

ELECTRIC VEHICLE CHARGING STATIONS

WHAT ARE ELECTRIC VEHICLE CHARGING STATIONS?

An electric vehicle charging station is a machine that supplies electric energy for the charging of batteries in plug-in electric vehicles (EV). EV charging stations can be in any place like shopping malls, markets, houses, streets that do not require a large area. There are parking lots, where there are spots reserved for EVs, which are then charged via charging stations with electricity from renewables.



Figure 1: EV charging stations

A CLOSER LOOK AT EV CHARGING STATIONS

Types of EVs that are available in the market today are:

Plug-in Hybrid EV (PHEV)

PHEVs run on battery and/or gasoline. The battery can be recharged by plugging it into an electric grid to charge. PHEV models typically run between 16 km and 65 km on the electric mode. They have lower fuel costs, reduced fossil fuel consumption, and carbon emissions compared to traditional cars. They can also use hydrogen or biofuels as alternatives to fossil fuels.

Battery EV (BEV)

BEVs are fully electric vehicles that run on rechargeable batteries. They are capable of storing electricity onboard in high capacity battery packs. As BEVs charge from EV chargers, they are eco-friendly as they emit no carbon emissions.



KEY FACTS

About **80% OF Green House Gas EMISSIONS** can be reduced by switching to electric vehicles powered by renewable energy.



Cost of electricity to run an EV is **40% LOWER THAN PETROL CARS** over the same distance.



The cost can be even lower if solar PV systems are used to charge EVs.

An EV **requires between 150Wh and 250Wh per kilometer** depending on vehicle weight, speed and terrain.



Norway and the Netherlands have **OVER 10 TIMES the number of public charging stations** per capita compared to the average market.



TABLE 1: CLASSIFICATION OF THREE TYPES OF EV CHARGING STATIONS [1]

Level 1	Level 2	Level 3
<p>AC Level One</p>	<p>AC Level Two</p>	<p>DC Fast Charge</p>
<p>Power 1.3–2.4 kW</p>	<p>Power 3–19 kW</p>	<p>Power 150 kW</p>
<p>Voltage 120 V</p>	<p>Voltage 240 V</p>	<p>Voltage 480 V</p>
<p>Charging Time 6-12 hours to fully charge</p>	<p>Charging Time 1-6 hours to fully charge</p>	<p>Charging Time 20-30 minutes to charge up to 80% 60 minutes to reach 100% battery</p>
<p>Connectors Used J1772 go-to connector</p>	<p>Connectors Used CCS (Combined Charging System) = J1772 with two extra pins CHAdeMO (fast charging)</p>	<p>Connectors Used Tesla Superchargers</p>

Connectors used

LEVEL 1



Source

LEVEL 2



Source

LEVEL 3



Source

MOST COMMON LOCATIONS FOR EV CHARGING STATIONS [2]

Every EV can charge at Level 1 and 2, whereas Level 3 is more specific and not all EVs are capable of charging at this level. There are different connectors that are available to interphase with EV charging stations.

Residential Spaces (privately-owned)

Private homes, multi-family homes, charging spots in hotels, etc.



Source

Commercial Spaces (commercially-owned)

Fleet charging bays, charging spots in office and other commercial buildings.



Source

Public Space (government-owned)

Parking lots, community spaces, corridors with special charging facilities, etc.



Source

FINANCIAL FACTS

The cost to operate electric vehicles is one of the primary benefits of the technology. EVs operate more efficiently than internal combustion engines, thanks to fewer moving parts. As a result, the average per-mile cost of operating an EV is about a third that of a comparable gasoline-powered vehicle.

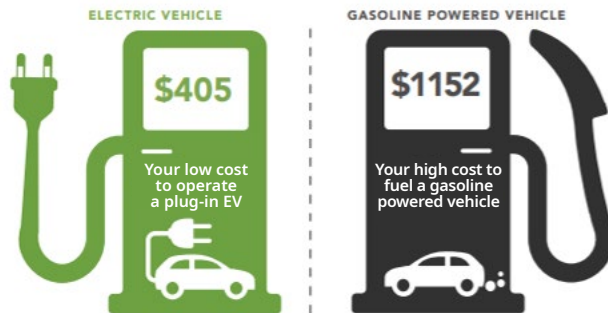


Figure 3: Annual cost comparison (Assumes 13,000 miles per year, an average of 0.35/kWh per mile, 8.896 cents/kWh, 28.2 miles per gallon at \$2.50 per gallon) [1].

The cost of fully charging your EV will be two-thirds cheaper than gasoline [2].

TABLE 2: COST ESTIMATES OF EV CHARGING STATIONS [2]

	Level 1	Level 2	Level 3
Station Cost (\$)	300-600	500-2,200	20,000-50,000
Parts and Labor (\$)	0-1,700	1,200-3,300	50,000+

REFERENCES

1. Clean energy economy for the region. [Online] Available: https://cleanenergyeconomy.net/wp-content/uploads/2019/04/CLEER_EV_fact_sheet.pdf
2. Charge EVC. [Online] Available: <http://www.chargevc.org/wp-content/uploads/2017/08/Top-5-Facts-about-Charging-an-EV.pdf>
3. Fortum Corporation press release. [Online] Available: <https://www.fortum.com/media/2019/03/fortum-and-city-oslo-are-working-worlds-first-wireless-fast-charging-infrastructure-taxis>
4. IEA. Global EV outlook 2020. [Online] Available: <https://www.iea.org/reports/global-ev-outlook-2020>
5. Reuters. [Online] Available: <https://www.reuters.com/article/us-health-coronavirus-germany-autos-idUSKBN23B1WU>

KEY FACTS

Oslo has a population over 630,000 and there are **2,025 PUBLIC CHARGING STATIONS**, out of which 1,325 are owned by the local government. The city aims to have zero-emission taxis by 2023 [3].



As of 2020, **Germany** has: **27,730** public charging stations **~700,500** plug-in electric cars **22,000** light duty electric commercial vehicles [5].

Author

Namrata Joshi - ICLEI World Secretariat

Collaborators

Rohit Sen, Laura Noriega, Kanak Gokarn, Ashley Mwenda, Everica Rivera - ICLEI World Secretariat

Design

Olga Tokareva - ICLEI World Secretariat

Supported by:



Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

based on a decision of the German Bundestag

Copyright

(c) 2021 ICLEI - Local Governments for Sustainability e.V. All rights reserved. The ICLEI World Secretariat holds the copyright of this publication, including text, analyses, logos and layout designs. Requests to reproduce or to quote material in part or in full should be sent to carbonn@iclei.org. ICLEI encourages use and dissemination of this report, and permission to reproduce this material without modification will usually be permitted without charge for non-commercial use.