JUNE 21TH, 2017 / JOHAN PEETERS, VP MARKETING AND SALES / ABB EPBP EVI

Fast Charging Gets Faster

EV Roadmap Conference - Portland

ABB EV Charging

Mission Statement – EV Charging Team

We offer DC Charging solutions for Electric Vehicles…

…from 10-600KW…

…based on standards…

…in all countries…

..with cloud connectivity..

…using ABB technology…

and ABB manufacturing.

EV DC fast charging and global standardization

ABB leading in major developments this decade

Pilots

CHAdeMO

First EV's

CCS alliance

IEC 61851-23

Multi-standard

Global EV spread

E-bus

OppCharge

Higher power

DC home

Near Future

2010
Founding of CHAdeMO
ABB was involved from the start

2010
First 50 kW charger in EU
Based on proprietary standard, no consumer EV's available

2010
Launch ABB Terra 51
50 kW CHAdeMO charger

2010
First EV's with DC charging
Nissan Leaf & Mitsubishi iMieV

2012
Founding of CCS alliance
ABB was involved from the start, basis for IEC standard

2012
First demo of CCS charging
ABB & CCS alliance at EVS26 show In Los Angeles, USA

2013
Launch CCS & multi-standard Terra 53
CCS + CHAdeMO + AC

2012 - 2013
First nationwide DC networks
ABB in Estonia, Denmark, Netherlands

2013-2015
Launch global variants Terra 53
China, USA, APAC

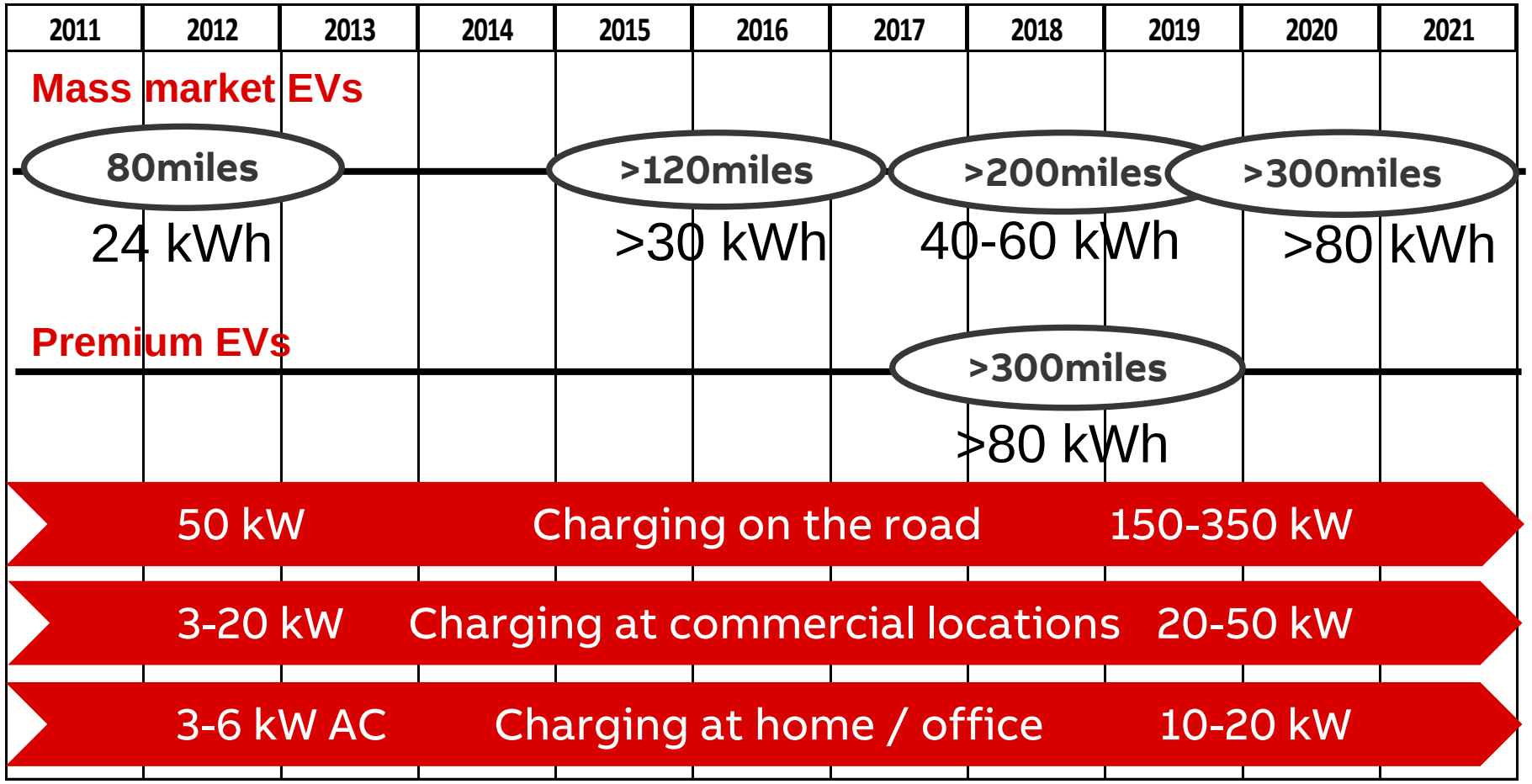
2012, >
Leading Connectivity & uptime
ABB has industry leading uptime by remote management
and supports global payment solutions

2016
First eBus chargers in EU
Global partnerships with bus OEMs

2014, >
DC networks spread globally
Europe, USA, Asia

Driver: The EV range roadmap for EU, USA, APAC

Batteries get bigger, range gets longer



Small cars:
50 - <150 kW

Mid/ high segment:
120 - 150 kW

Top segment:
~300 kW

ABB in the lead for new high power standard (2018)

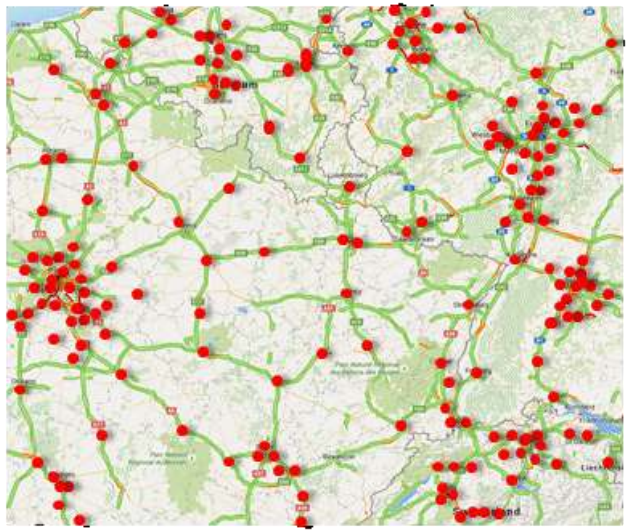
CCS standard changes required for power >150 kW

Standard	Specification (today)	Max charging power for EV car
CHAdeMO	50-500V, 125A	~50 kW
CCS	200-500V, 200A	~95 kW

CCS today	New high power CCS
CCS connector	Special CCS connector, backward compatible with today's cars
200 – 500 V_{DC}	Up to 920 V_{DC}
200 A_{DC}	350/500A_{DC}
Up to ~95kW charging power	150kW – 350 kW/460kW charging power
CE / UL charger certification based on today's standard	Power electronics cabinet parameters changed - Current - Voltage - Safety concept - Isolation concept - Electro Magnetic Compatibility (EMC) - Power quality - Accuracy

Network roll-out of high power DC charging

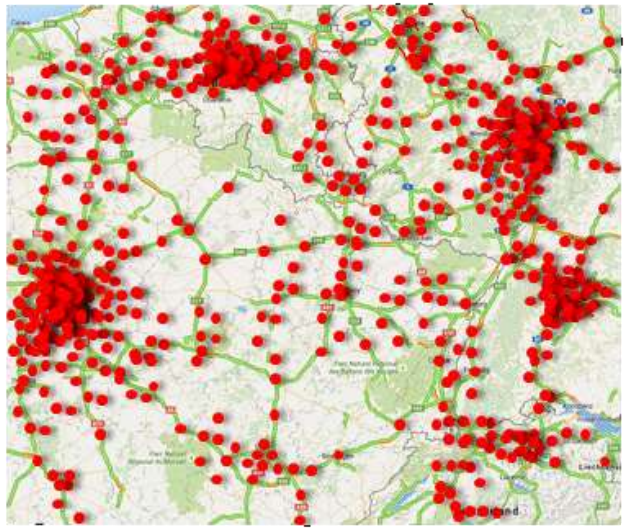
Networks to serve short range EVs will expand fast



= 50 kW fast charger

Today

- Short distance small EVs
- 120 miles range
- 50 kW charging networks are growing



= 50 kW fast charger

>2017

- Fast growth of short/medium distance small EVs (200 miles)
- Higher density 50 kW networks

Network roll-out of high power DC charging

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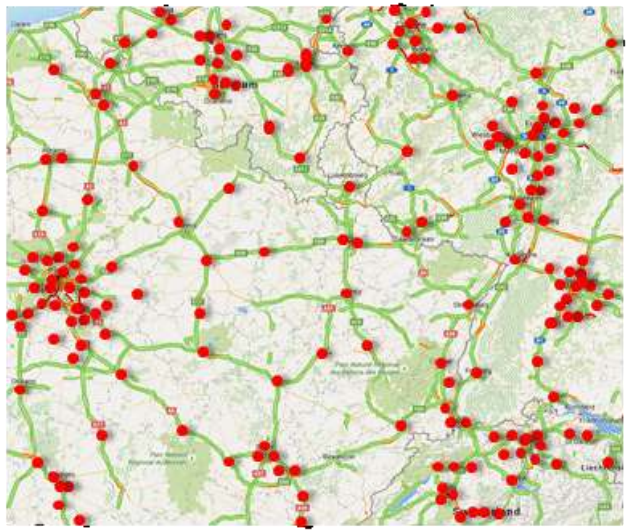

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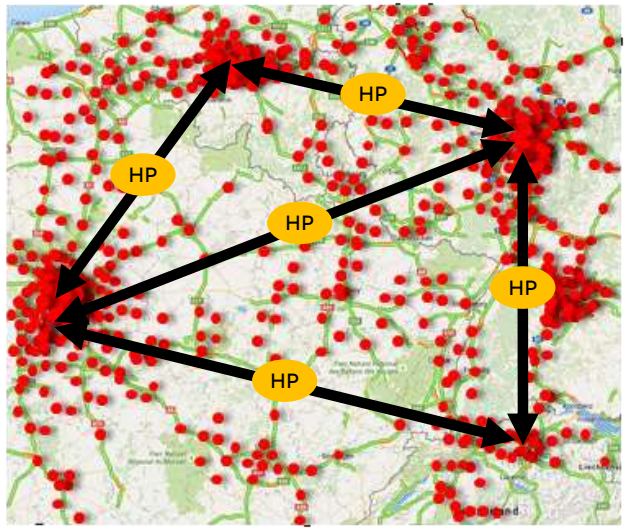


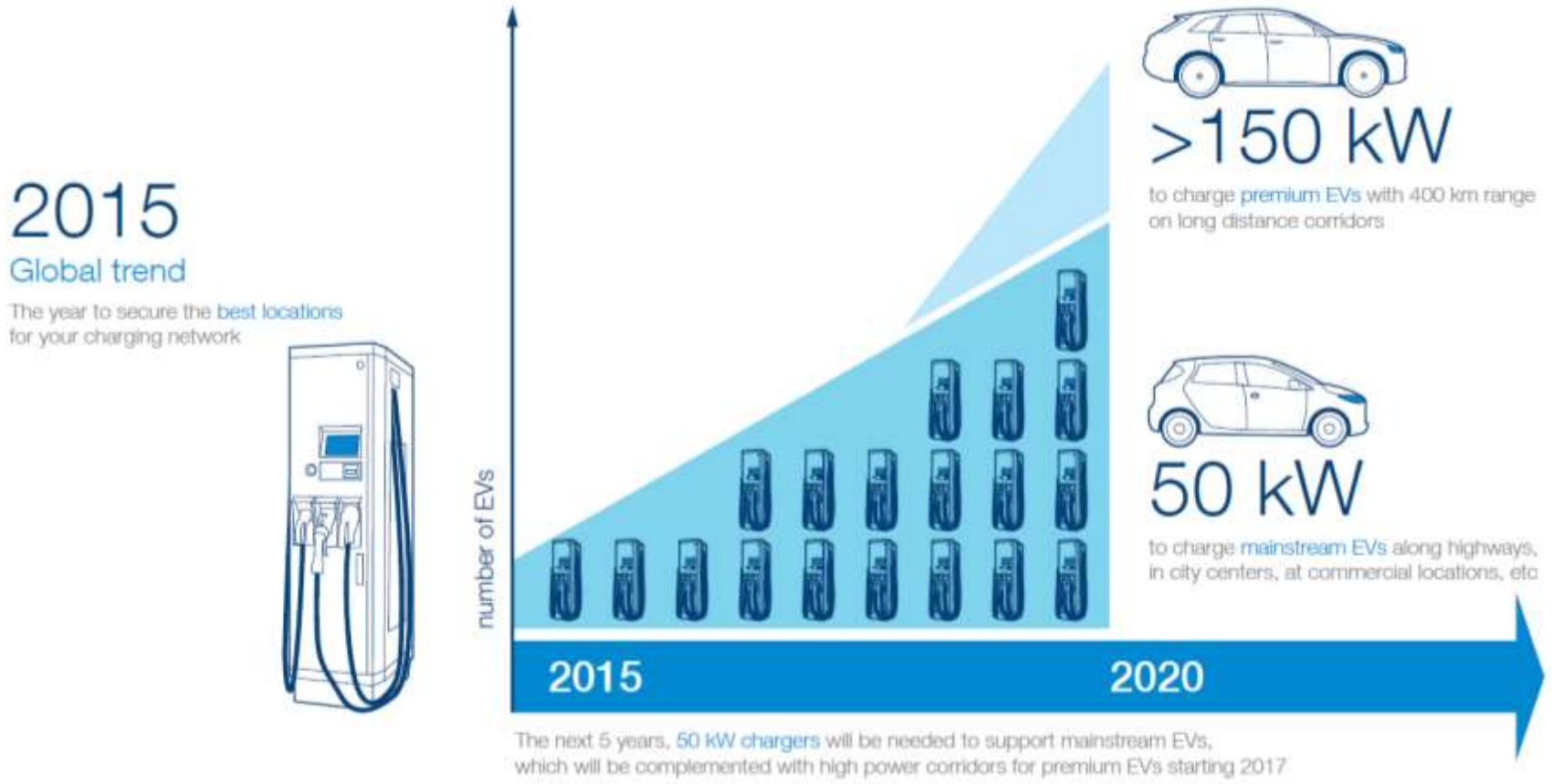
HP = High power fast charger (>150 kW) = 50 kW fast charger

>2017

- Fast growth of short/medium distance small EVs (200 miles)
- Higher density 50 kW networks
- Introduction long distance premium EVs (>300 miles range)
- High power corridors between cities

Cumulative EV population estimate

In 2020 most EVs on the road still have < 50 kW capability



Cumulative EV population estimate EU

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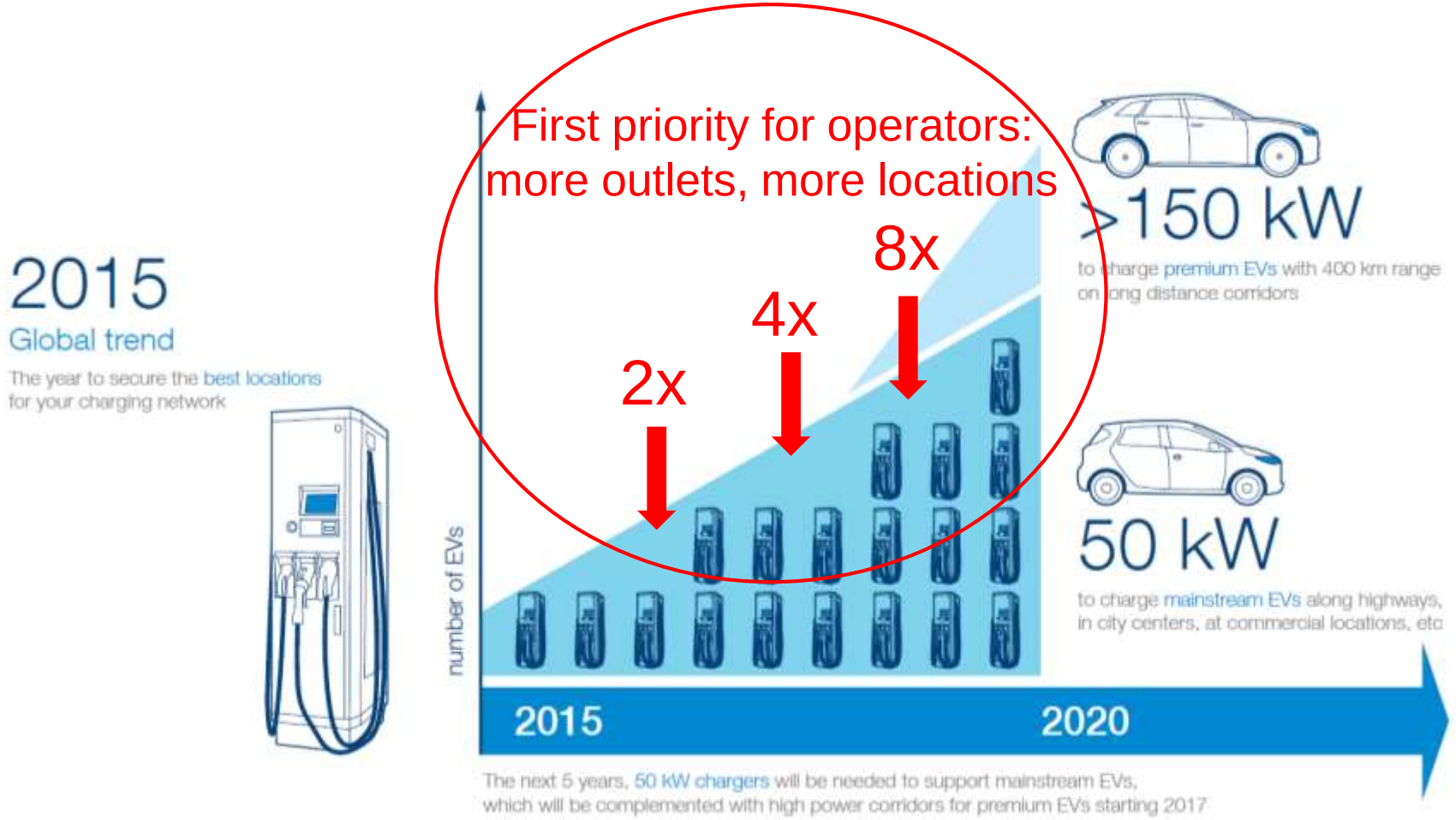
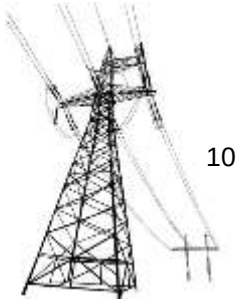


ABB modular upgradable high power charging solution

User friendly system up to 460kW 920V 500A per output

NOTE: design subject to change

ABB modular upgradable high power charging solution
Managing the load on the grid and optimizing charging assets



10 kV, 20 kV

480VAC

1 x 1,2 MVA substation

6 x 350/460kW 500A per outlet

Roll-out of first high power charge park with EVgo

E-bus product: 150kW to 600kW charging via automatic connection

OPPcharge

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