the implementation of electric vehicle charging stations require an integrated approach, combining innovative financial solutions and strategic partnerships.
- Technological innovations play a crucial role in the efficient development of charging stations. Solutions such as fast charging stations, wireless charging technology or the use of renewable energy to power stations can reduce operational costs and improve the user experience.

References

[1]. James Larminie, John Lowry - Electric Vehicle Technology Explained, ISBN: 9781119942733, 2012
[2. Gijs Mom - The Electric Vehicle: Technology and Expectations in the Automobile Age, ISBN: 978 0801871382, 2013
[3] N Novas, RM Garcia Salvador, F Portillo, I Robalo…Global perspectives on and research challenges for electric vehicles - Vehicles, 2022 - mdpi.com
[4]A Märtz, P Plötz, P Jochem - Global perspective on CO2 emissions of electric vehicles, Environmental Research Letters, 2021 - iopscience.iop.org
https://op.europa.eu/webpub/eca/special-reports/electrical-recharging-5-2021/ro/ISO 5740,
[5 Tests, Sintered metal materials Standards Collection;
[6] SR, ISO 5755/2, Tests at low temperature.