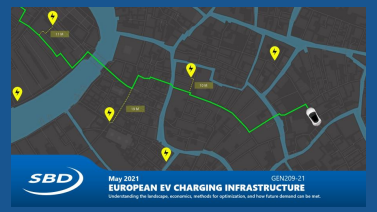


TABLE OF CONTENTS

RELATED SBD REPORTS

623 - The Electric Vehicle Guide

SBD's EV Guide provides insight into the current situation for mass-produced passenger and light commercial EVs, their features, charging infrastructure, as well as environmental impact and policy considerations.

With editions for Europe, USA and China, this guide is ideal for understanding the opportunities that EVs offer and challenges they face, both now and in the future.

Electric Vehicles

#209

European EV Charging Infrastructure

Understanding the landscape, economics, methods for optimization, and how future demand can be met.

Globally, the EV market has made impressive gains in the last few years, but much of this growth has been linked to government -funded schemes. Directly tied to increasing EV sales is the need for charging infrastructure development. Where charging infrastructure is sufficient it can act as a net regional promotor for EV sales, but the converse is also true. Much of the recent research on the barriers to EV uptake highlight that the lack of charging infrastructure is a clear barrier to EV uptake.

SBD Automotive's European EV Charging Infrastructure report provides a detailed understanding of the charging infrastructure industry, followed by a detailed review of the current state of charging infrastructure in Europe. This will enable intelligent decisions about how we can meet the needs of the rapidly growing EV market. This report reviews the existing EV charging networks deployed across the EU, EFTA and the UK, including an overview of organizations operating in closely related sectors.

COVERAGE: NA, CHINA, EUROPE

FREQUENCY: ANNUALLY, QUARTERLY, ONE TIME

PUBLICATION FORMAT: PDF, POWERPOINT, EXCEL, ONLINE

PAGES: 310+

Request price

Key features and benefits

- An overview of the sector value chain, the profile and roles of the key companies involved in the roll out and/or operation of EV charging networks.
- The key business models underpinning EV charging network deployment and operation, including information on general capital and operational cost structures.
- Characteristics of the major networks deployed, highlighting countries that need additional investment.
- Suggested methodology for analyzing effectiveness of existing infrastructure and setting targets for regional investment.
- Reviews the existing EV charging networks deployed across the EU, EFTA and UK

This research is useful for

PRODUCT PLANNERS

CUSTOMER EXPERIENCE

MARKETING

C-SUITE

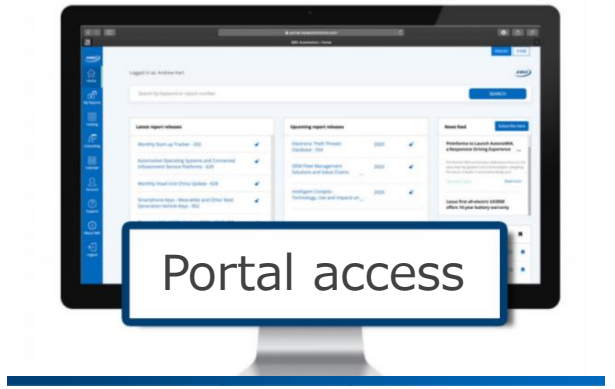
ENGINEERS

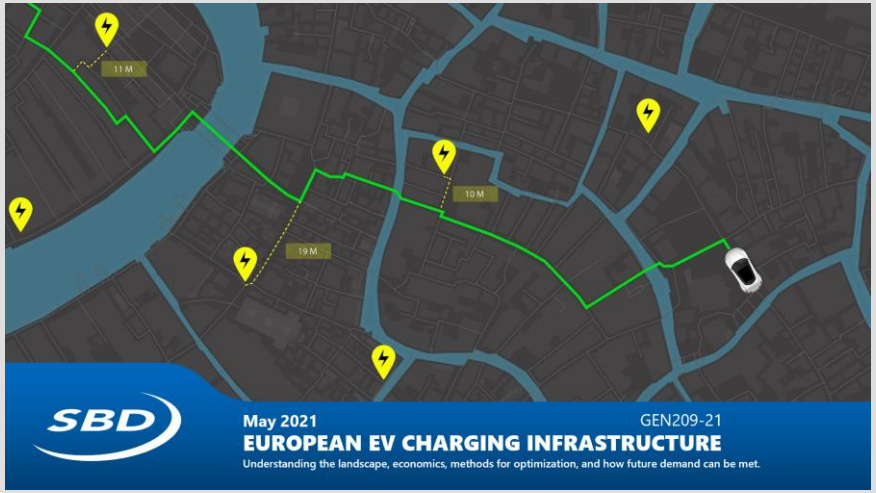
Do I have access?

100+
Reports published per year

50k+
Slides of insights, forecasts & data

4,000+
# of auto professionals who access our reports



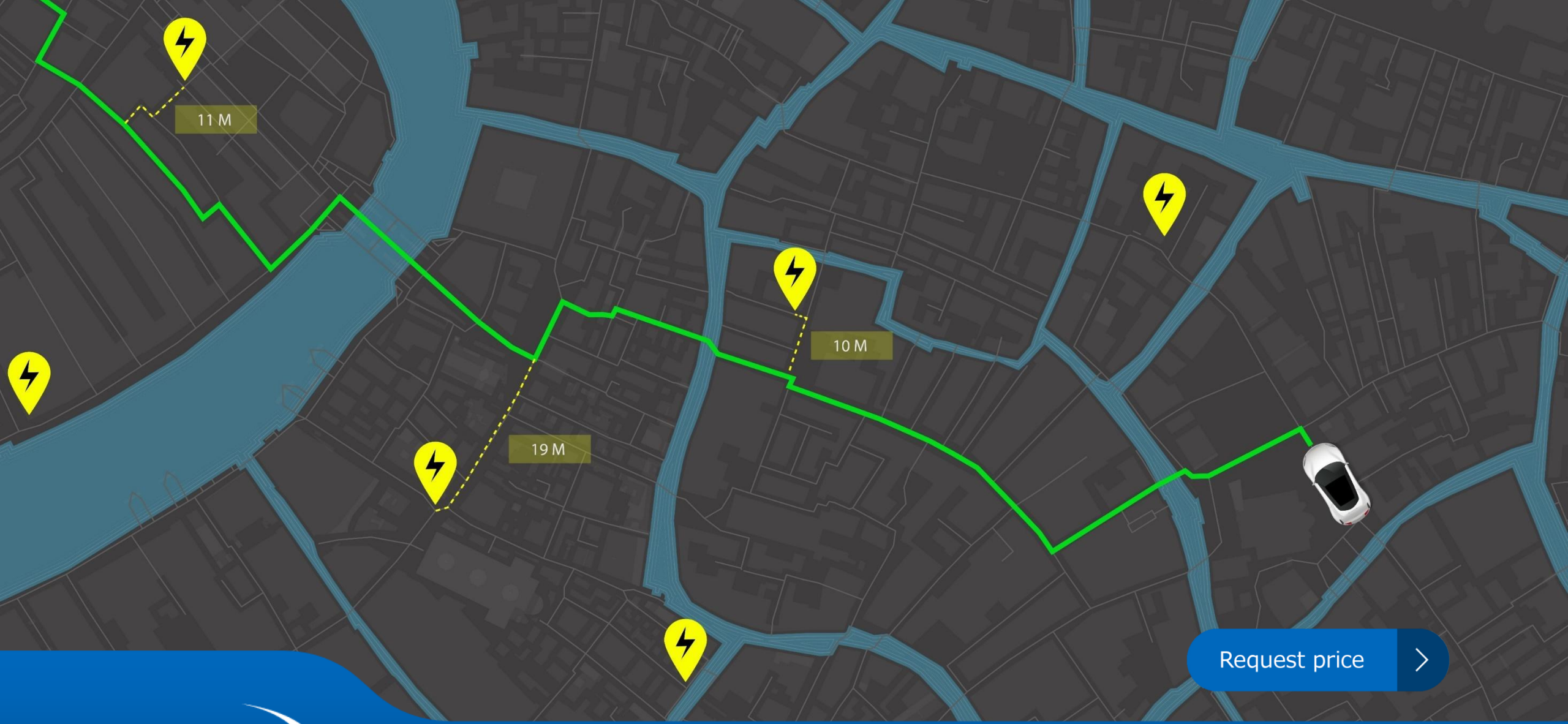


Request a quote for

European EV Charging Infrastructure

New for 2021

Request price



May 2021

GEN209-21

EUROPEAN EV CHARGING INFRASTRUCTURE

Understanding the landscape, economics, methods for optimization, and how future demand can be met.

Table of Content

Introduction

Introduction

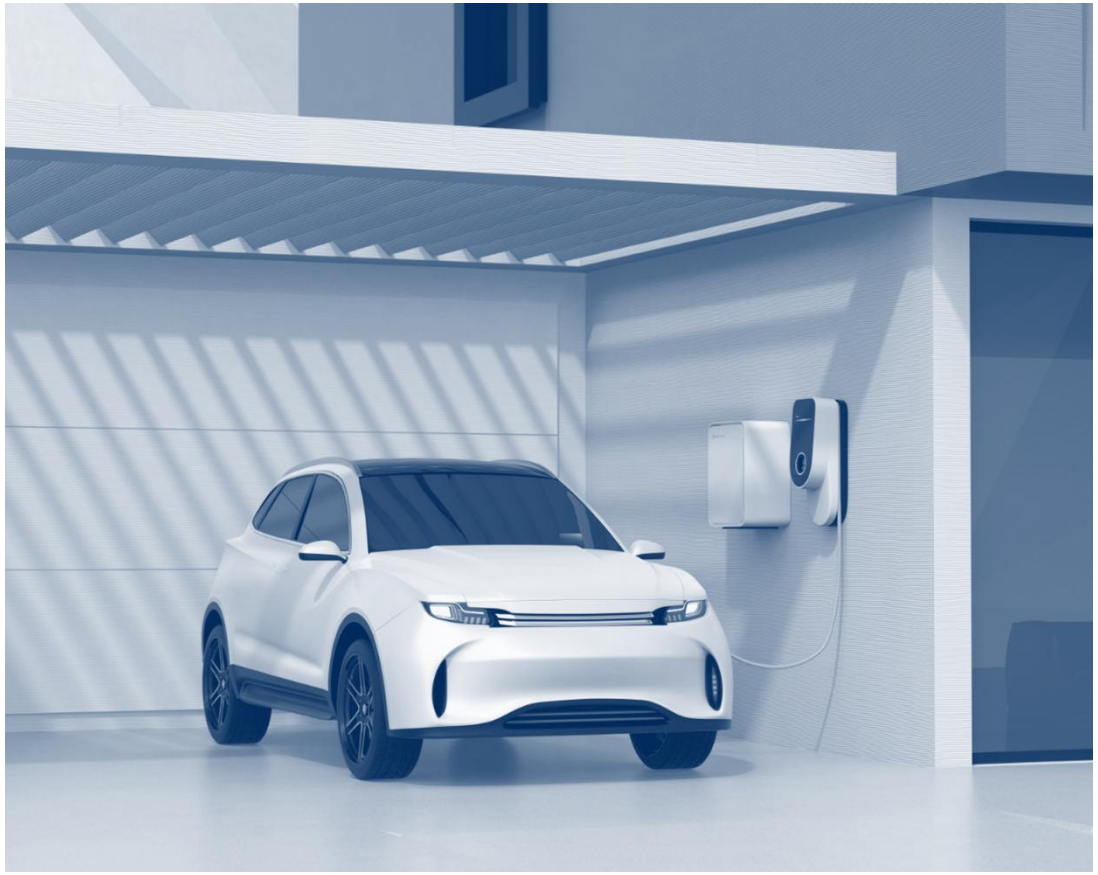
Globally, the EV market has made impressive gains in the last few years, but much of this growth has been linked to government-funded schemes.

Directly tied to increasing EV sales is the need for charging infrastructure development. Where charging infrastructure is sufficient it can act as a net regional promotor for EV sales, but the converse is also true. Much of the recent research on the barriers to EV uptake, including SBD's recently published report highlight that the lack of charging infrastructure is a clear barrier to EV uptake.

This report will provide a detailed understanding of the charging infrastructure industry, followed by a detailed review of the current state of charging infrastructure in Europe. This will enable intelligent decisions about how we can meet the needs of the rapidly growing EV market.

This report reviews the existing EV charging networks deployed across the EU, EFTA and the UK, including an overview of organizations operating in closely related sectors. This report covers:

1. An overview of the sector value chain, the profile and roles of the key companies involved in the roll out and/or operation of EV charging networks.
2. The key business models underpinning EV charging network deployment and operation, including information on general capital and operational cost structures.
3. Characteristics of the major networks deployed, highlighting countries that need additional investment.
4. Suggested methodology for analyzing effectiveness of existing infrastructure and setting targets for regional investment.

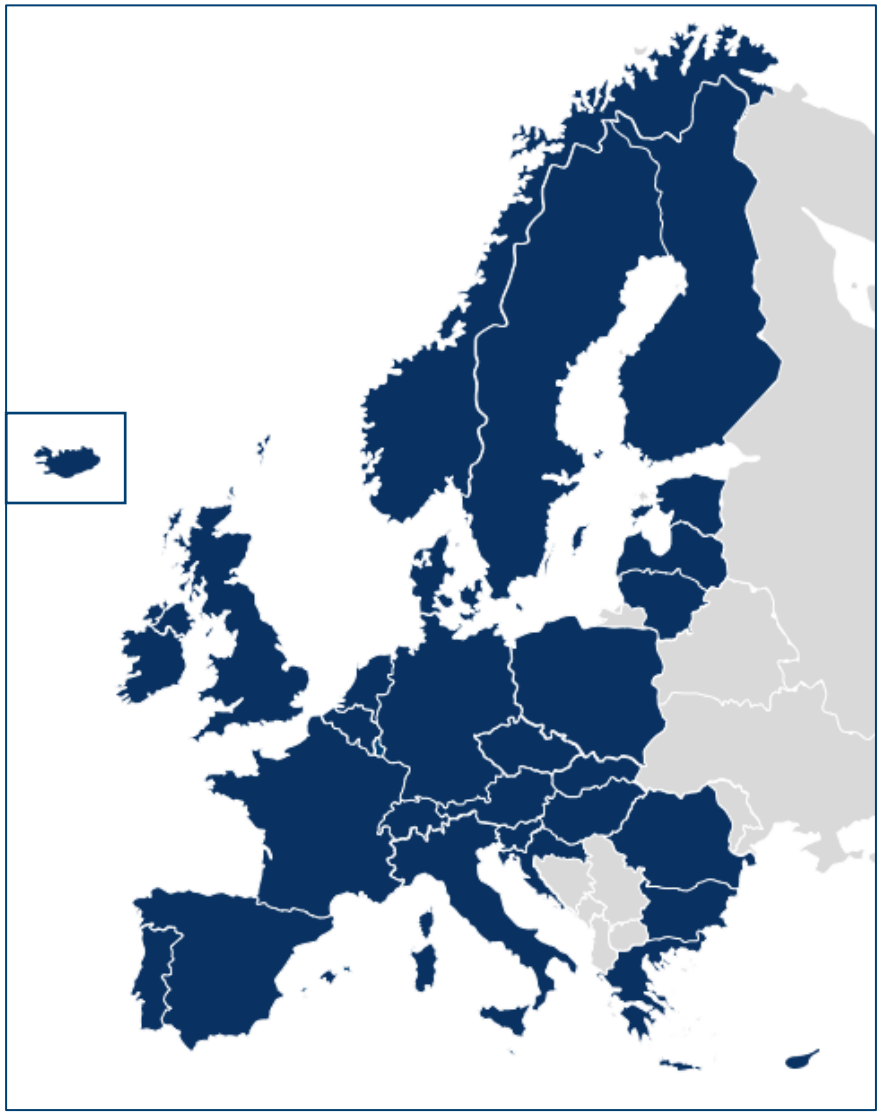


Report Scope

The European Union and other European government bodies have been pursuing progressive climate policies for many years with policies and directives used to ensure members states are steadily achieving targets as they progress toward climate neutrality in 2050. This includes the 2030 Climate Target Plan and the 2050 European Green Deal. Of particular importance to electrification, is the Clean Power for Transport Directive which requires EU member states to establish targets for publicly-accessible EV charging infrastructure distribution. This includes ensuring a charging station at least every 60 km along the TEN-T road network, a network of road corridors critical to the movement of goods in the EU.

To understand where investment is required in Europe to establish sufficient charging infrastructure, SBD has performed an in-depth analysis of charging station economics in the region as a whole as well as the situation in each individual country. This is supported by primary research including interviews with key players in the industry such as CPOs, eMSPs, and municipalities.

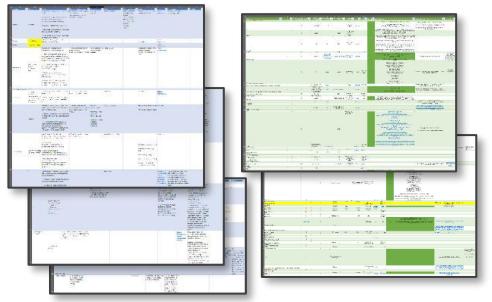
The project's geographic scope consists of the current EU-27 countries as well as the UK and EFTA countries. The analysis in this report will be limited to publicly-accessible charging stations. Although this work does not focus on vehicles specifically, the charging use cases and value chain in scope are those related to light highway and city vehicles, 3.5t or less.

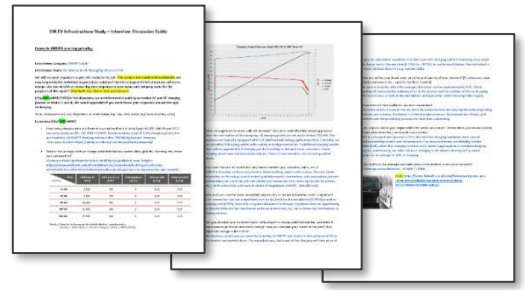


Methodology

This report provides conclusions from the research as well as back-up reference material to support further understanding and analysis. SBD has employed several methodologies to ensure a complete understanding and to enable further self-guided analysis:

Desk-Based Research	To ensure that the report reflects the most recent information and the current state of Europe's charging infrastructure, researchers began by collecting information about the major commercial and public actors. This allowed SBD to review the relative importance of each player at the beginning of the project to determine which ones to focus on for more in-depth study. This research phase included ~600 separate sets of details.
Interviews	The next step in this project involved making contact with as many of our target companies and cities as possible to arrange interviews. We were successful in completing 19 interviews covering major cities, CPOs, EVSE manufacturers, and CPMS providers. These ~100 pages of transcripts have been distilled to their key points in this report and those results used to inform our overall analysis.
Data Analysis	One of the goals of this report is to understand the geographic distribution of charging infrastructure relative to demographic factors, country borders, city vicinities, and in relation to the TEN-T road network. To enable the data analysis SBD developed a custom web-based tool that allows the user to dynamically view charging station locations in Europe while comparing against various statistical and demographic metrics. The tool includes information for the 1300+ NUTS regions in the EU and also allows filtering and calculation against the TEN-T road corridors. Information on this tool is available on request to info@sbdautomotive.com.





Definitions

Charging Stations, Points, Connectors, and Hubs

Several terms are being used in the industry to describe the characteristics of charging infrastructure. Some are synonyms while others have unique meanings. The example equipment below is referred to as a *Charging Station*. You'll notice that it has 3 *Connectors*, however this equipment can only charge through two connectors at once, which means that this station has 2 *Points*.

Using these definitions, we can quantify the number of vehicles that can be charged simultaneously based on the number of *Points*. Note that in some cases, the station will not be able to supply full power to each point, so a 300kW station with two points, may supply only 150kW to each point when used at the same time. The focus in this report will be on the number of *Points* and the equipment power.

Image source: Efacec

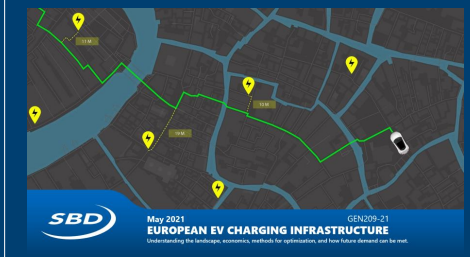
Note that unlike a *Gas Station*, a group of chargers (or *Charging Stations*), as shown in the image to the right, is referred to as a *Charging Hub* or *Charging Pool*. This terminology may soon evolve to more closely resemble current Gas Station terminology.

Image source: Ionity

Terms Used in this Report

Terms	Definition
BEV	Battery Electric Vehicle – Fully electric vehicle without a combustion engine
CAPEX	Capital Expenditure – Non-recurring expenses for equipment, labor, etc.
Car Parc	Refers to the cars in operation in the market
Charge Point	Often used to mean 'Charging Station'. Not to be confused with 'Point'.
Charging Hub/Pool	A collection of charging stations from a single company
Charging Station	Charging equipment that acts as an interface between the vehicle and the grid
Connectors	Refers to the number of individual connectors available on the EVSE
CPMS	Charge Point Management Software
CPO	Charge Point Operator
CPO/O	Charge Point Owner / Operator
CSO	Charging Station Owner
DSO/TSO	Distribution System Operator / Transmission System Operator – components of the electrical grid
eMSP	Electric Mobility Service Provider
EVSE	Electric Vehicle Supply Equipment – synonymous with charging station
HPC	High Power Charger
HPDC	High Power DC Charger
kW	Kilowatt – Used to describe the power provided by an EVSE
kWh	Kilowatt-Hour – Used to describe the energy provided by an EVSE
NUTS	A European Commission acronym that refers to a standardized system for dividing up geographic regions into smaller components
OEM	Original Equipment Manufacturer – in this report, synonymous with 'Automaker'
OPEX	Operational Expenditure – Recurring expenses for the provision of services
PHEV	Plug-in Hybrid Electric Vehicle – Contains both an electric drive system and combustion engine. Can be plugged-in, but not mandatory.
Point	Refers to the number of simultaneous charging sessions offered by an EVSE
PPP	Public / Private Partnership
TEN-T	Trans-European Transport Network
V2G	Vehicle to Grid – Allows the vehicle to send power to the electric grid

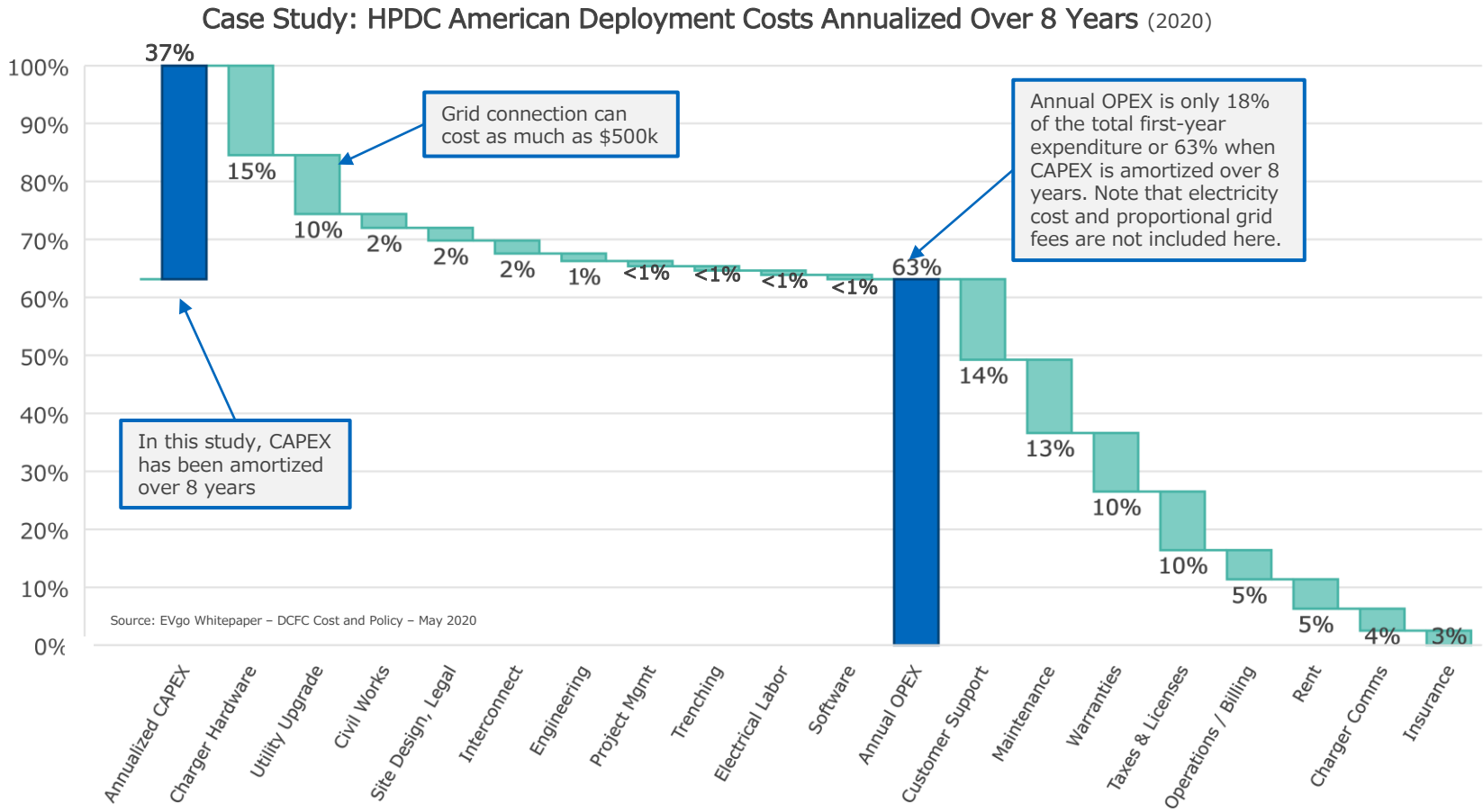
Example slides from the report



Request price

Profitability is a distant dream with grid costs playing major role

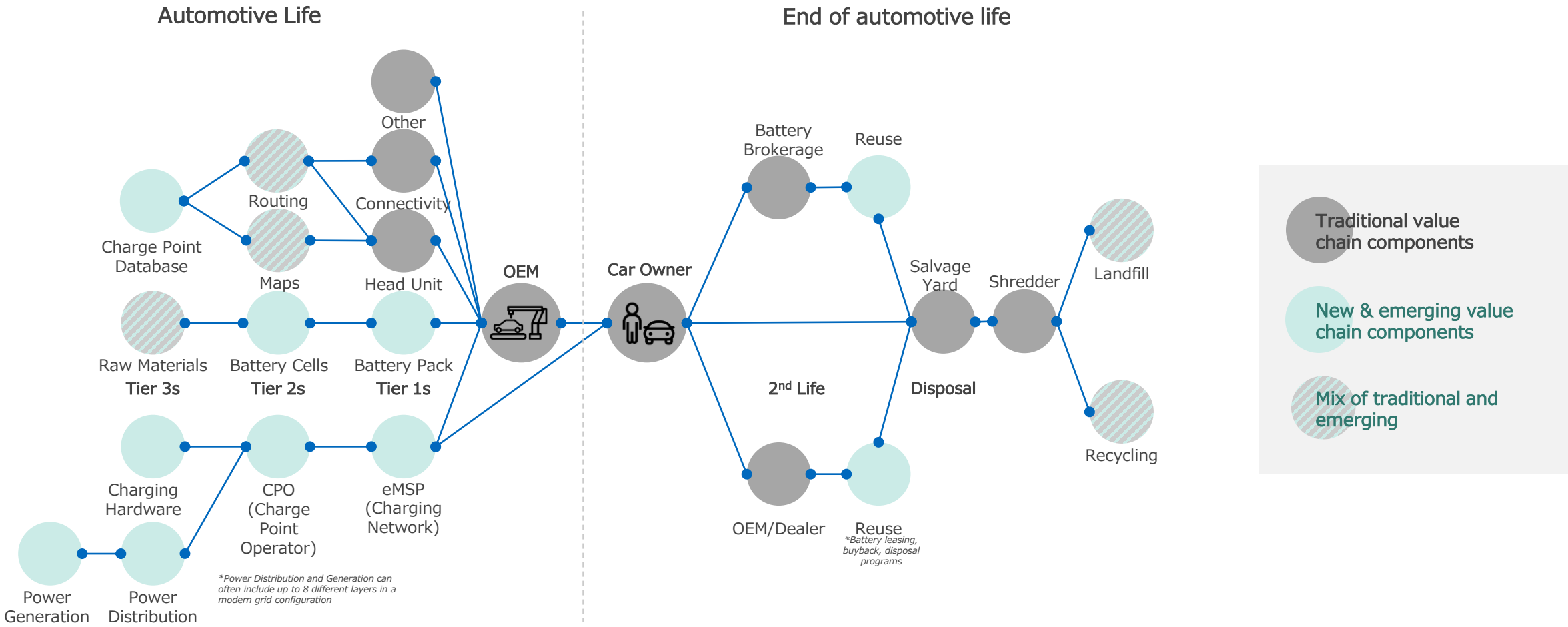
- CAPEX
  - Equipment
    - Charger (EVSE)
    - Signage and/or Canopy
    - Opt. Battery or Solar
    - Transformers
  - Labor
    - Installation
    - Site Survey & Prep
    - Grid Connection
    - Engineering & Design
- OPEX
  - Per Charger
    - Electricity Payment
    - eMSP Partner Fees
    - Maintenance & Repair
    - Insurance
    - Land Use
    - Revenue Share
    - Grid Fees
  - Business
    - Customer Support
    - Onboarding
    - Accounting & Invoicing
    - Taxes & Licenses
    - Rent



Large initial outlay combined with low utilization illustrates the critical role subsidies play in establishing HPC networks. Many companies expect charging equipment pricing to reduce gradually with economies of scale and technological advances. Without government intervention, it's unlikely that grid connection fees will change significantly, **however solar- and battery-supported charging stations may be able to reduce or eliminate grid connection fees** entirely.

A variety of initial CAPEX and recurring OPEX costs are associated with building and operating charging infrastructure. The CAPEX costs can vary significantly, with high-power chargers being much more expensive to setup and install. **Access to suitable locations along highways, roads and in urban areas is seen as a major barrier as well as permitting and grid connection processes that can significantly reduce the speed of infrastructure roll-out.** The 'Pure CPO' business model avoids some of the business expenses such as onboarding and advertising but may leave revenue from higher charging prices on the table.

The EV value chain is more complex than with traditional vehicles



The EV value chain adds several more layers with respect to the traditional vehicle value chain. Specifically, the required integration with electrical energy infrastructure and end-of-life component considerations adds significant complexities for OEMs, suppliers and government. Coordination across industries is required to create an environment that is conducive to the present and future EV owner in order to achieve the emissions targets set by local and national governments. With complexity and gaps in-market comes opportunity for new entrants and innovation, both of which are prevalent in the EV industry today. Several challenges remain, with the efficiency of how infrastructure assets are managed being near the top.

The EV charging industry will continue to evolve

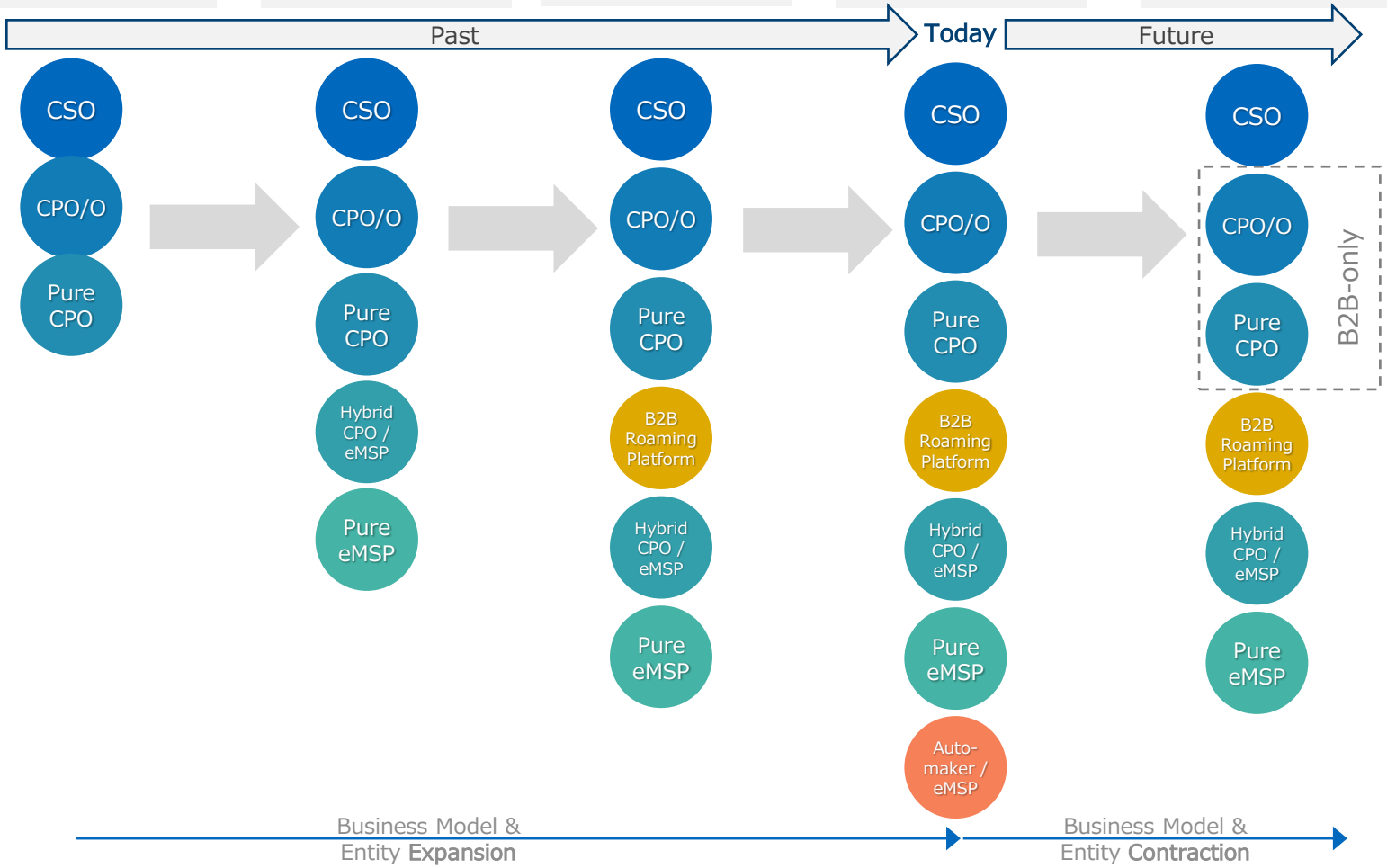
A fledgling industry focuses on B2B relationships. A poor user experience develops due to multiple memberships being required.

The need for roaming agreements leads to the eMSP business model. Some CPOs adopt the model as well, creating the hybrid model.

To simplify the setup of roaming agreements, B2B roaming platforms such as Hubject are formed.

To provide more seamless service to their customers, automakers begin to operate as eMSPs, typically through white-labeling.

The overhead of managing customer account services is no longer worthwhile for CPOs. Automakers are unable to add value to mature eMSP offering.

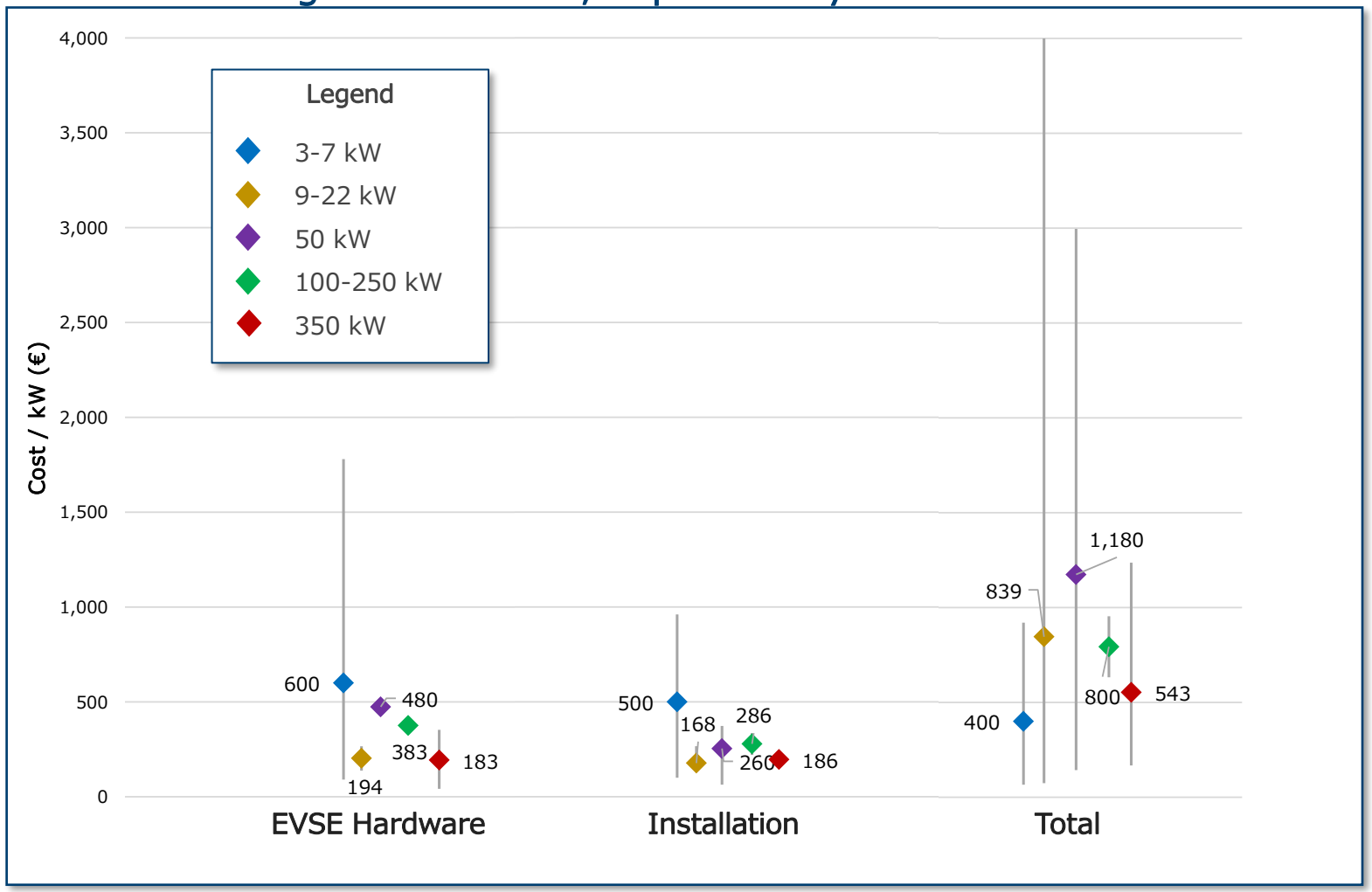


The EV charging industry has evolved through several stages and will continue to evolve over the next few years. The same type of evolution has occurred in the mobile phone industry. In fact, each layer represented to the left (except the 'Automaker/eMSP') has a parallel layer in the mature mobile phone industry, where consumer pressure led to widespread roaming partnerships, which were eventually mandated in many areas, followed by the creation of specialist layers such as IoT platforms. Automakers acting as eMSPs would be similar to mobile phone manufacturers bundling service with their phones, something that we haven't seen in the mobile phone industry. One reason for this is that there is little perceived value from the consumer's perspective. Why would a consumer want to be bound to the service provider that the manufacturer had chosen to partner with? This is similar to what we have with automakers offering eMSP services. Unless they can provide a substantial discount, there's little reason for consumers to want to use the service that the automaker provides. The one exception is that since EVs are still new to most people, this built-in service offer can improve consumer understanding and onboarding. **We expect this type of Automaker/eMSP offer to disappear** in a few years as the consumer finds better offers elsewhere and becomes more confident charging their vehicle.

In addition, the **CPO layer is expected to become a purely B2B proposition in the near term, dropping consumer account management** from its offer. This is because a relationship with a pure CPO restricts the consumer to the use of that CPO's stations only, while membership to an eMSP platform enables regional and possibly global roaming and simplified billing. Note that Plug&Charge could challenge these assumptions.

High-power charging may be cheaper per kW

CAPEX Per Charge Point Per kW, Separated by Power



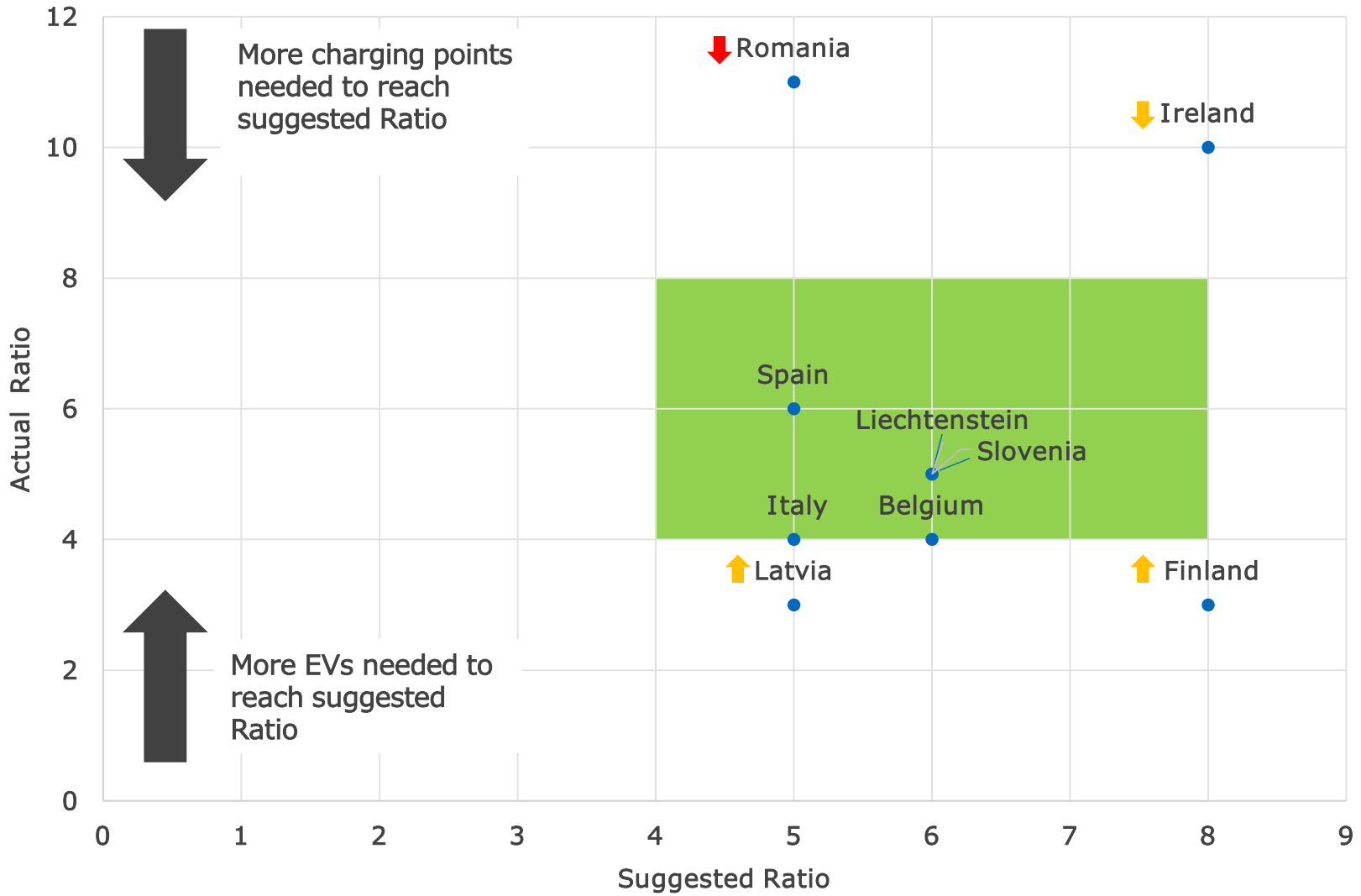
Since high power charging can be particularly expensive to install due to grid fees, equipment costs, and installation costs, it may seem that lower-power chargers are a more practical solution for maintaining predictable expenses and achieving profitability. However, the chart here shows the same data as on the prior page but divided by the average station power per power category to show the price per kW. We can now see that the total price per kW can actually be quite reasonable for high power chargers, while lower-power solutions could prove to be much more expensive.

Higher-power charge points can also command higher prices, yet utilization is generally lower and with greater seasonal fluctuation. For the same utilization, a higher-power charger will generate proportionally higher revenue. For instance, a 7kW charger could generate a theoretical max of 168 kWh-worth of revenue while a 350kW charger could generate 8400 kWh-worth of revenue. However, at present, only a minority of charging sessions will be at 350kW, with many of them being only 50kW and only during a portion of the session. Employing a realistic revenue model that adjusts with vehicle advances is critical to estimating future revenue potential.

Note the extreme variability of some of the low power charging stations. This is often due to civil works in dense, older cities where excavation and archaeological works are required. One examples includes the City of London needing to identify underground artifacts near Roman ruins prior to installing new power cables.

* The gray line indicates the range of high and low quotations received while the colored diamonds indicate the average cost. The 'Total' category reflects quotations of 'Total Cost' as provided during the research and is not directly connected to the EVSE Hardware nor Installation categories. In most cases, the Total will also include other costs such as Civil Works, Grid Connection, and Engineering.

Suggested Ratio - Slow Follower



Ratio= BEV:charging points

The majority of the Slow Follower countries are in the suggested ratio area. Romania should certainly focus on expanding its charging infrastructure and the same is true for Ireland, although to a lesser degree. Finland has more than enough chargers, but much like some of the early adopters, they need to shift their focus to installing faster chargers. Latvia has a slightly lower ratio than suggested due to a fairly robust DC charging network on the large highways to enable through-traffic. Local charging infrastructure is almost non-existent. Countries in this phase also need to be careful about proper placement of charging infrastructure. For instance, while Spain has a sufficient quantity of chargers, there are large areas of Spain with no access to fast charging equipment. This can prevent cross-country trips. A conscious, structured roll-out of this type of highway charging is critical to spurring EV sales in the market.

Key

- A slightly higher/ lower Ratio is suggested
- A significantly higher / lower Ratio is suggested
- Area of suggested Ratio (4-8):1

Allego - CPO/eMSP Profile

Company Overview

Link | Public | **Private**

Allego develops electric vehicle charging infrastructure and services. Founded in 2013 in the Netherlands, Allego develops electric vehicle charging infrastructure and cloud service platform supporting all charging infrastructure as well as provides services like charging station installation, management maintenance and monitoring services to municipalities, businesses and public transport companies.

Business Sector

Automotive | Oil/Gas | **Green Energy** | Software

Business Model

B2C Sales | **B2B Sales** | Subscription | Unit Sales

Investment & Acquisition Detail

- Paris-based investment firm Meridiam acquired Allego in 2018 from grid company Alliander.

Country Coverage

Value Chain Components

EVSE | **CPO** | eMSP | CPMS | Other

Products & Services

Public | Private

EV charging at
Van der Valk Hotel

Allego EV Cloud Platform

Partners & Customers

EVBOX

SBD Insight

- Allego is determined to shape the E-Mobility market.
- Allego is working to become a leader in e-mobility by partnering with local utilities, auto manufacturers, and suppliers on Ultra-E project to bring ultra-fast charging stations to Europe.

*Shows only charging stations where the company is listed as the operator.

Driivz - CPMS Profile

Company Overview

Link | Public | **Private**

Headquartered in Tel Aviv-Yafo, Israel, Driivz is a charging management software platform. The company manages a public electric vehicle charging network. In addition, it offers a robust cloud-based open and modular software platform that offers operations management, grid management, user management, public and workplace charging management as well as various advanced billing capabilities and driver applications.

Business Sector

Automotive | Oil/Gas | Green Energy | **Software**

Business Model

B2C Sales | **B2B Sales** | Subscription | Unit Sales

Investment & Acquisition Detail

- In August 2018, UK energy giant Centrica joined a $12m investing round for Driivz
- Gilbarco Veeder-Root made a minority investment in Driivz, part of a US$11M funding round co-led by Centrica Innovations in 2020.

Global Headquarters

Value Chain Components

EVSE | CPO | eMSP | **CPMS** | Other

Products & Services

Public | Private

Driivz Smart Platform

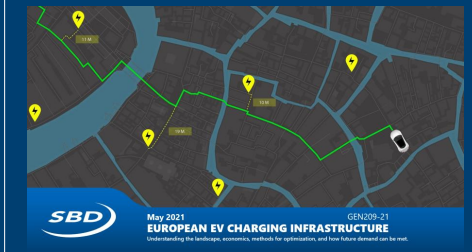
Partners & Customers

CEZ GROUP, Elaadnl, OPEN CHARGE ALLIANCE, centrica, epm, ALFEN, estamos ahí., EVgo, Energy for generations, HUBJECT, efacec

SBD Insight

- Driivz has a global presence and offers its EV charging management platform in 21 countries
- Driivz has a large footprint, and its unique platform gives the company a competitive edge in the European EV charging market.
- By focusing solely on a CPMS offering, the company has been able to build a robust system that meets the needs of a variety of customer types. Although the majority of its customers are based in Europe, global expansion should not be particularly difficult.

Request the price



Request price

Contact SBD Automotive

Do you have any questions?

If you have any questions or feedback about this research report or SBD Automotive's consulting services, you can email us at info@sbdautomotive.com or discuss with your local account manager below.

info@sbdautomotive.com

Book a meeting

USA | UK | Germany | India | China | Japan

Garren Carr
North America
garrencarr@sbdautomotive.com
+1 734 619 7969

Alessio Ballatore
West Europe
aballatore@sbdautomotive.com
+44 74 71 03 86 22

Luigi Bisbiglia
South Europe & RoW
luigibisbiglia@sbdautomotive.com
+44 1908 305102

Andrea Sroczynski
Germany, North & East Europe
andreasroczynski@sbdautomotive.com
+49 211 9753153-1

SBD China Sales Team
China
salesChina@sbdautomotive.com
+86 18516653761

SBD Japan Sales Team
Japan, South Korea & Australia
postbox@sbdautomotive.com
+81 52 253 6201