Market of EVs and EV Chargers
How Does The Future Look Like?

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Power Technology Research Inc.

Founded in 2016

Owned and operated by researchers, analysts, and power engineers

Objective:

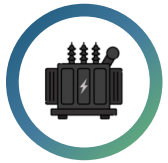
To understand the recent and upcoming changes to our electric infrastructure while identifying and communicating the best technologies and associated business models applied by industry leaders.

COVERAGE

Power Grid

New Energy

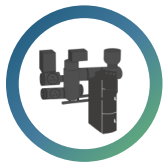
Specialized Power Grid & New Energy Market Research



Transformers
(Dist., Power)

Substation Automation
(Dist. vs Cent.)

EV Charging Infrastructure
(Public, Private, Passenger/Comm.)

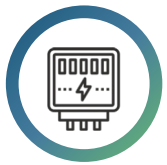


Switchgear
(HV, MV)

Port Electrification
(Shore-to-Ship, Microgrid)

Energy Storage Value Chain
(Utility Scale, C&I)

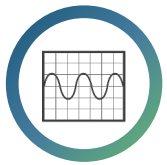
Flexible AC Trans. Systems
(SVCs, STATCOMs)



Smart Meters
(Power Quality, AMI)

Comm. & Off-Highway Vehicles
(BEVs, PHEVs, ICEs)

HVDC Market Analysis
(VSC, LCC, Cables)



Power Factor Correction
(Active, Passive)

Hydrogen in Power Sector
(Tech., Demand, Value Chain)

Synchronous Condensers
(4-Pole, 6-Pole,...)

Grid Communication
(Private LTE, 5G)

Impact of EVs on Power Grid
(Quantitative, Trafo., Switchgear)

Agenda

1. **Introduction (10 mins)**

2. **Quantitative Analysis (20 mins)**

Vehicle Electrification Trends
- Vehicle Electrification Trends- Light Duty Vehicles
- Vehicle Electrification Trends- Trucks and Buses
- Electrification Landscape

Global EV Chargers Market Overview
- Global EVSE Market Forecast
- Price Decline of EV Chargers
- Global Public EV Charger Market
- Global Private EV Charger Market

Regional EV Chargers Market Trends
- Regional EVSE Market- APAC
- EVSE Country Market - APAC
- Regional EVSE Market- Americas
- EVSE Country Market - Americas
- Regional EVSE Market- EMEA
- EVSE Country Market – EMEA

3. **Qualitative Analysis (20 mins)**

EVSE Policies and Incentives
- Global EVSE Policies & Incentives

Technological Innovations
- Regulations on EV Charging
- Technology Trends

Competitive Landscape

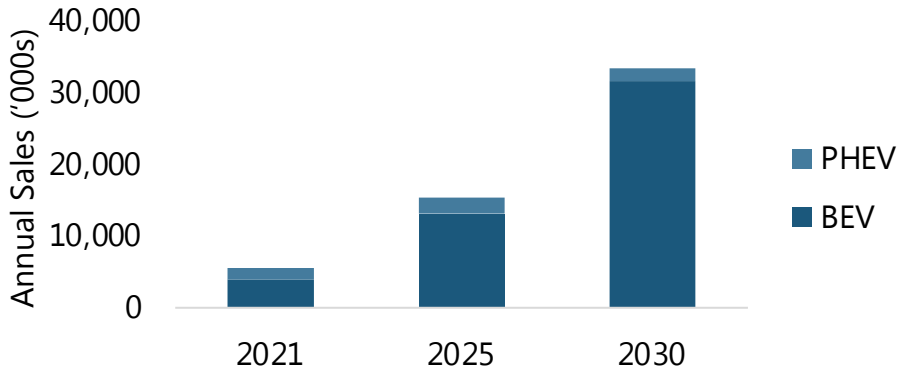
4. **Q/A Session: (10 Mins)**

Vehicle Electrification Trends

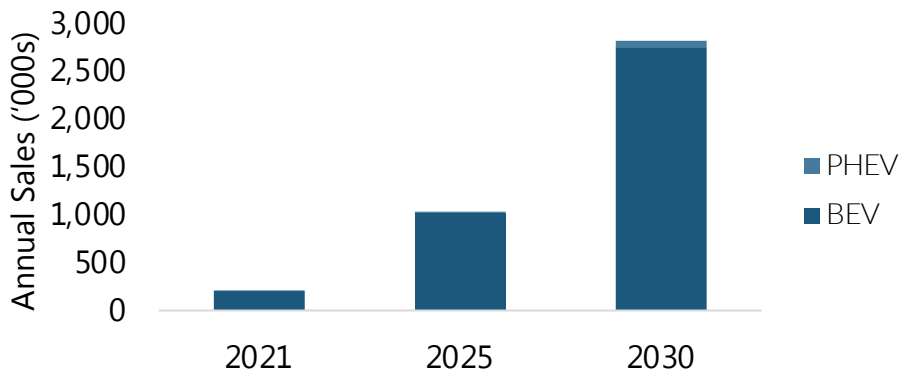
Electrification Landscape – Light-Duty Vehicles

Electric car sales accounted for 9% of global car market in 2021

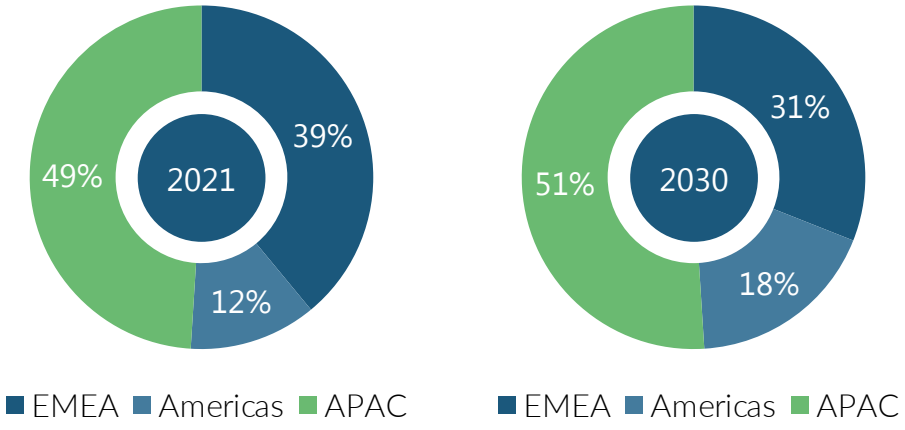
Annual Passenger EV Sales



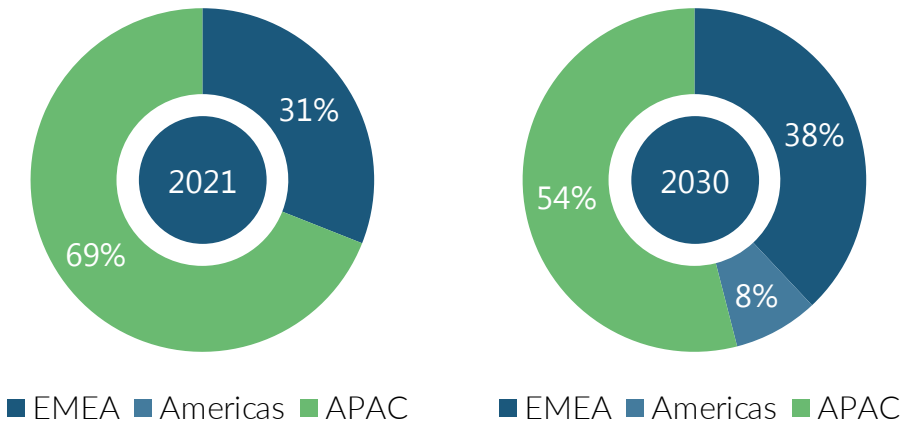
Annual Electric LCV Sales



Regional Distribution (Passenger EV)



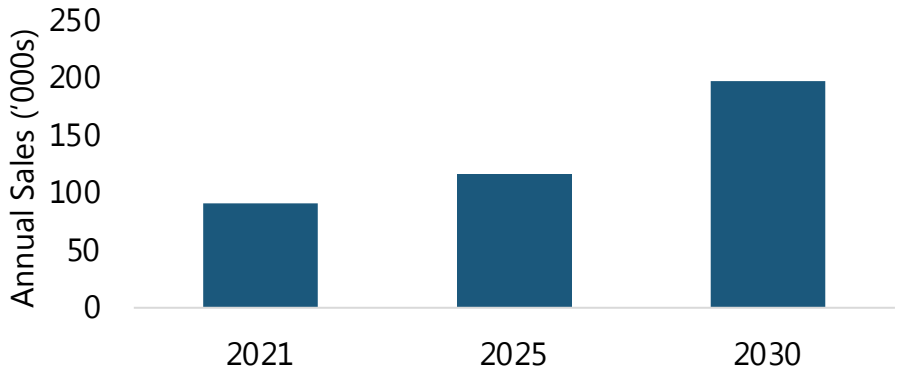
Regional Distribution (Electric LCV)



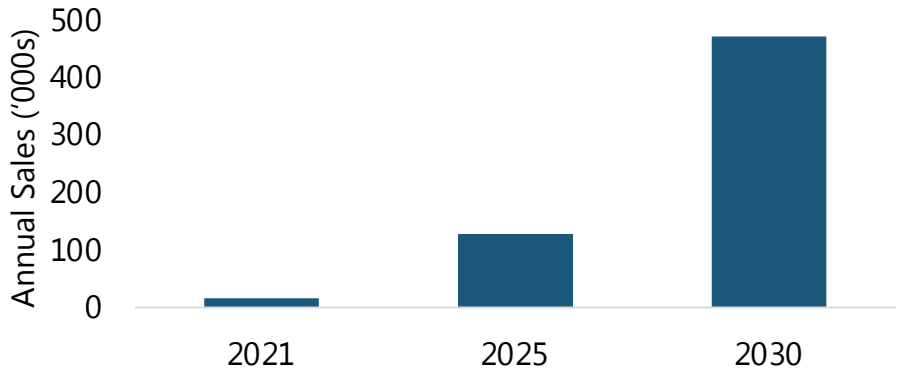
Electrification Landscape – Trucks & Buses

Truck electrification will gain significant momentum in coming years, leading bus sales by 2025

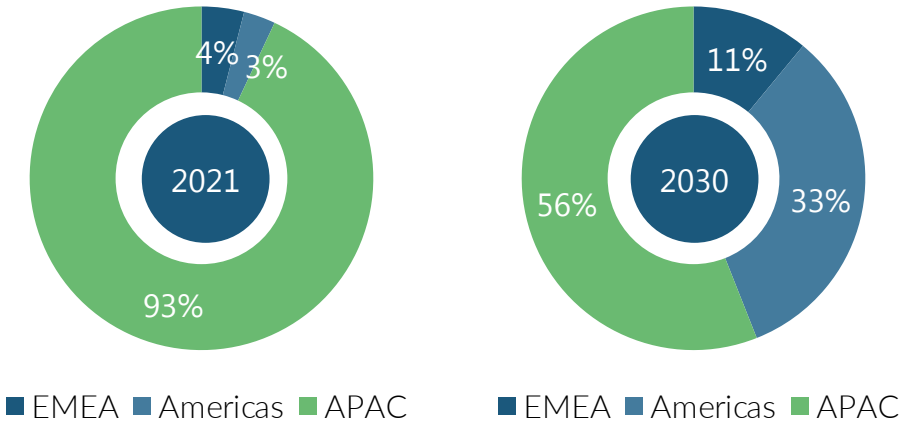
Annual Electric Bus Sales



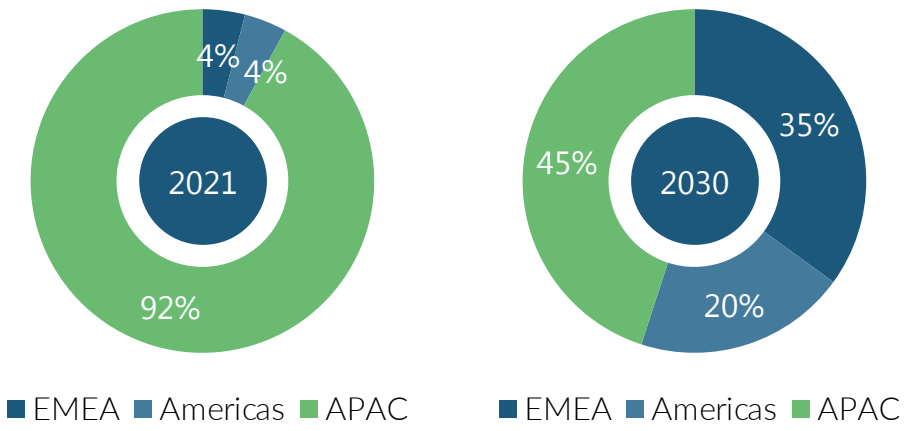
Annual Electric Truck Sales



Regional Distribution (Electric Bus)

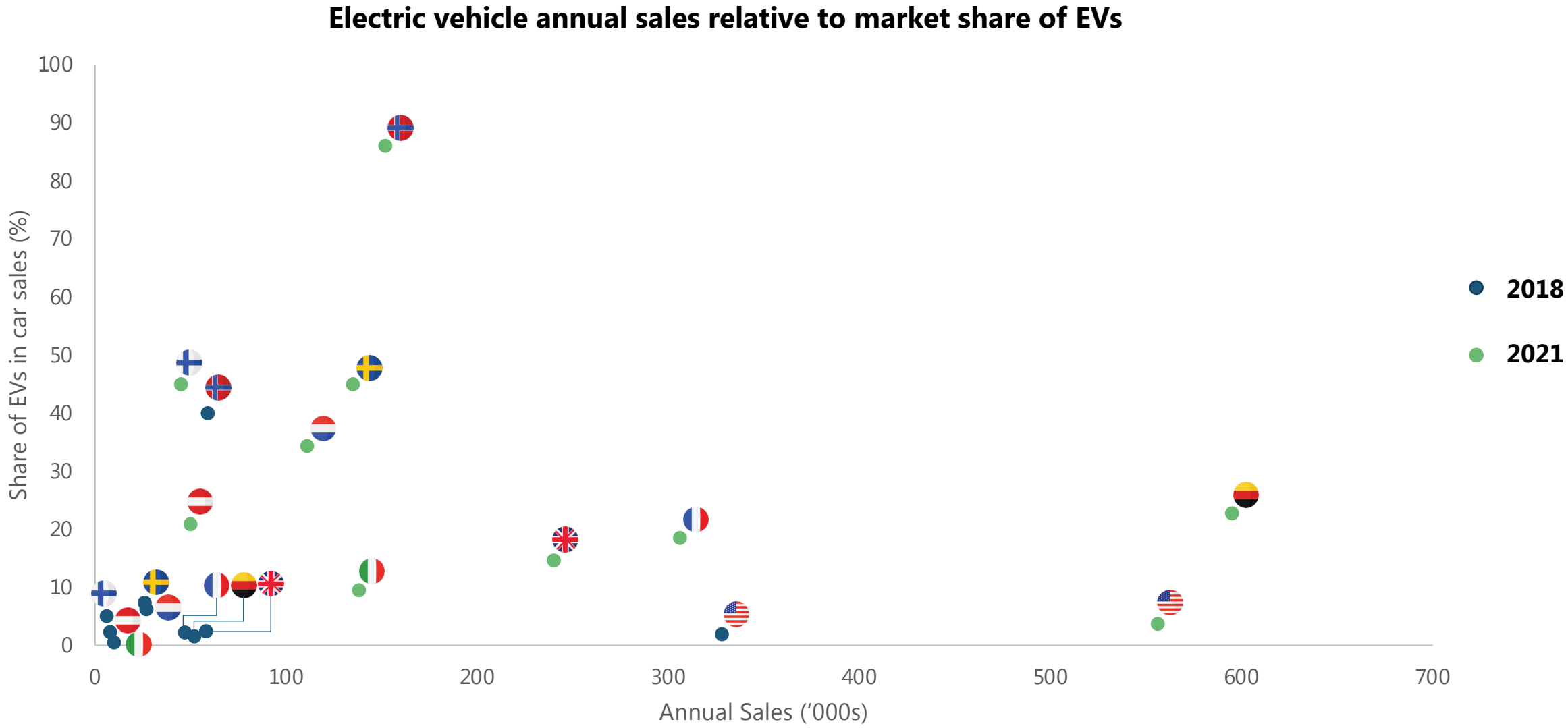


Regional Distribution (Electric Truck)



Electrification Landscape

Norway, Sweden, Finland had the highest market share for electric vehicles in 2021



Global EV Chargers Market Overview

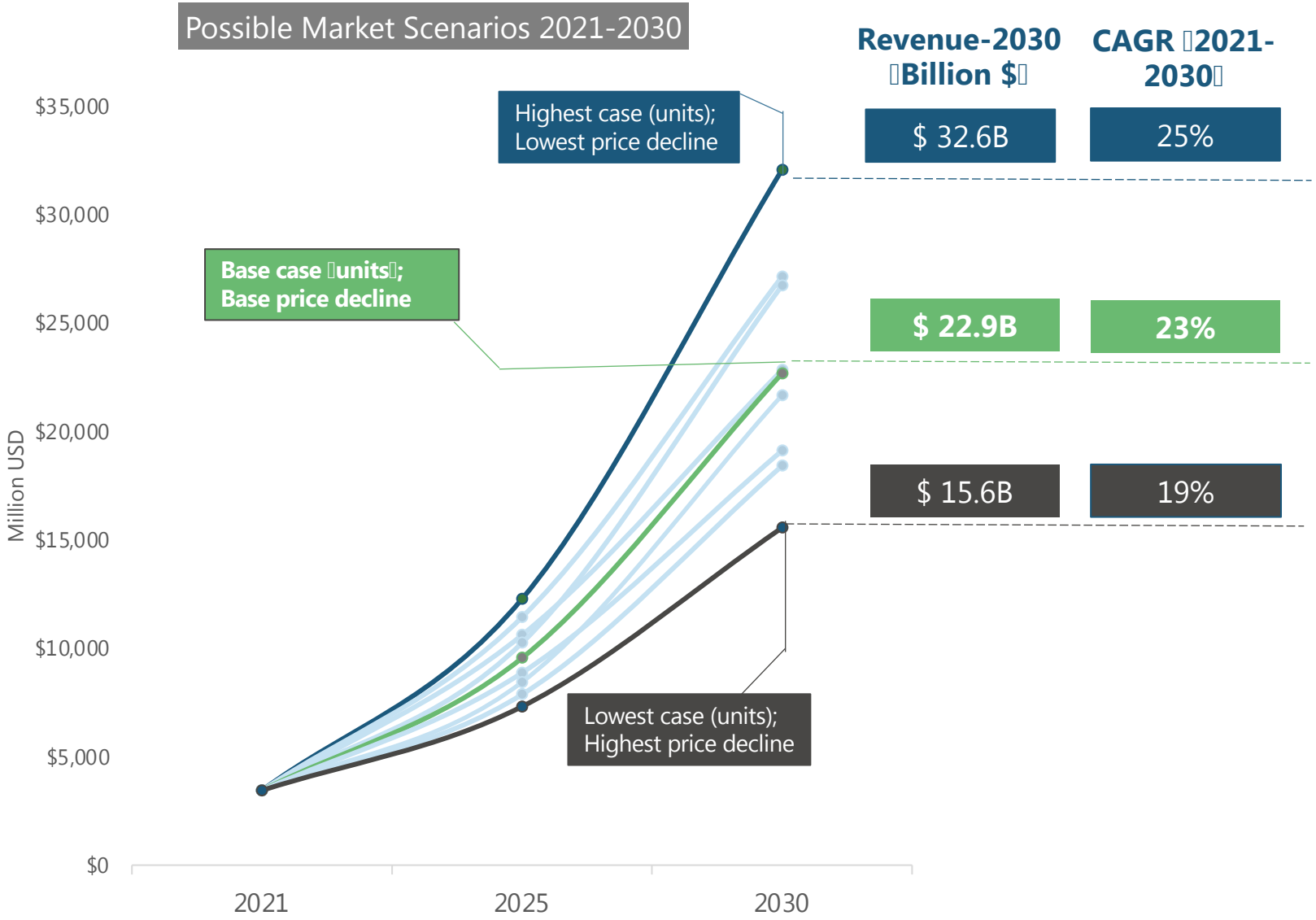
Global EVSE Market Forecast

***Volatile forecasts**; Implementation of the plans and future price decline can significantly impact the market revenue in the forecast (Global)*

Rate of penetration of EVs in the market

Implementation of government plans and incentives for charging infrastructure

Price decline of EV chargers



Price Decline of EV Chargers

EV charger prices are far from settled *as huge price variations exist across different countries*

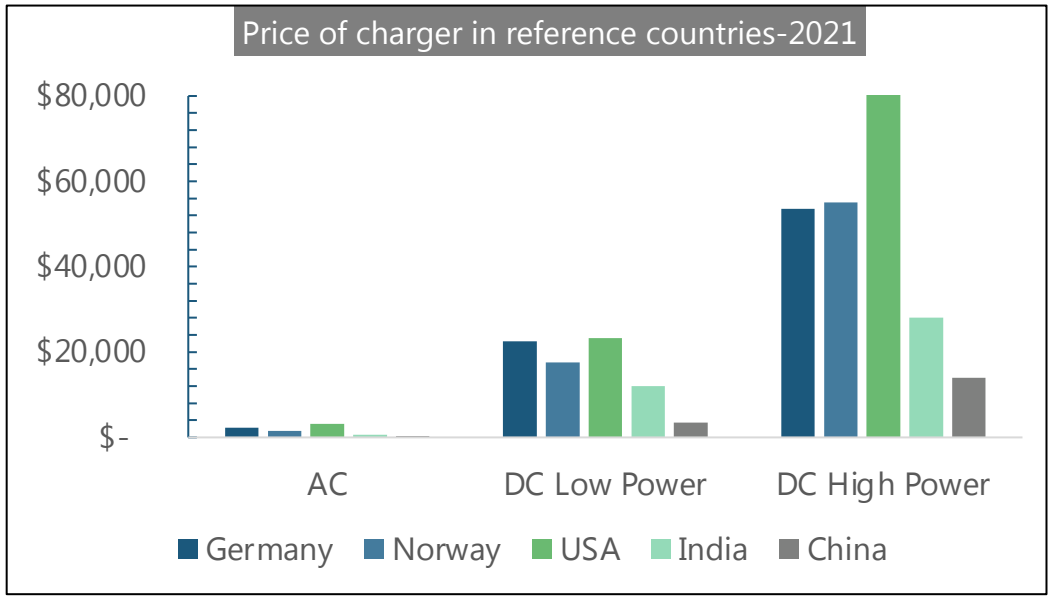
Price Variation

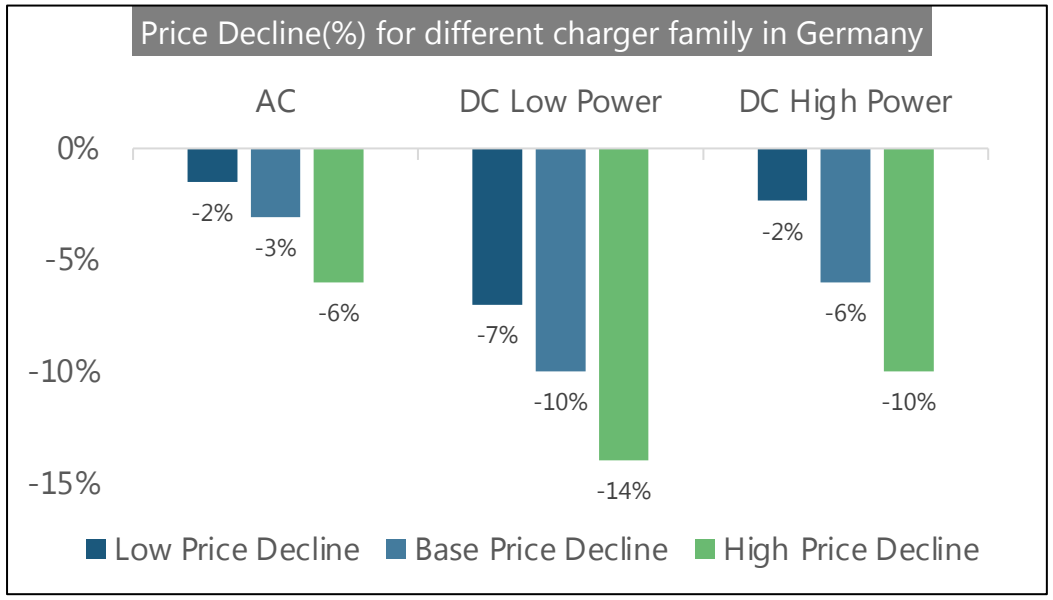
- Country specific product feature requirements
- Varying competition, local players involvement and maturity of market
- Extremely low prices in China due to economies of scale

Price Decline

- Due to high sensitivity of prices between products and countries, there is uncertainty about price decline
- AC chargers market more mature than DC chargers, hence lesser price decline is expected.
- Economy of scales and competition will play a major role in determining price decline

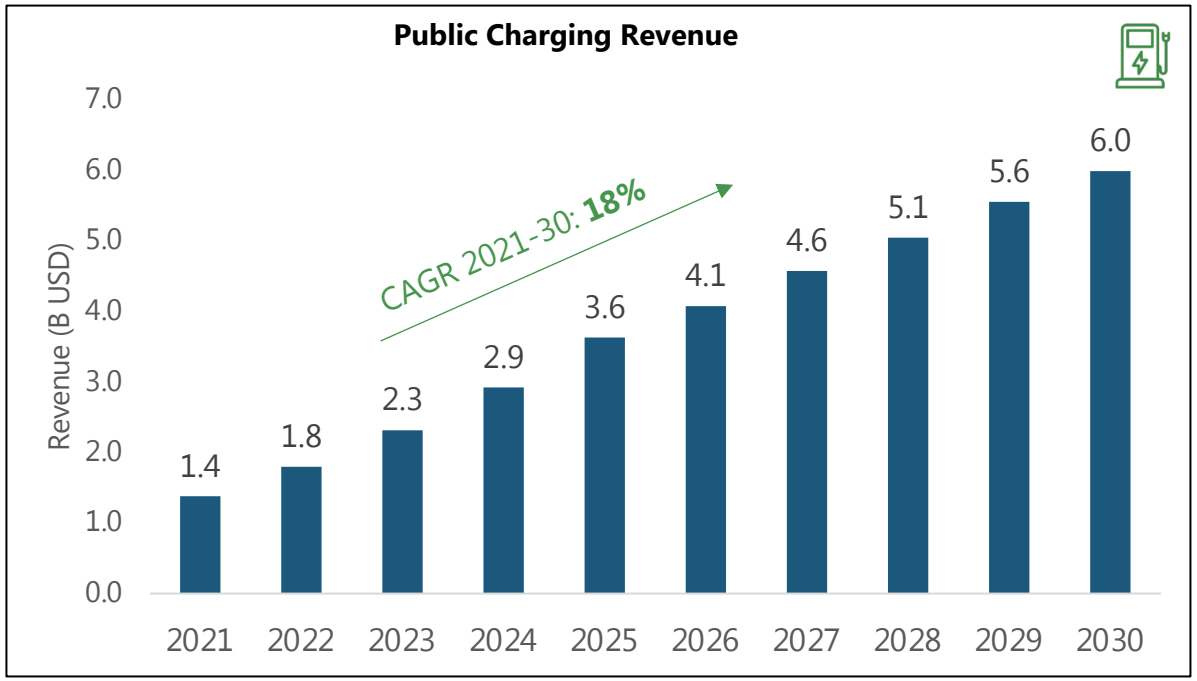
*Prices for 22 kW (AC), 50 kW (DC low power) and 240 kW chargers are used in the graph

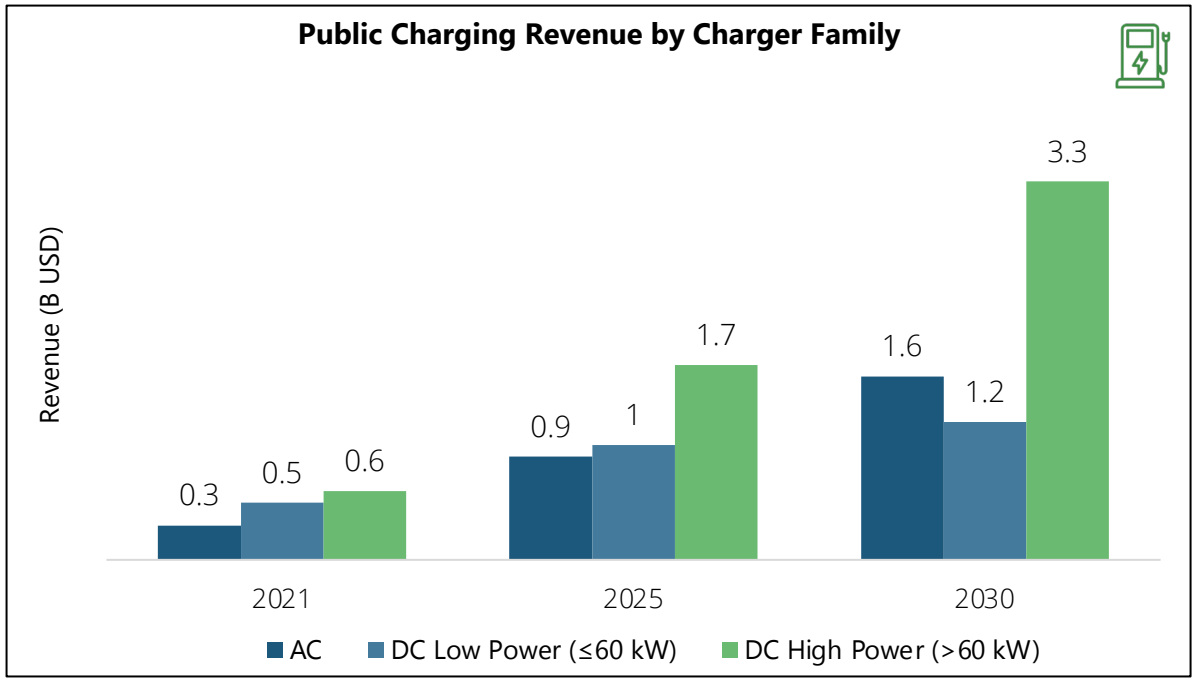




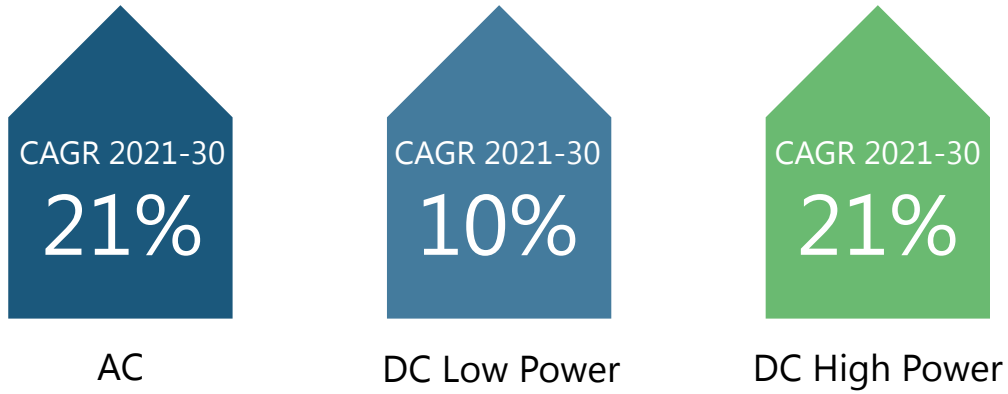
Global Public EV Charger Market

*DC high power charging (>60kW) is expected to grow rapidly in **public** charging infrastructure*



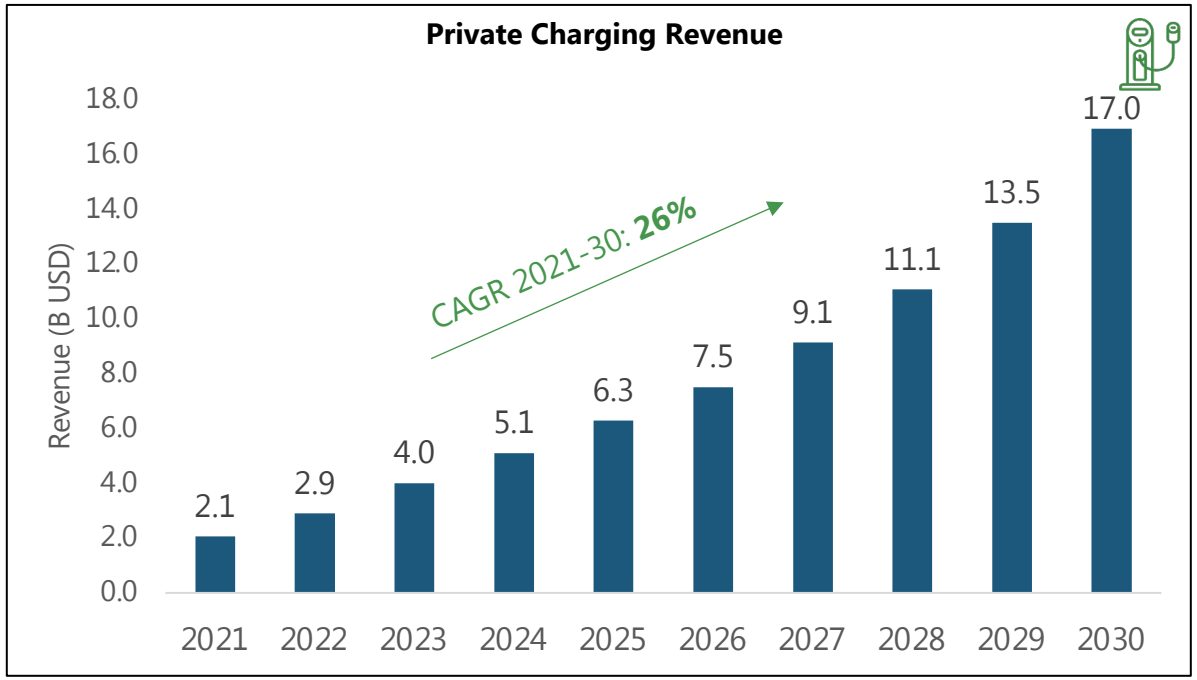


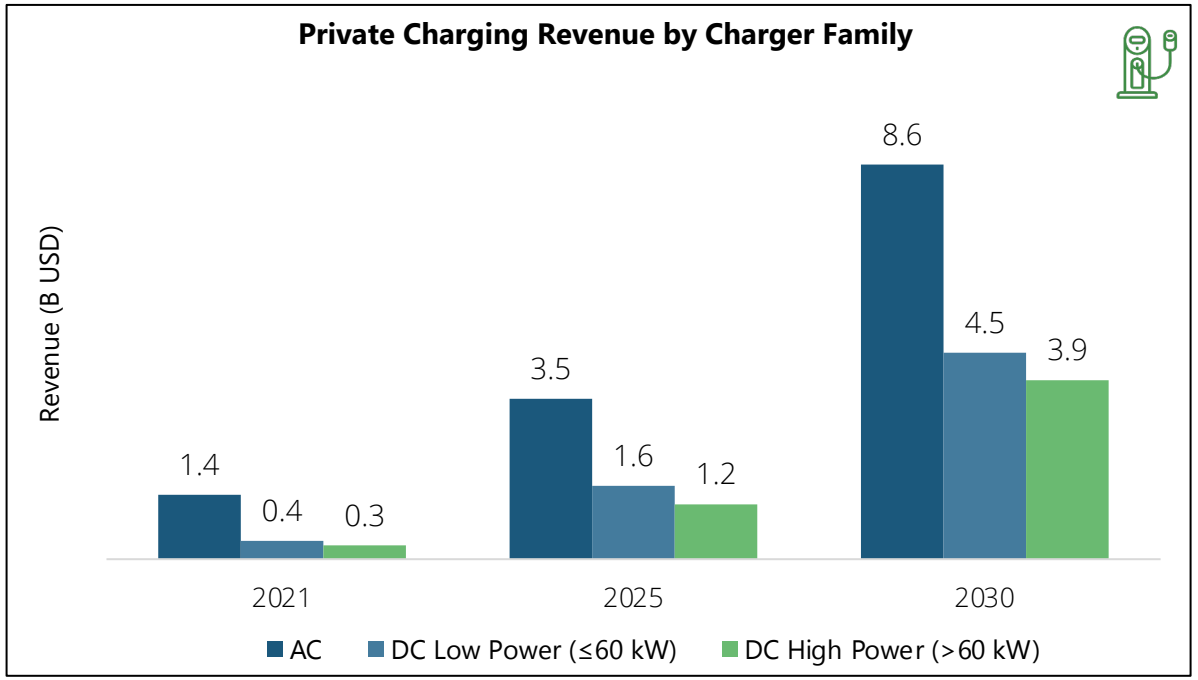
- Limited growth of public low-power DC chargers in coming years
- Destination and en-route applications to spearhead growth of public high-power DC chargers



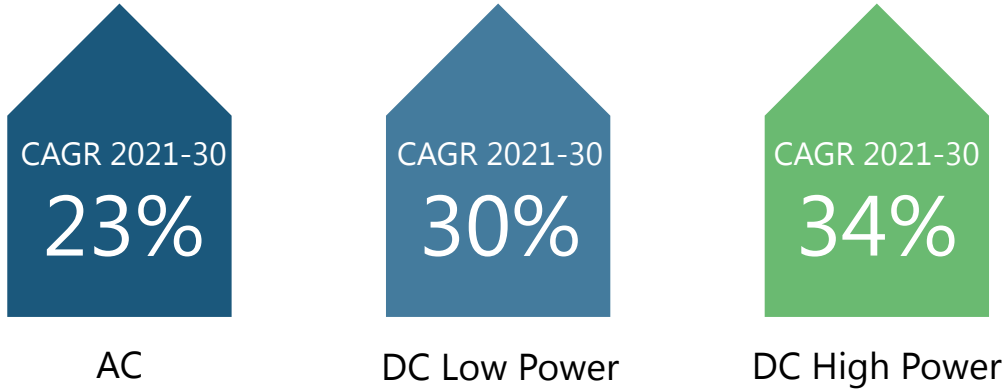
Global Private EV Charger Market

While AC chargers remain the dominant type in EV charging, DC charging will gain more popularity in fleet applications.





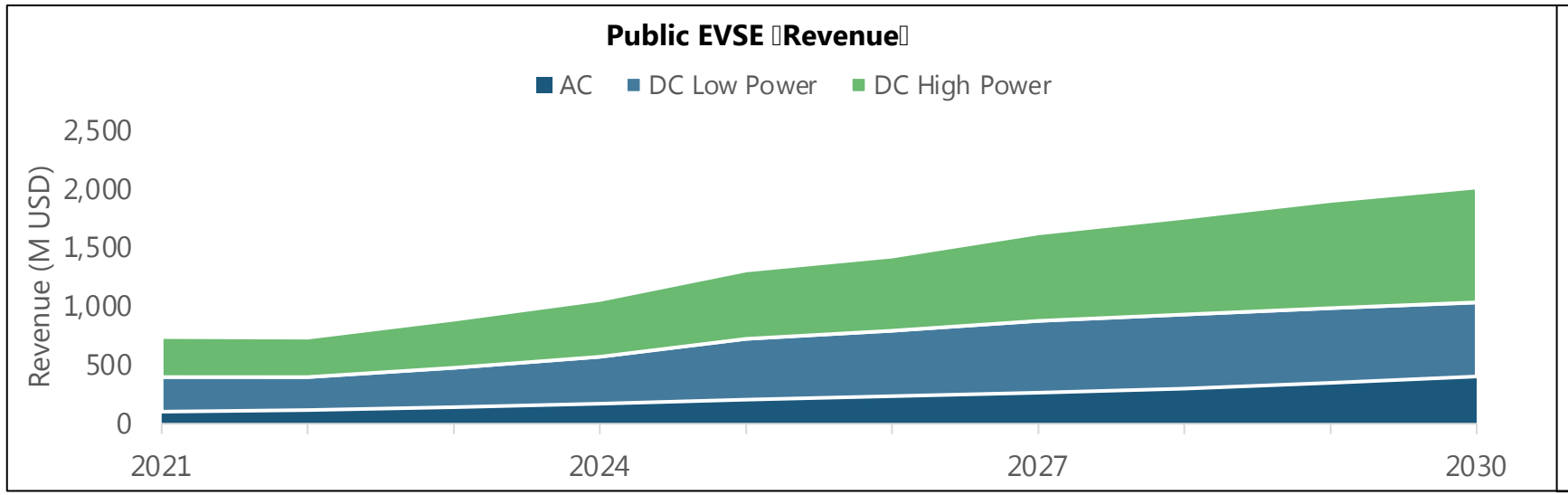
- AC chargers' leading market share will sustain due to residential and workplace applications
- In private sector, DC charging to grow exponentially driven by fleet electrification

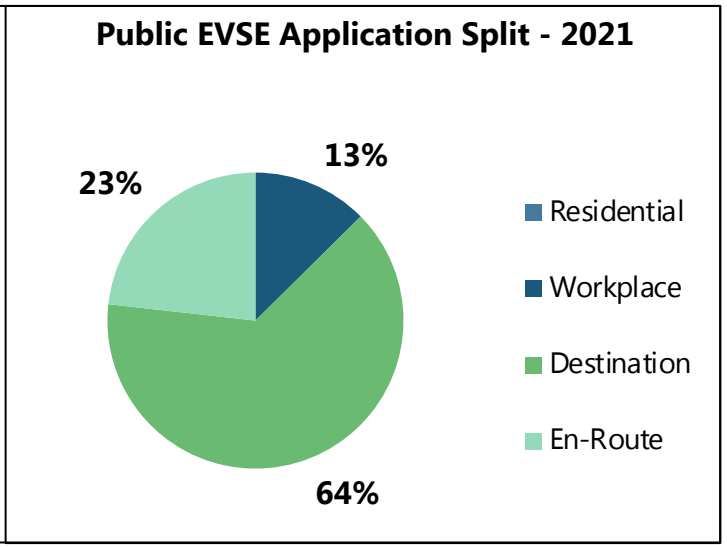


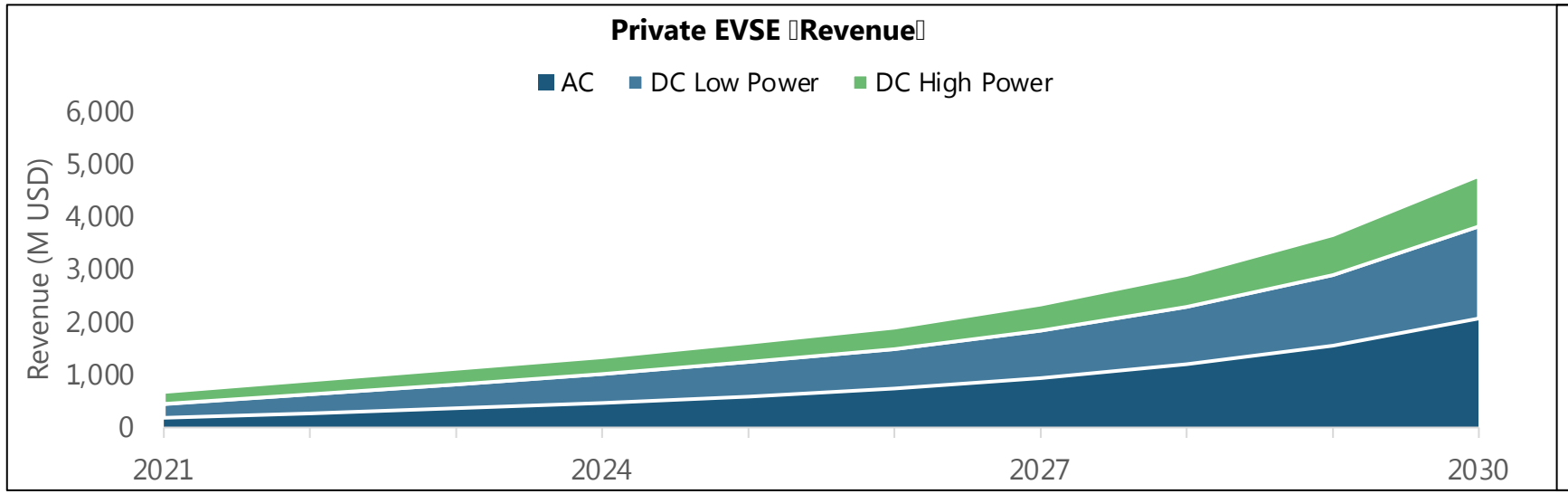
Regional EV Chargers Market Trends

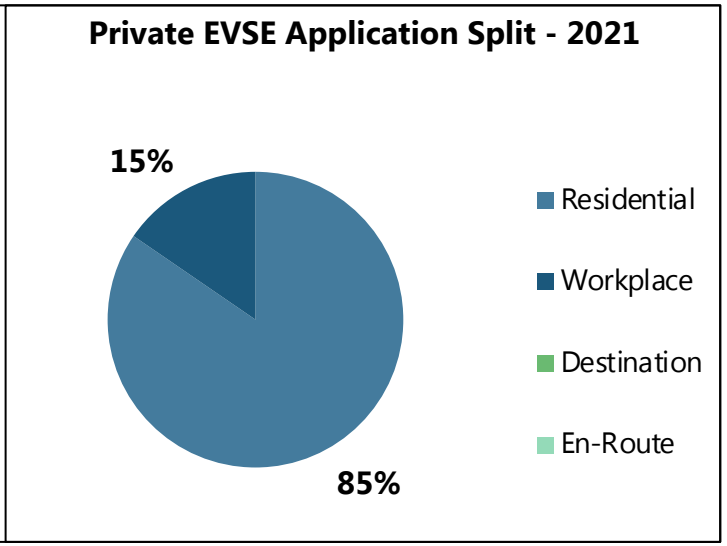
Regional EVSE Market- APAC

APAC region accounts for a significant share in the global EV charging market primarily because of China and South Korea spearheading the growth





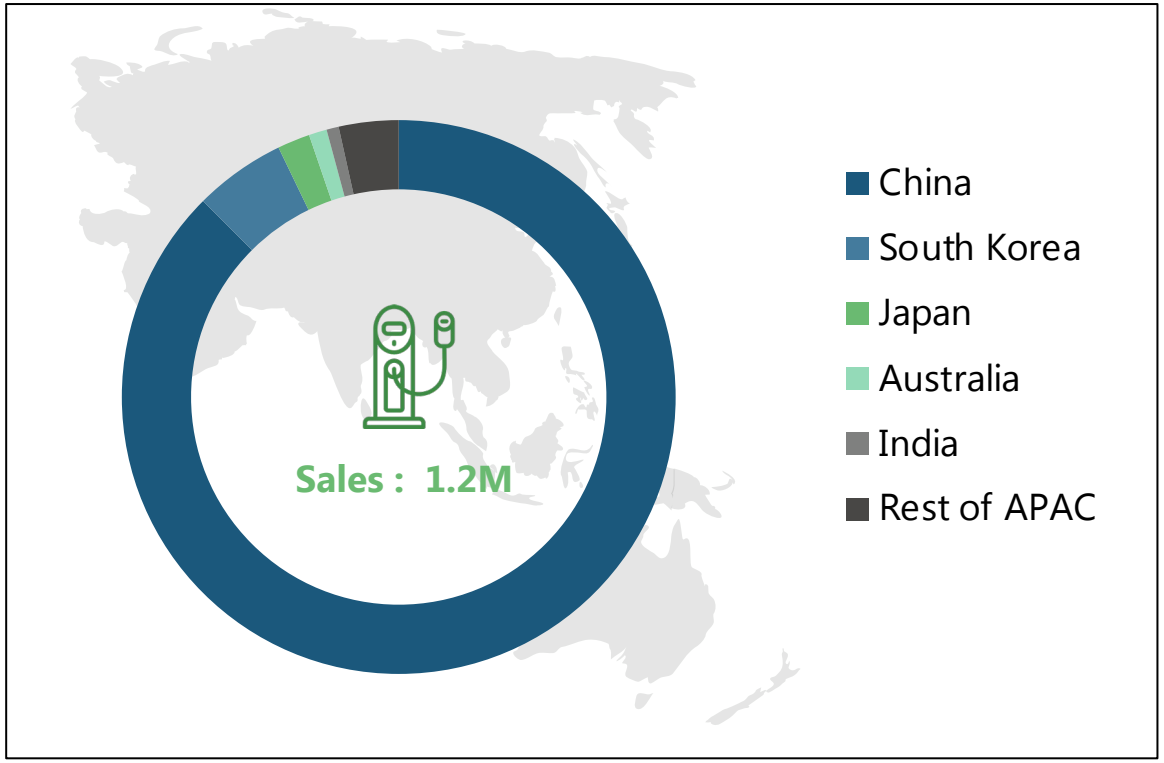




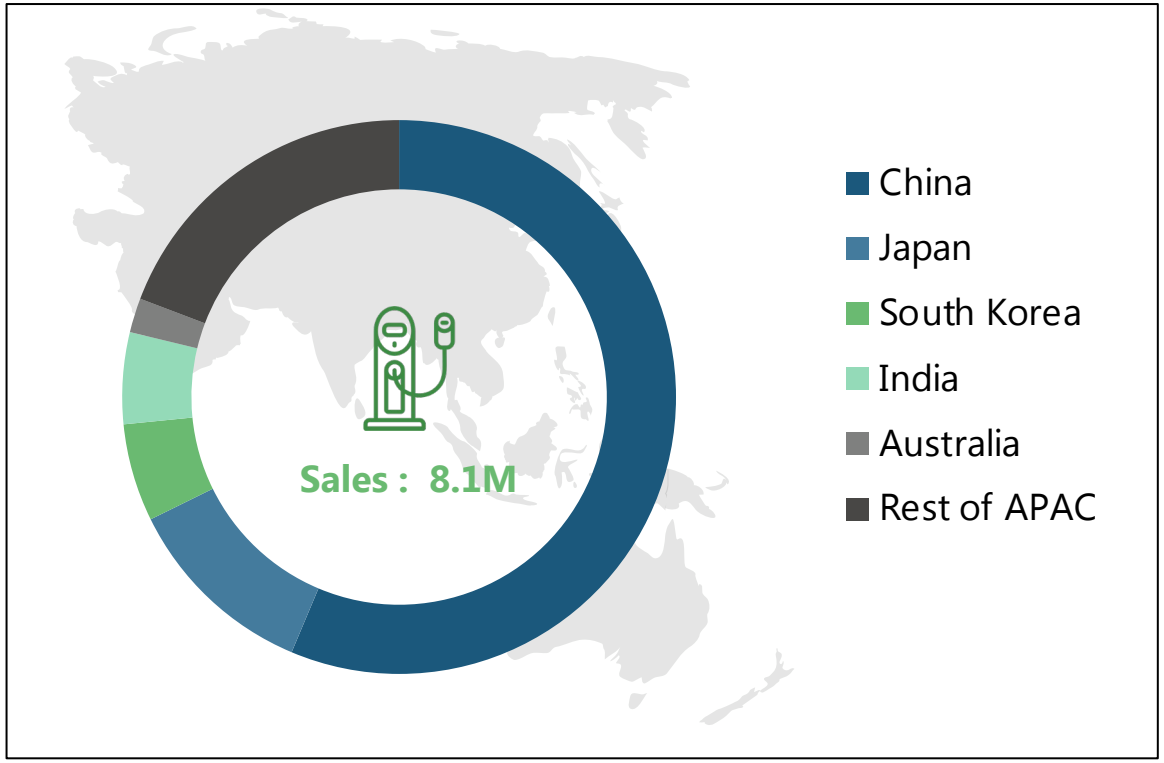
EVSE Country Markets - APAC

China leads the EVSE market in APAC, however its share in the region will decrease over the years

Charging Points Annual Market - 2021

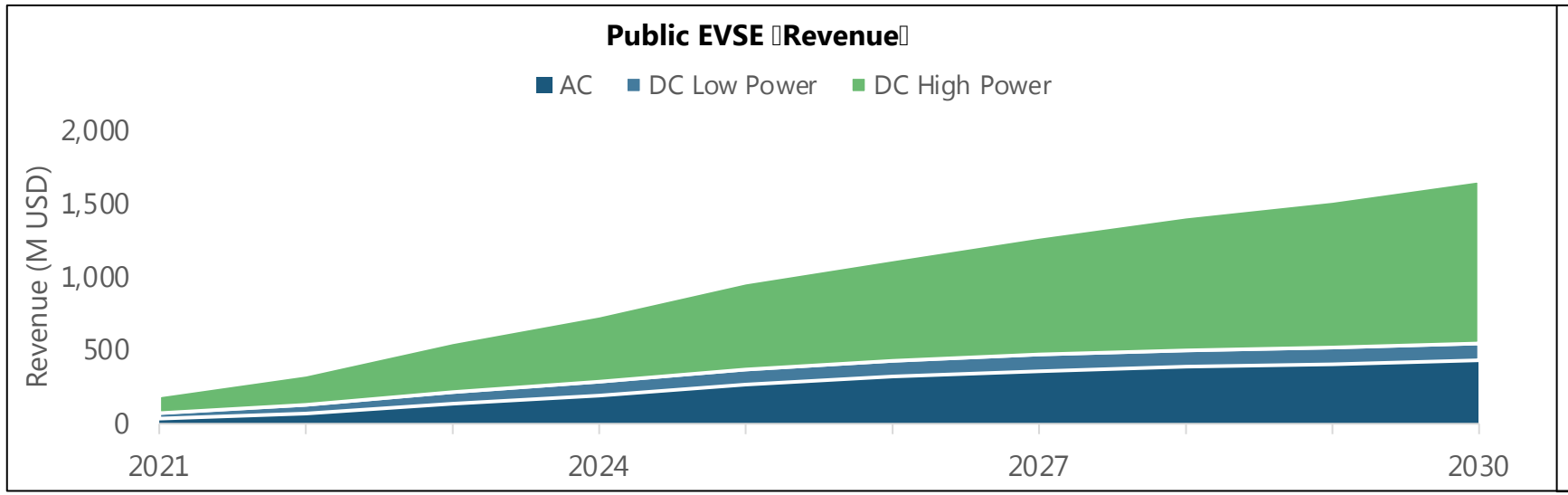


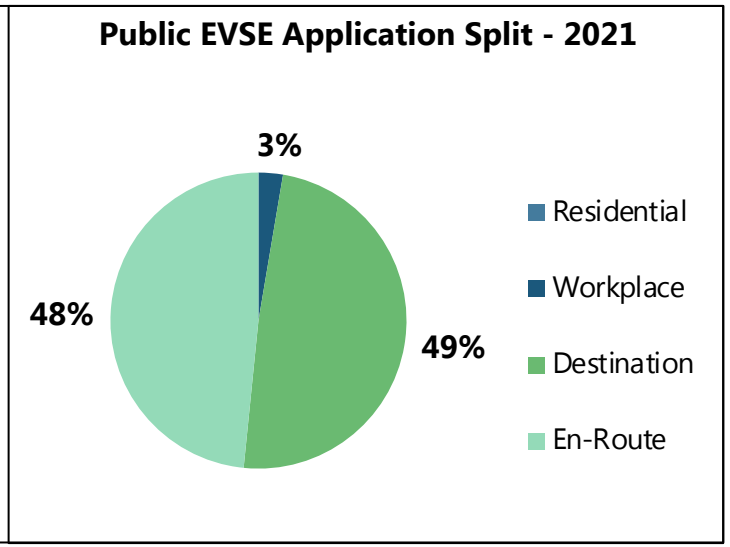
Charging Points Annual Market - 2030

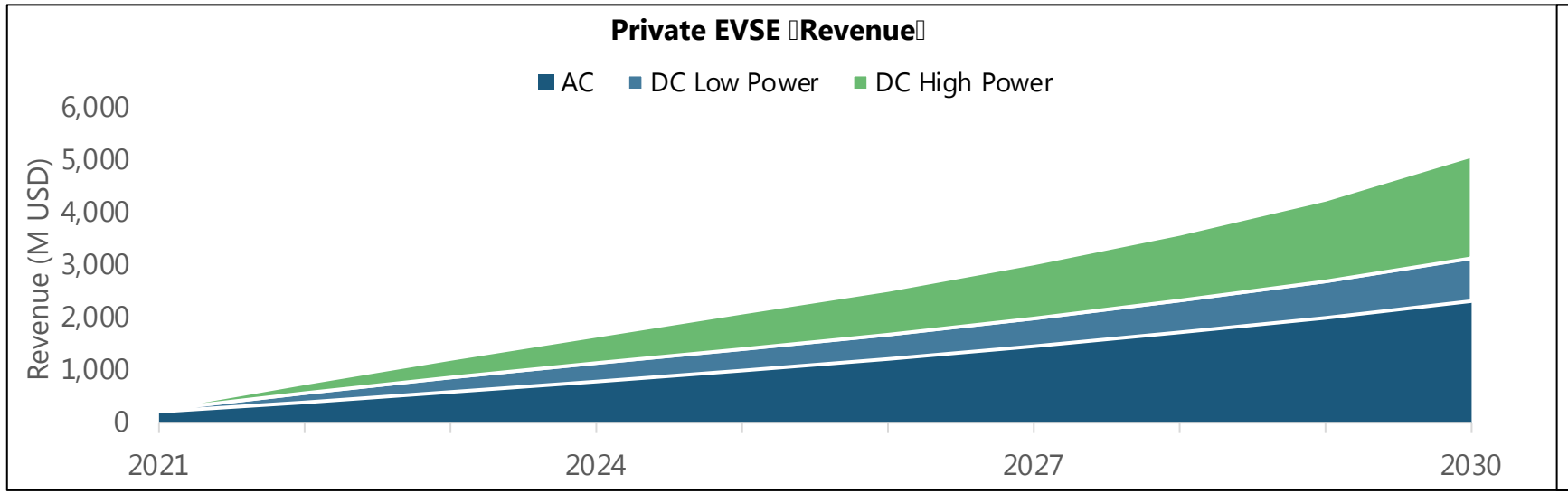


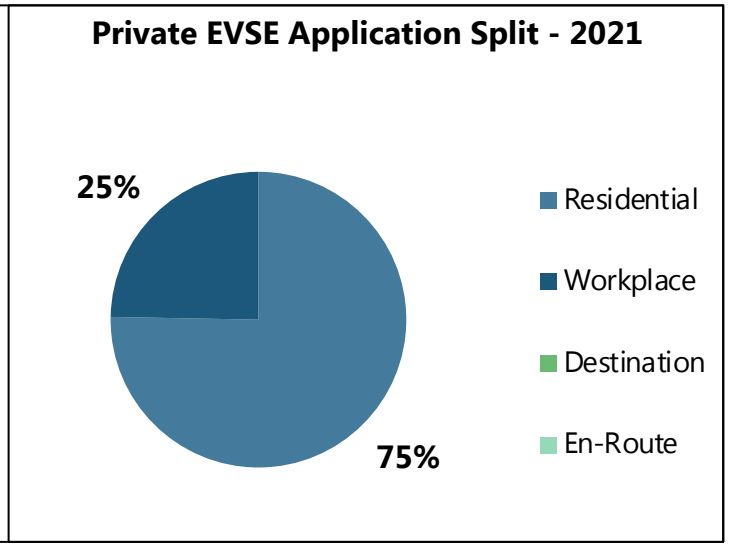
Regional EVSE Market- AMERICAS

The regional market is dominated by USA and Canada





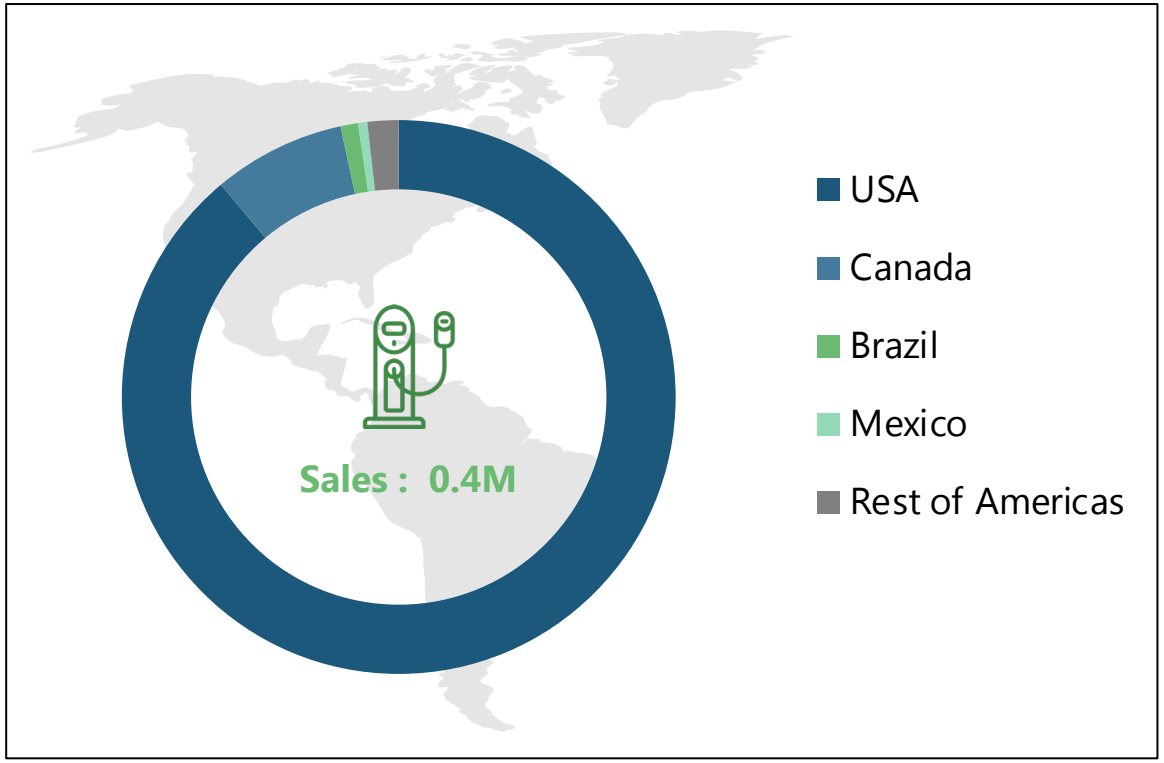




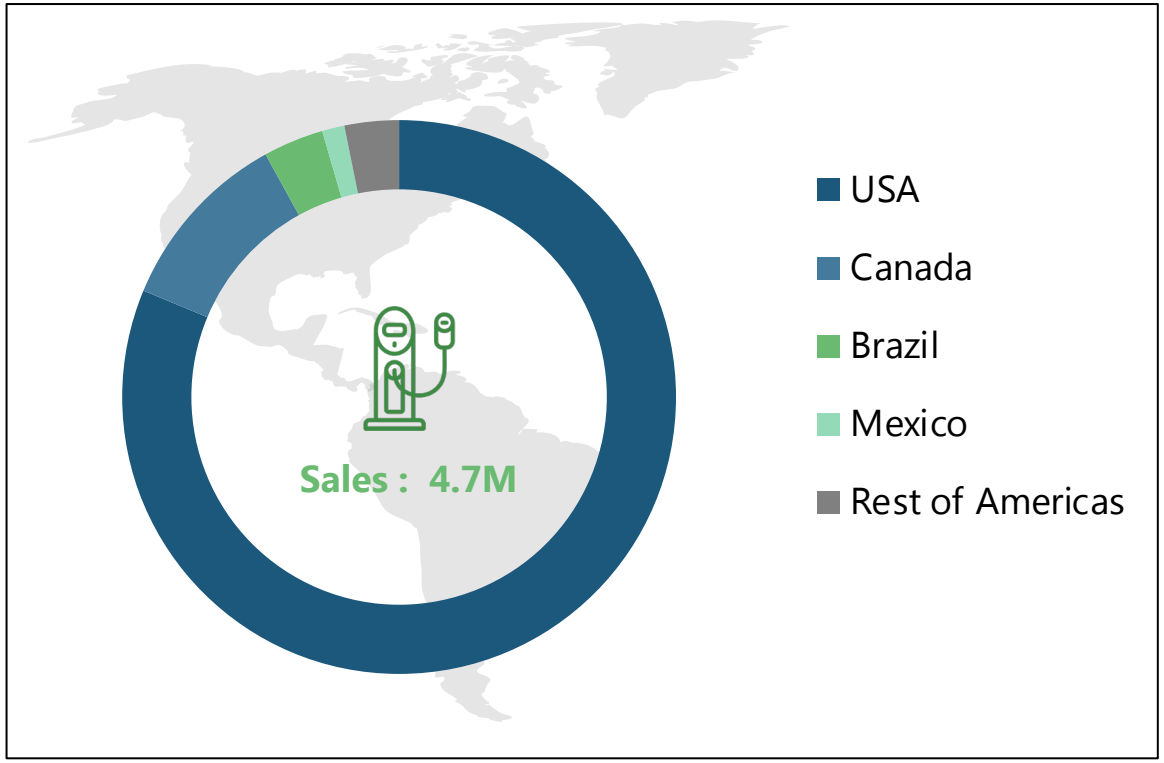
EVSE Country Markets - Americas

Capturing 90% of the Americas market, USA ranks 2nd globally with 350,000 charging points installed in year 2021

Charging Points Annual Market - 2021

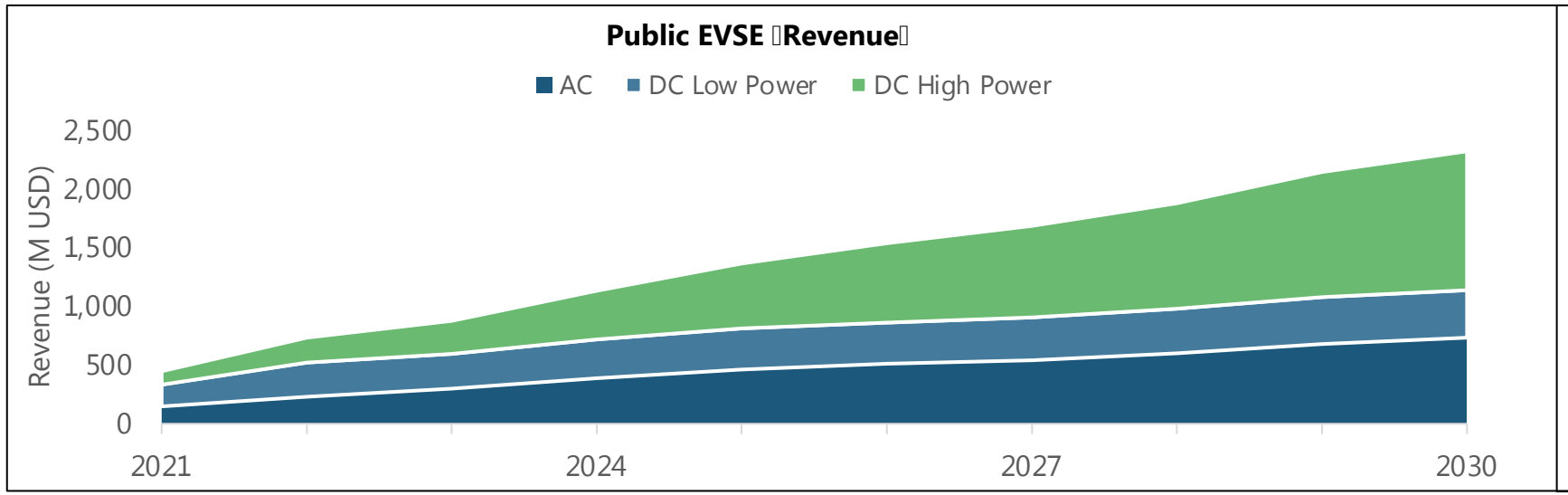


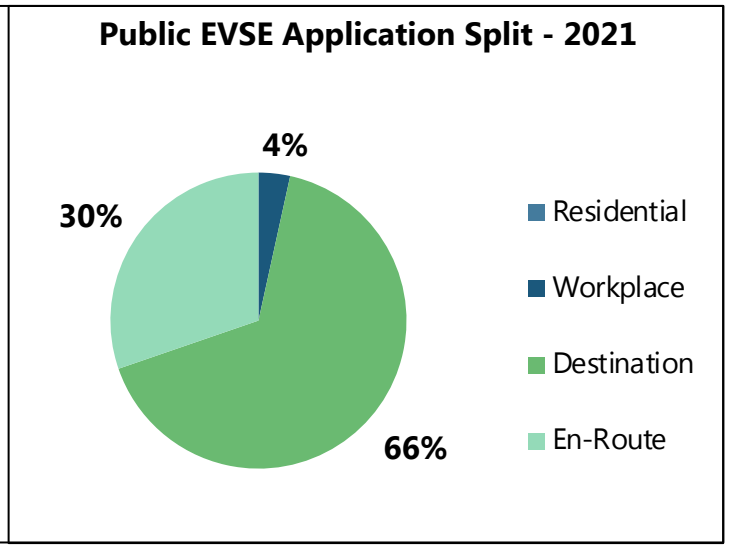
Charging Points Annual Market - 2030

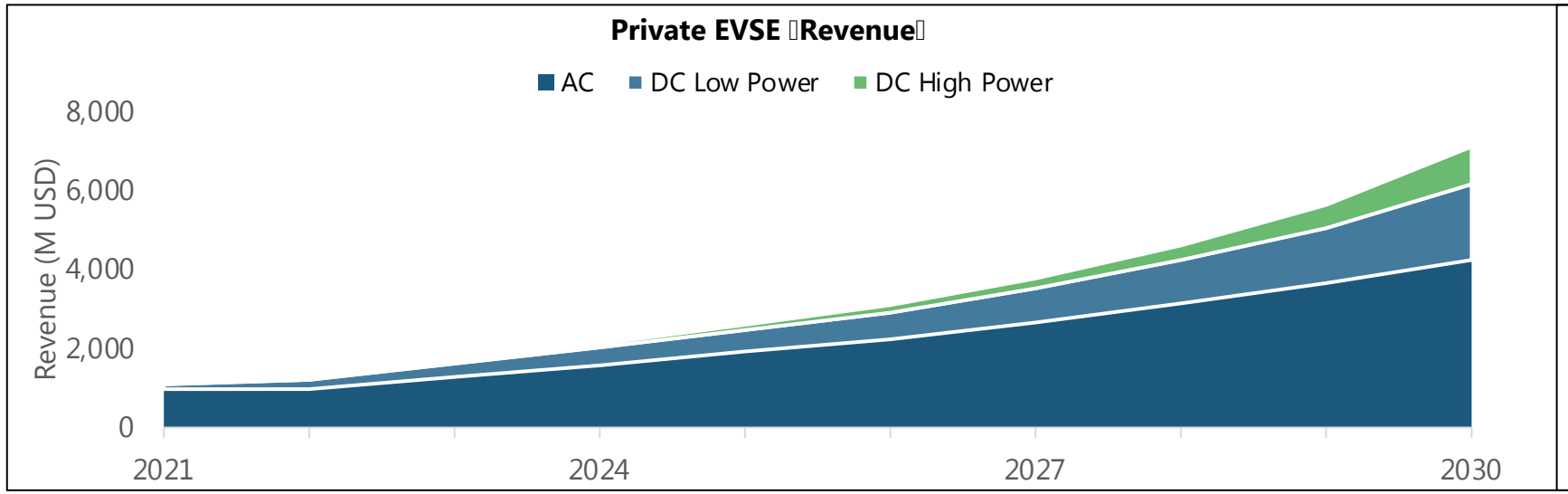


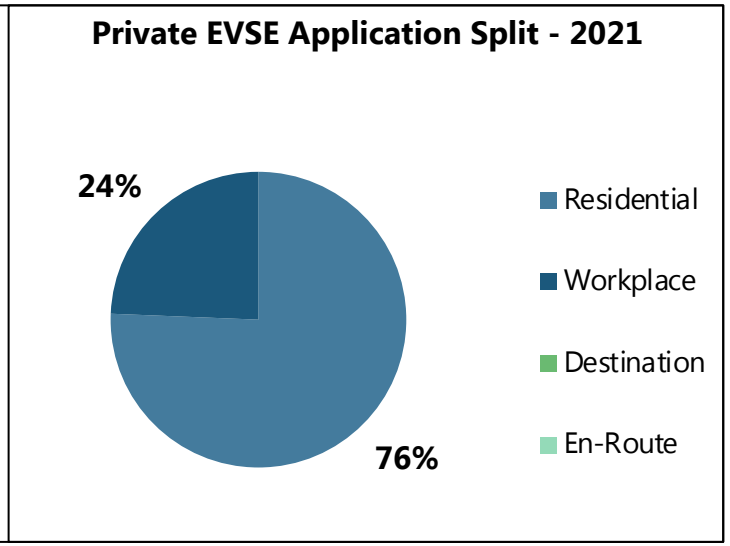
Regional EVSE Market- EMEA

Investments, incentives and targets are accelerating EMEA's EV charging sector





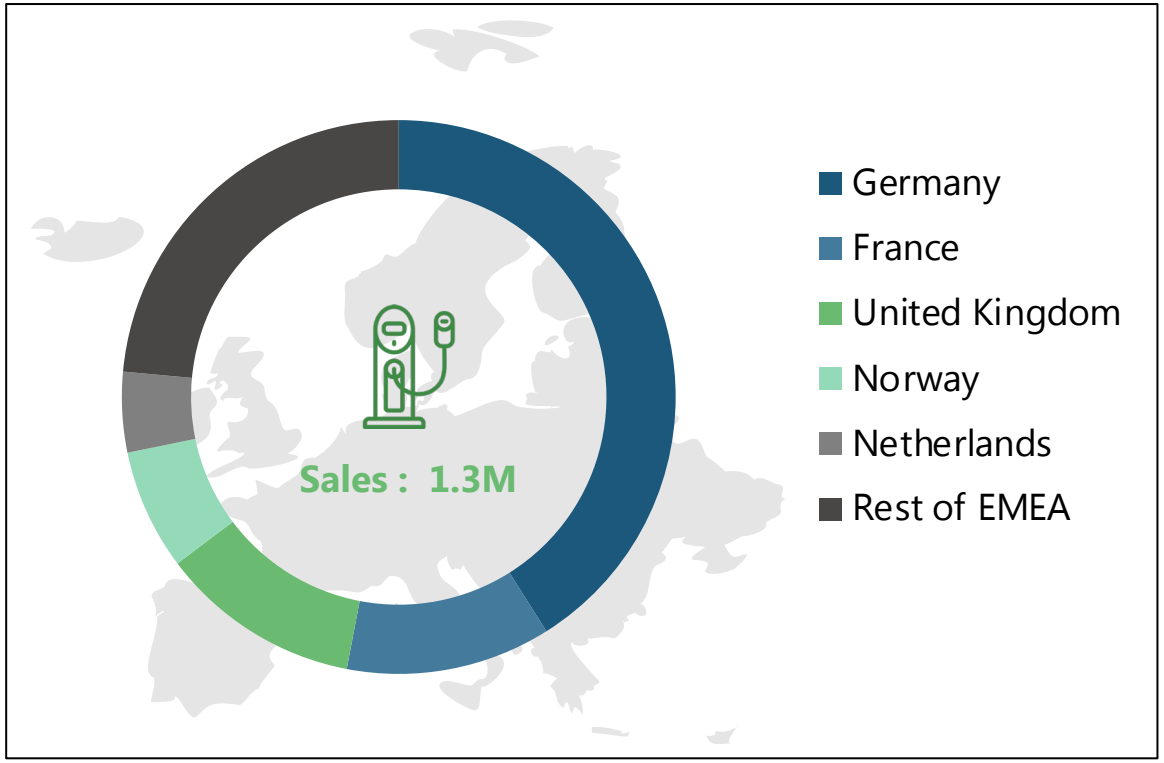




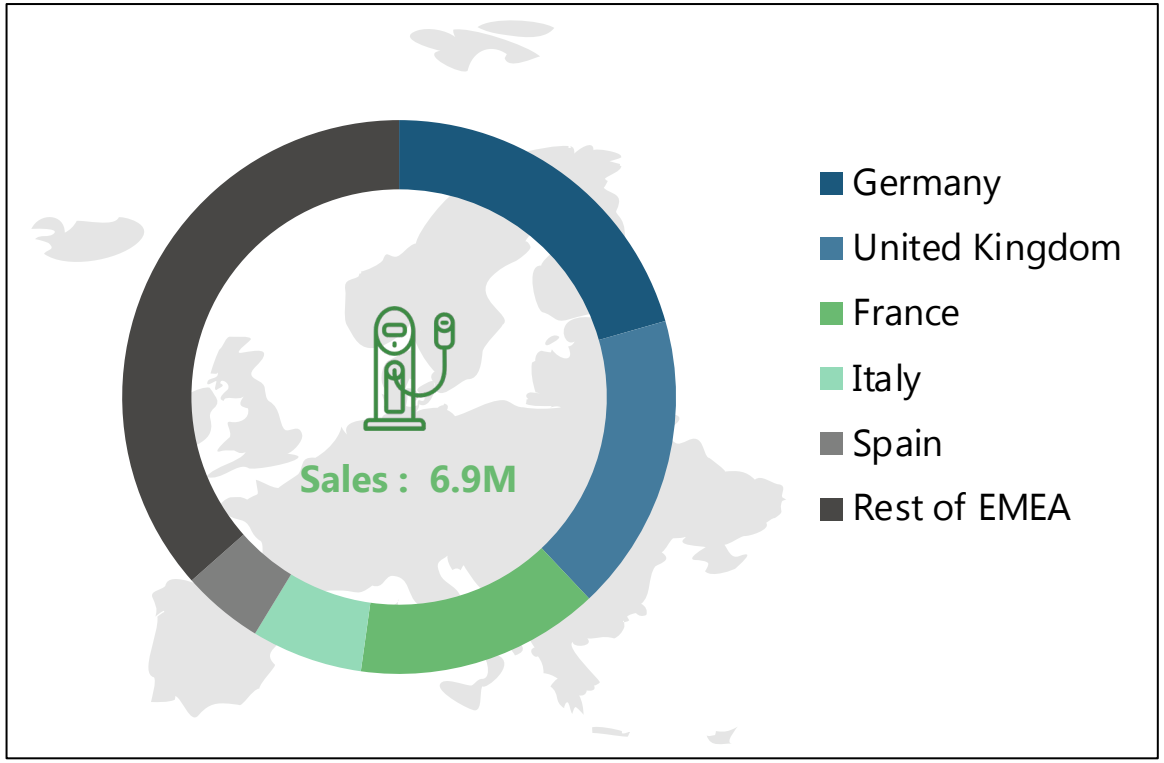
EVSE Country Markets - EMEA

Few active countries are driving majority of the EMEA's EV charging sector

Charging Points Annual Market - 2021



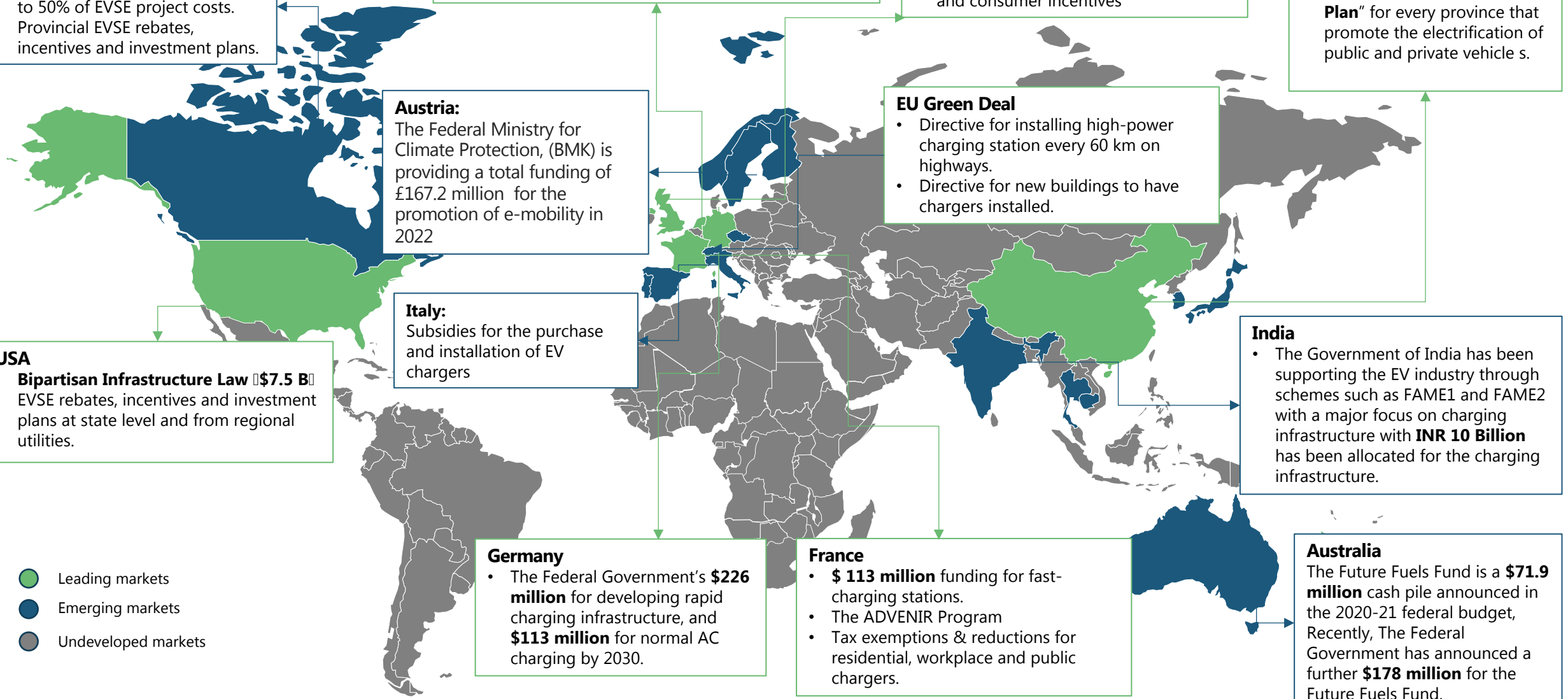
Charging Points Annual Market - 2030



EVSE Policies and Incentives

Global EVSE Policies & Incentives

EV charging market is currently an incentive driven market



Canada:
- **$680 million** '**ZEVIP**' funding up to 50% of EVSE project costs.
- Provincial EVSE rebates, incentives and investment plans.

Netherlands
- Deductions in prices in installation of chargers.

United Kingdom
- **£1.9 billion** in charging infrastructure and consumer incentives

China
- China has"**14th Five-Year Plan**" for every province that promote the electrification of public and private vehicle s.

Austria:
The Federal Ministry for Climate Protection, (BMK) is providing a total funding of £167.2 million for the promotion of e-mobility in 2022

EU Green Deal
- Directive for installing high-power charging station every 60 km on highways.
- Directive for new buildings to have chargers installed.

Italy:
Subsidies for the purchase and installation of EV chargers

USA
- **Bipartisan Infrastructure Law $7.5 B**
- EVSE rebates, incentives and investment plans at state level and from regional utilities.

India
- The Government of India has been supporting the EV industry through schemes such as FAME1 and FAME2 with a major focus on charging infrastructure with **INR 10 Billion** has been allocated for the charging infrastructure.

Germany
- The Federal Government's **$226 million** for developing rapid charging infrastructure, and **$113 million** for normal AC charging by 2030.

France
- **$ 113 million** funding for fast-charging stations.
- The ADVENIR Program
- Tax exemptions & reductions for residential, workplace and public chargers.

Australia
The Future Fuels Fund is a **$71.9 million** cash pile announced in the 2020-21 federal budget, Recently, The Federal Government has announced a further **$178 million** for the Future Fuels Fund.

Technological Innovations

Regulations on EV Charging

Harmonized standards for EV charging will drive the evolution of charger features

Uptime

In the U.S, there is a minimum requirement of 97% uptime for public chargers funded through Bipartisan Infrastructure Law

Metering

The EU directive in Fit for 55 requires Package establishes requirements that need to be satisfied by energy meters. Germany in specific has the Calibration Law which requires all charging devices to provide transparent billing system

Building Regulation

Energy Performance of Buildings Directive (EPBD) of the European Union and other regulations in countries like UK and India require new buildings to be equipped with EV chargers

Smart Charging

A lot of countries like UK, Belgium, Netherlands and some states in the US require chargers funded by government programs to be smart and be connected to the back-end software via OCPP or OCPI

Load Management

As defined by NKL , chargers in Netherlands must have a local-load balancing system. For three or more EV chargers, load management features are generally required in multi-unit buildings in Germany

Renewable Energy

Germany and Belgium require chargers funded by the government or tax –subsidized to be powered by green energy.

Payment

Germany's new regulation requires all future charging points to have a debit or credit card reader. Other countries like Netherlands require public chargers to be able to read valid charge cards from various providers

Technology Trends

Key technologies penetrating EVSE market

1. DC Wallbox

- DC wallbox charger market will see rapid expansion owing to applications in workplace and destination segments.

2. Vehicle-to-Grid (V2G)

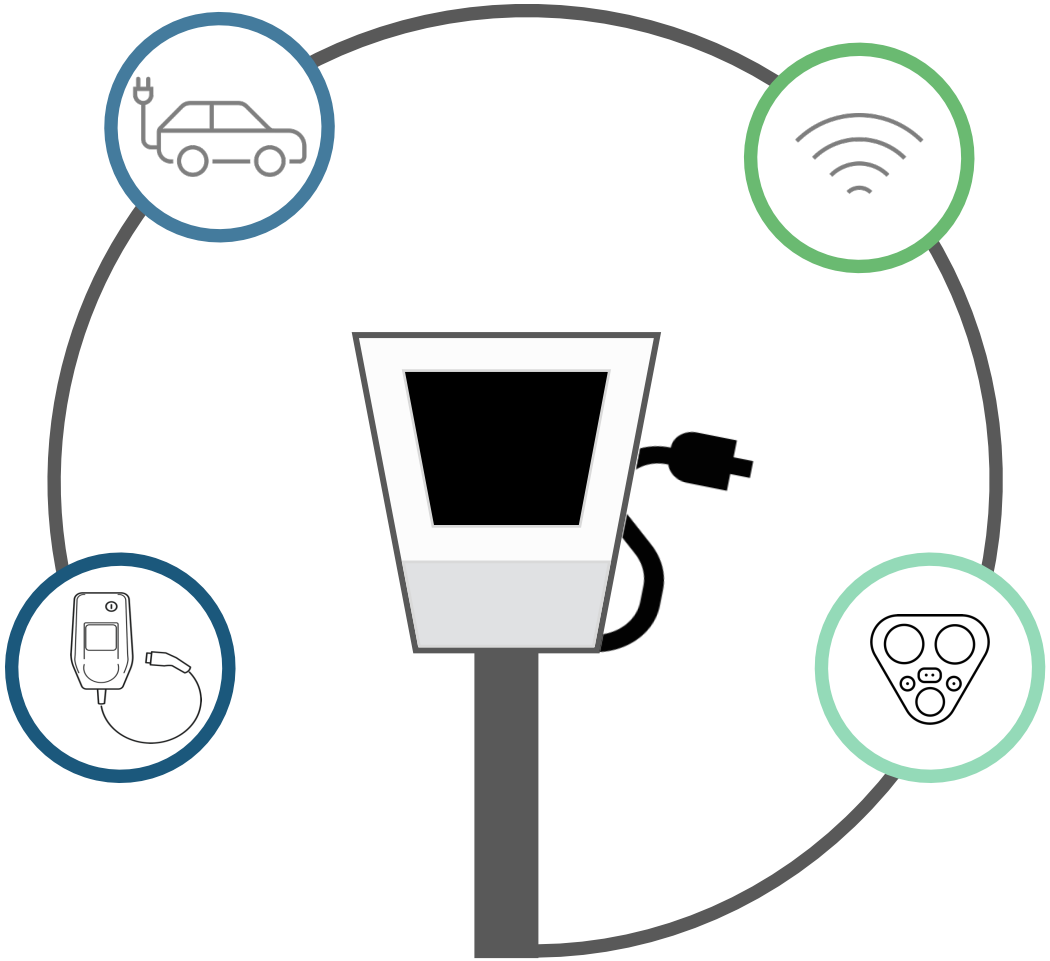
- 7000+ chargers installed globally.
- 20+ EVSE manufacturers providing V2G chargers.

3. Wireless Charging

- Increased vehicle range.
- Hands-free operation.

4. Megawatt Charging System (MCS)

- Charging speed of up to 3,750 kW.
- High-speed charging for heavy-duty vehicles.



Competitive Landscape

Competitive Landscape (1)

Evolving business models; M&As slowly moving E-mobility market towards consolidation

Diversification by businesses

- EVSE start ups and small companies are acquired by energy utilities, large manufacturers and oil giants to strengthen their business
- Smaller companies, specially maintaining public charging networks are not able to sustain because of low utilization of chargers and cost associated

360-degree service

- Companies providing **E-Mobility service** are moving towards providing a **360-degree service**. They manufacture chargers, manage and operate charging stations, design management software and function as an electric mobility service provider as well. Below are some examples:
  - **Eaton** has acquired **green motion** which provides all the above services
  - **ABB** has partnered with **ChargeLab** which will allow them to offer integrated hardware and software services
  - **ABB** is also planning to carve out its EV charging business into a separate legal entity
  - **Chargepoint** recently acquired Austrian e-Mobility software provider **has.to.be** to accelerate e-mobility developments across Europe.

Competitive Landscape (2)

EVSE companies going public, entering new markets and expanding their product portfolio

Companies going public

- To meet the huge market need of chargers, sizable investments are required, hence private EVSE companies are going public through the route of "Initial Public Offering" IPO or through merger with Special Purpose Acquisition Company (SPAC) deals.
- In e-mobility spectrum, SPAC deal has shown to be preferred over IPO route by OEMs for going public. This is because companies then get imposed with less regulations of the Securities & Exchange Commission (SEC) as well as time frame.
- **Chargepoint**, **EVBox**, **Wallbox**, and **Tritium** are the companies that have opted for the SPAC route to go public while **ABB** and some small companies intend to go public via the IPO route. FASTNED and Blink charging have already gone public in 2014 and 2018, respectively, through IPO.

Globalization

- EVSE OEMs are making strategic international expansion plans to scale their footprint to a global level and provide their companies a significant infrastructure share in new regions.
- This expansion is being done through new partnerships, mergers and acquisitions and allows the companies to capitalize on new markets immediately and provides opportunities to strategically increase their global assets
    - **ABB** acquired a majority stake in the Chinese EVSE OEM, **Chargedot** and Indian EV charging digital platform provider, **Numocity** to expand and deepen their footprints in the APAC region.
    - **U.S** based CPO, **Blink Charging** recently acquired European EV charging operator **Blue Corner** which immediately added **7,000** charging points in **Western Europe** to their network.

Audience Q&A

PTR's EVSE Market Research

Analysis of EV & EV Chargers market around the globe

EVSE Market Sizing- 28 Countries, 5 Regions

- Installed and Annual Market forecast in Capacity, Application and Owner's views from 2018-2030 (Units, Revenue)
- Public Policies and Plans
- Charger Pricing
- Incentives and Grants
- Market Shares, Top Suppliers
- Presentation of data in PowerBI platform

EVSE Software Service Market Sizing

- Installed and Annual Market forecast from 2018-2030 (Units, Revenue)

EVSE Market Competitive Analysis Report

- Mergers & Acquisitions (M&A)
- Company Profiles of 15 leading EVSE OEMs

PTR Sonar EVSE

- Weekly updates on key market happenings
- Proprietary desktop/mobile app

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