



MAY 2023 / JOE ELLWOOD

An introduction to EV charging

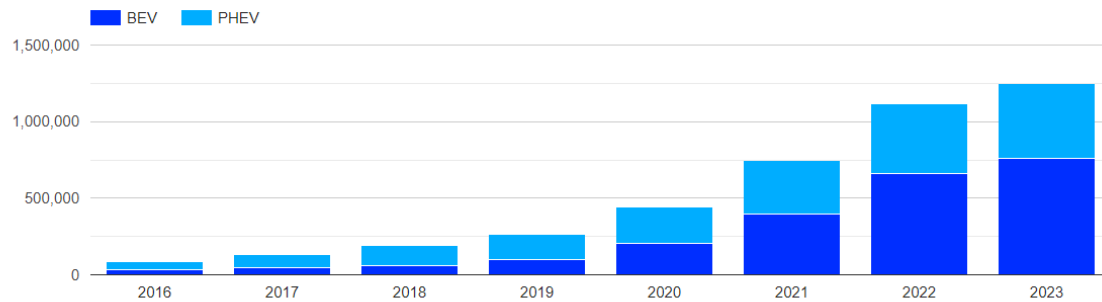
What's ahead and what are the opportunities for wholesalers?



E Mobility – Where are we now and where are we headed?

EV market

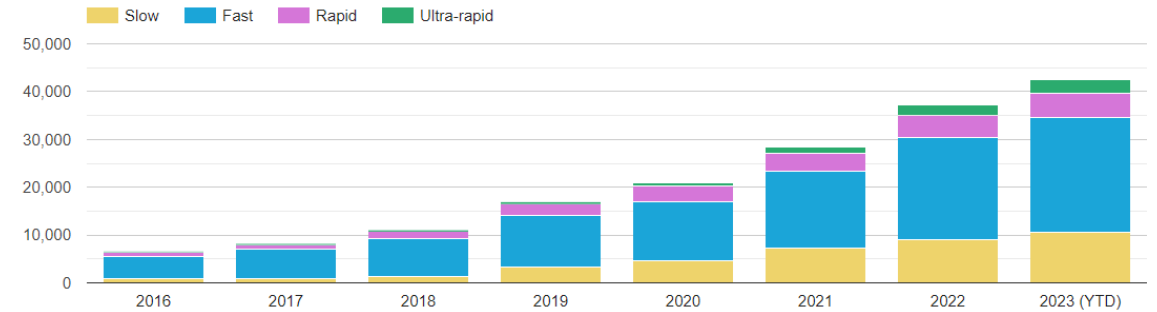
Cumulative number of plug-in cars registered in the UK (2016 to date)



Source: SMMT, April 2023

- 1,250,500 plug in cars on road in UK (760k BEVs and 490k PHEVs)
- 365,000 registrations in 2022 – market share of 22.9%
- 20% growth in 2022 compared with 2021
- 46,626 EVs registered in March 2023 – record month

Number of public UK charging points by speed (2016 to date)



Source: Zapmap database. Updated: 30th April 2023

E Mobility – Where are we now and where are we headed?

Changes to building regulations



Electric Vehicle Charging in Residential and Non-Residential Buildings

New residential buildings

- Chargepoint required for every dwelling with off-street parking
- Multi-dwelling buildings with more than 10 spaces to include cable routes for all spaces

New non-residential

- SCOTLAND: Every new non-residential building with more than 10 parking spaces to have chargepoint in 10% of spaces and cable routes in 50% of spaces
- ENGLAND: Every new non-residential building and every non-residential building undergoing major renovation with more than 10 car parking spaces to have one chargepoint and cable routes for a charger for one in five spaces

E Mobility – Where are we now and where are we headed?

Changes to building regulations

Product requirements

- Minimum 7kW
- Universal socket (untethered)
- Mode 3 or equivalent
- Smart charging legislation



E Mobility – Where are we now and where are we headed?

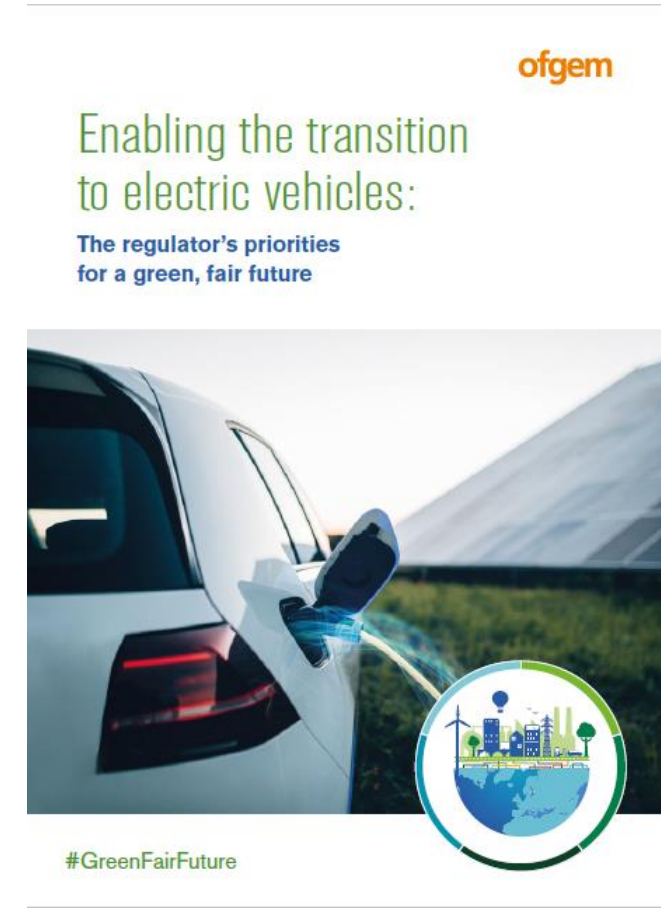
Ofgem report and smart charging legislation

Ofgem report

- Potentially 14 million EVs by 2030
- 19 million home chargers and 370,000 public chargers by 2035
- Need to spread demand
 - Smart charging tariffs
 - Vehicle to Grid (V2G), Vehicle to Home (V2H)

Smart charging (effective 30th June 2022)

- Chargers must require users to set a schedule during initial set up
- Default is to only charge at off-peak times
- Randomised delay
- Schedule 1 – Security (effective since 31st December 2022)



E Mobility – Opportunities

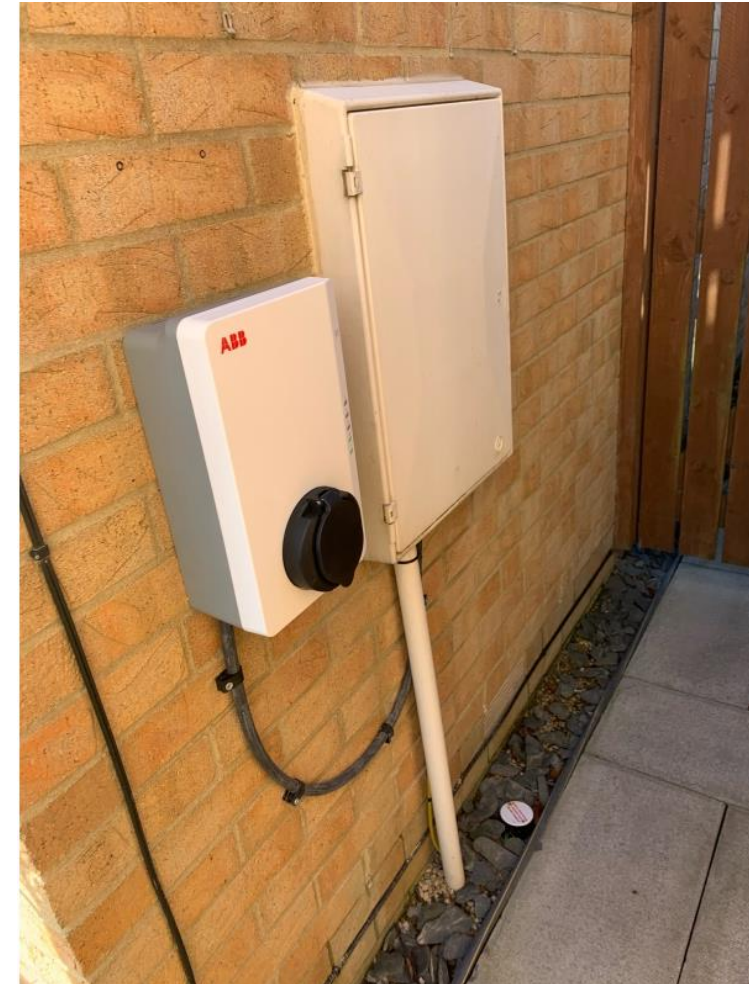
Residential

Customers

- Developers / house builders
- Landlords
- Home owners / tenants

Considerations

- Compliance with new building regs / smart charging legislation
- OZEV EV Home Charging Scheme grant (EVHS)
- Energy Saving Trust
 - Rural and remote owners
 - Used EVs



E Mobility – Opportunities

Commercial

Customers

- Developers
- Landlords
- Business owners

Considerations

- Multiple AC chargers (staff parking)
- Load management option is critical
- Supplement with DC chargers (fleet & visitors)
- OZEV Workplace Charging Scheme grant (WCS)



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Market (cars & standards)

Roadmap passenger cars

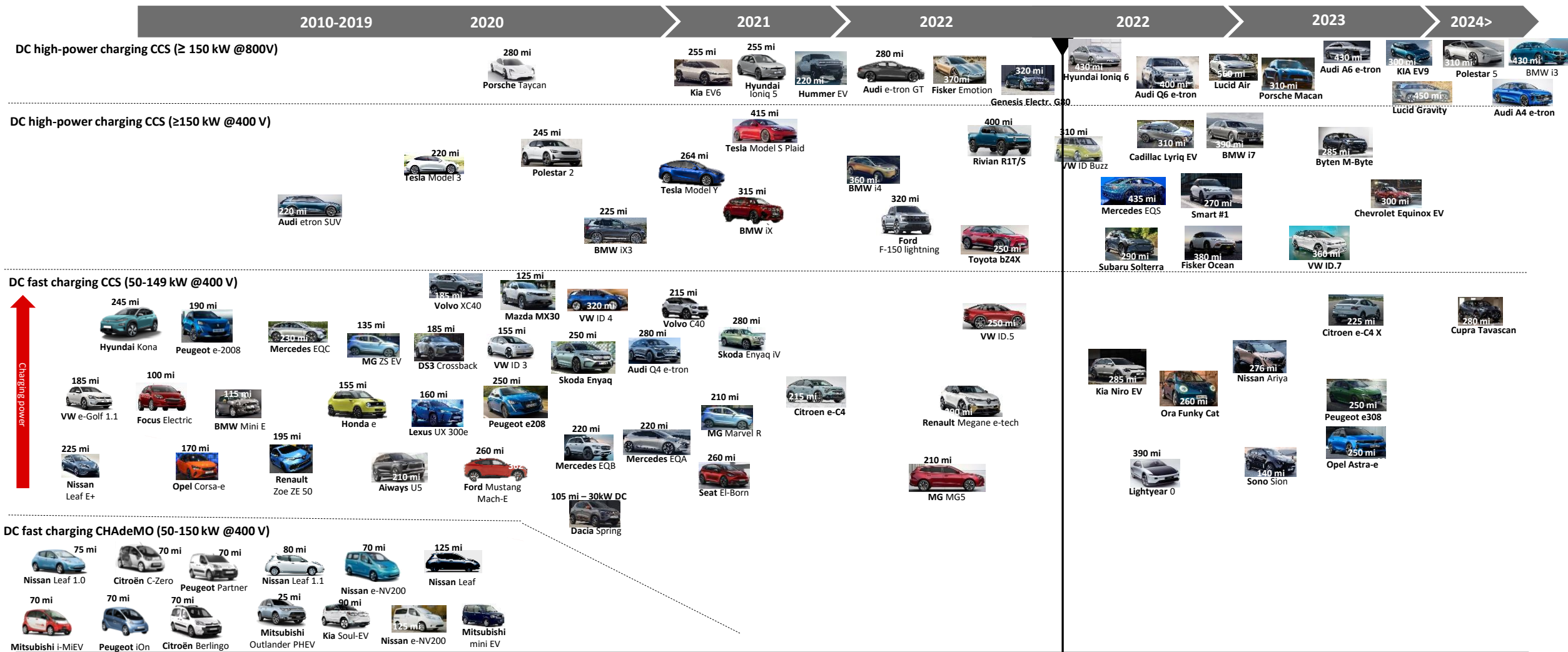


ABB is following the Car-OEM's Fast Charging standards

20-100 kW CHAdeMO/ 22-43 kW AC/ 20-350 kW CCS 2

From Q4-2012 onwards
22-43 kW AC



From Q4-2013 onwards
CCS 2



Very roughly said: A standard in fact is defined as the combination
of the physical connector + the communication protocol



From Q4-2010 onwards
CHAdeMO

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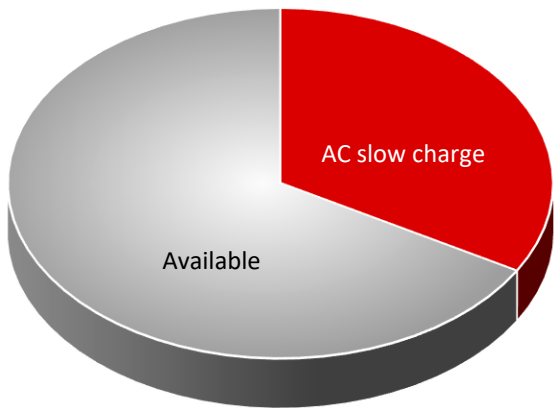
DC versus AC charging



Influence on range and availability by AC slow and DC fast charging

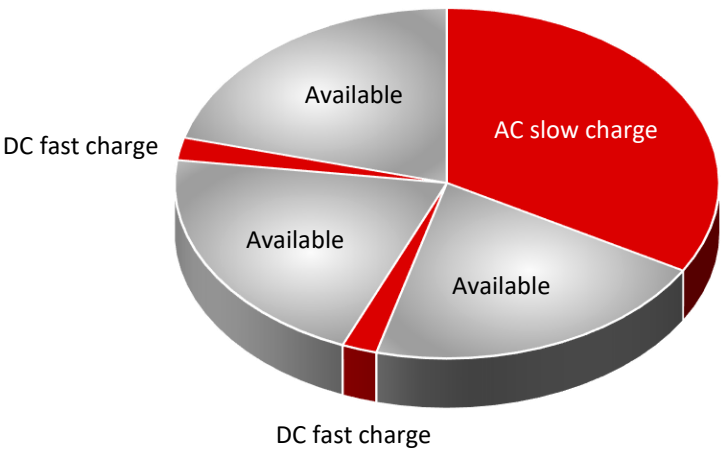
Possibility to strongly extend the range of a BEV by DC fast charging

Only AC slow charge (8 hrs)



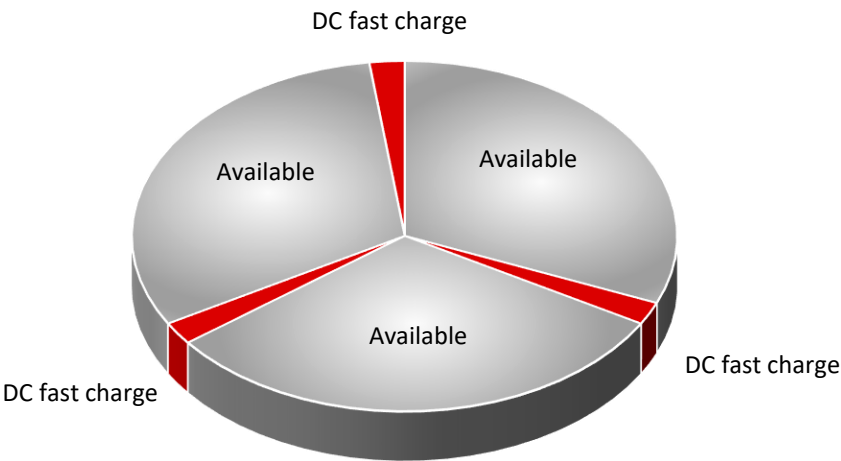
Availability 16 hours
Total range: 186 miles

AC slow charge (8 hrs) +
2x DC fast charge (each 30 min)



Availability 15 hours
Total range: 560 miles

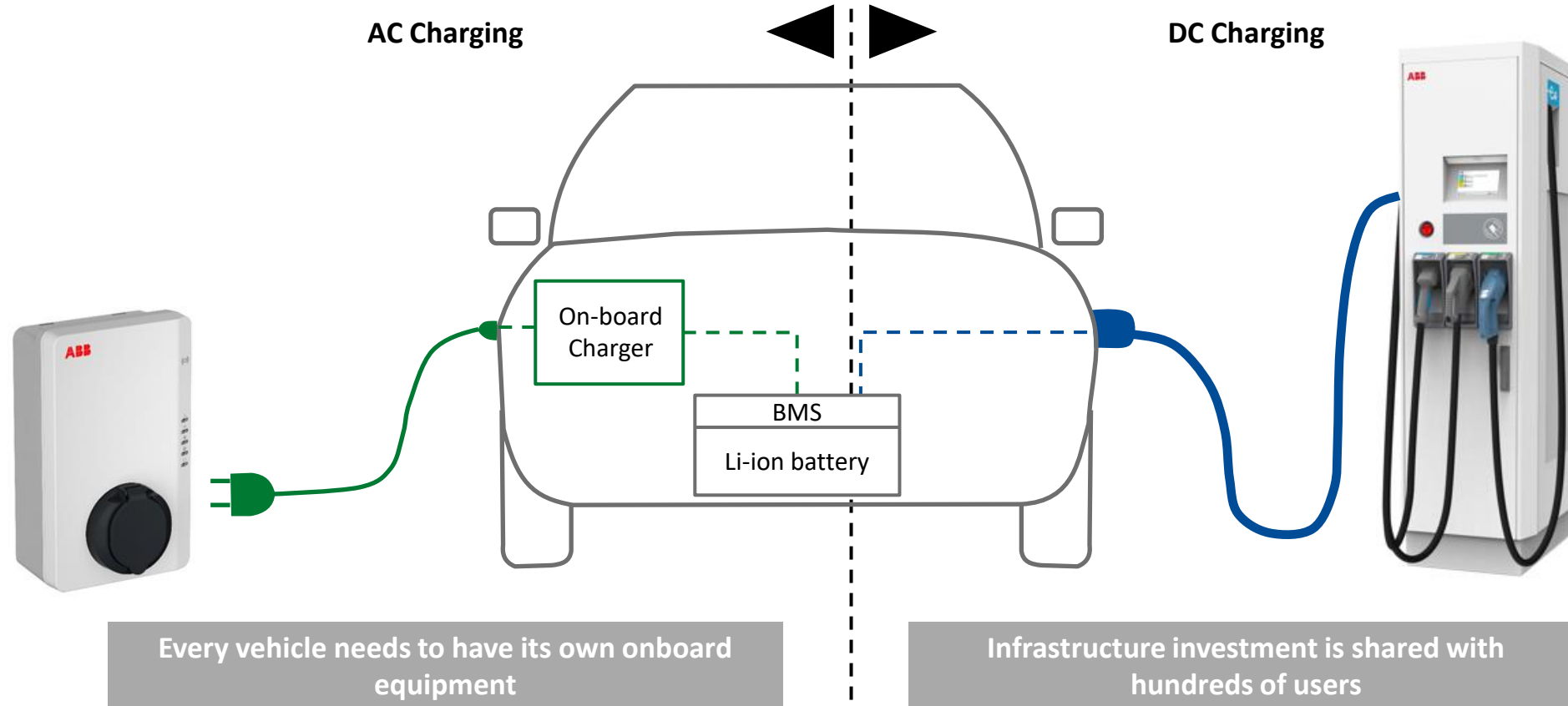
Extreme: for e.g. fleet owners:
3x DC fast charge (each 30 min)



Availability 22.5 hours
Total range: 560 miles

AC charging vs DC charging

On-board vs Off-board equipment





Market segments & products

Public and commercial car charging – Use cases

Charging service should match charging application and demand

Public and commercial EV Charging			
AC destination	DC destination	DC Fast	DC High Power
7-22 kW	20-25 kW	50-150 kW	150 to 350 kW+
4-16 hours	1-3 hours	20-90 min	10-20 min
			
– Office, workplace – Home – Multi family housing – Hotel and hospitality – Overnight fleet – Supplement at DC charging sites for PHEVs	– Office, workplace – Hotel and hospitality – Parking structures – Dealerships – Urban fleets – Public or private campus – Sensitive grid applications	– Retail, grocery, mall, big box, restaurant – High turnover parking – Convenience fueling stations – Highway truck stops and travel plazas – OEM R&D	– Highway corridor travel – Metro ‘charge and go’ – Highway rest stops – Petrol station area’s – City ring service stations – OEM R&D

Public and commercial car charging – Use cases

Charging service should match charging application and demand

Public and commercial EV Charging			
AC destination	DC destination	DC Fast	DC High Power
3-22 kW	20-25 kW	50 to 150 kW	150 to 350 kW+
4-16 hours	1-3 hours	20-90 min	10-20 min
			
Terra AC	DC Wallbox 24	Terra 54, Terra 94, Terra 124, Terra 184	Terra HP Terra 360



Connection to back-office & payment systems

Manage, monitor and connect to your business

Run a successful and profitable business with connected chargers



Connectivity is needed to:

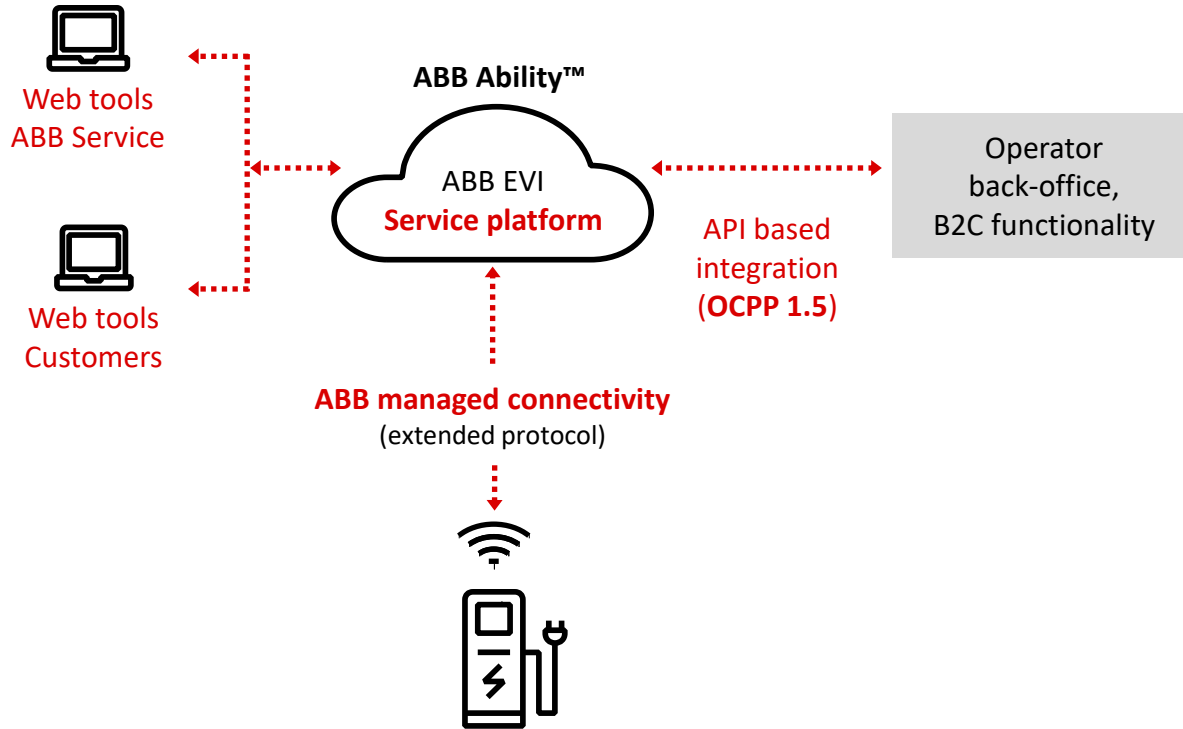
1. Monitor and operate a network of chargers
2. Get paid for charge sessions
3. Help EV-drivers in case of questions
4. Maintain and service chargers at the lowest cost

Reliable 24/7 connectivity is fundamental for the commercial operation of a network of chargers!

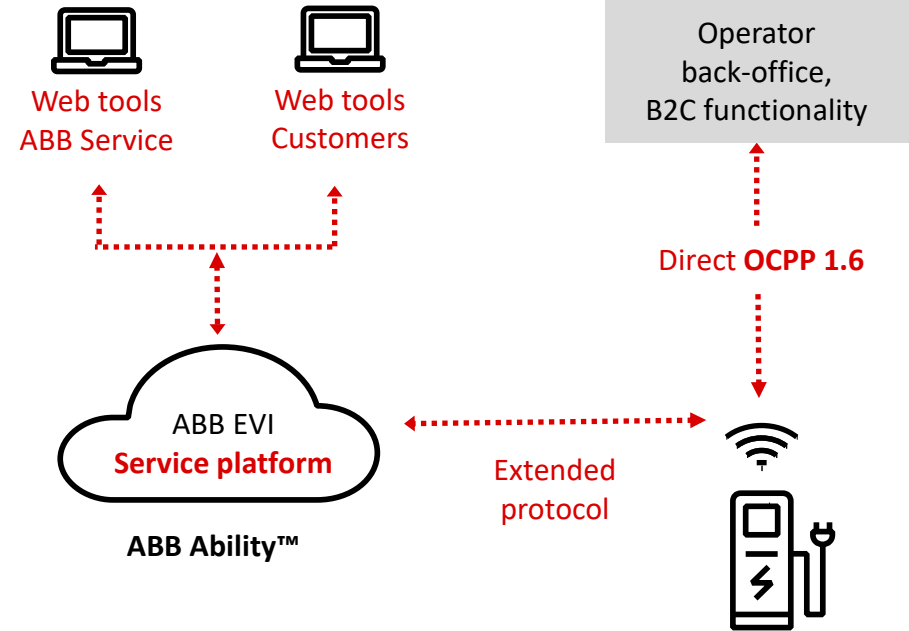
Digital integration of an EV charger

OCPP 1.5 API compared to Direct OCPP 1.6

OCPP 1.5 API



Direct OCPP 1.6 via Dual Uplink



ABB