



MAY 28TH, 2018 / JEROEN HEGGELMAN / EP EVI

EV Infrastructure

Broad voltage charging infrastructure

Pilot City Forum



Who am I?



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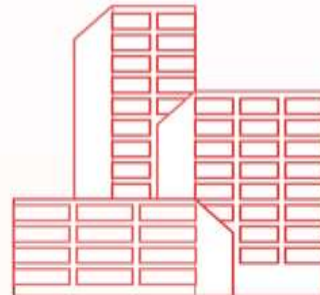
A global leader in power and automation technologies

Leading market positions in main businesses

~135,000 
employees

 **\$36** billion
In revenue
(2015)

Present
in
+100 
countries

Formed
in
1988 
merger of Swiss (BBC, 1891)
and Swedish (ASEA, 1883)
engineering companies

Single “A”
credit rating

HQ Zurich

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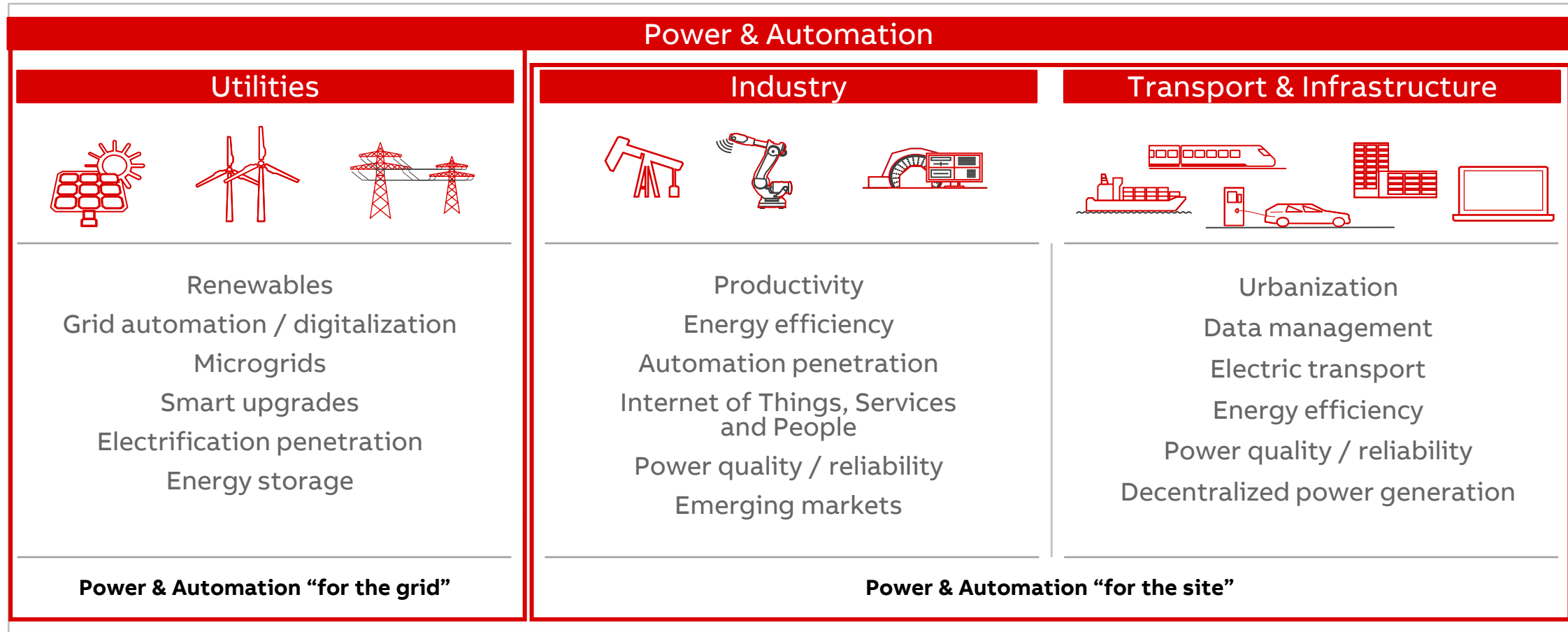


ABB EV Charging

Mission Statement – EV Charging Team

We offer AC and DC Charging solutions for Electric Vehicles...

...from 3-600kW...



...based on standards...



...in all countries...



..with cloud connectivity..



...using ABB technology...



and ABB manufacturing.



ABB DC fast charge installations

Proven technology in the field since May 2010, now in **60 countries**

Actual:

Australia, Austria, Azerbaijan, Belgium, Brazil, Bulgaria, Canada, China, Chili, Colombia, Croatia, Czech, Denmark, Egypt, Estonia, Faroe Islands, Finland, France, Germany, Greece, Greenland, Hong Kong, Hungary, India, Iceland, Ireland, Italy, Japan, Jordan, Kazakhstan, Latvia, Liechtenstein, Lithuania, Malaysia, Mexico, Monaco, The Netherlands, New Zealand, Norway, Poland, Reunion Island, Romania, Russia, Serbia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, Ukraine, United Kingdom, USA.

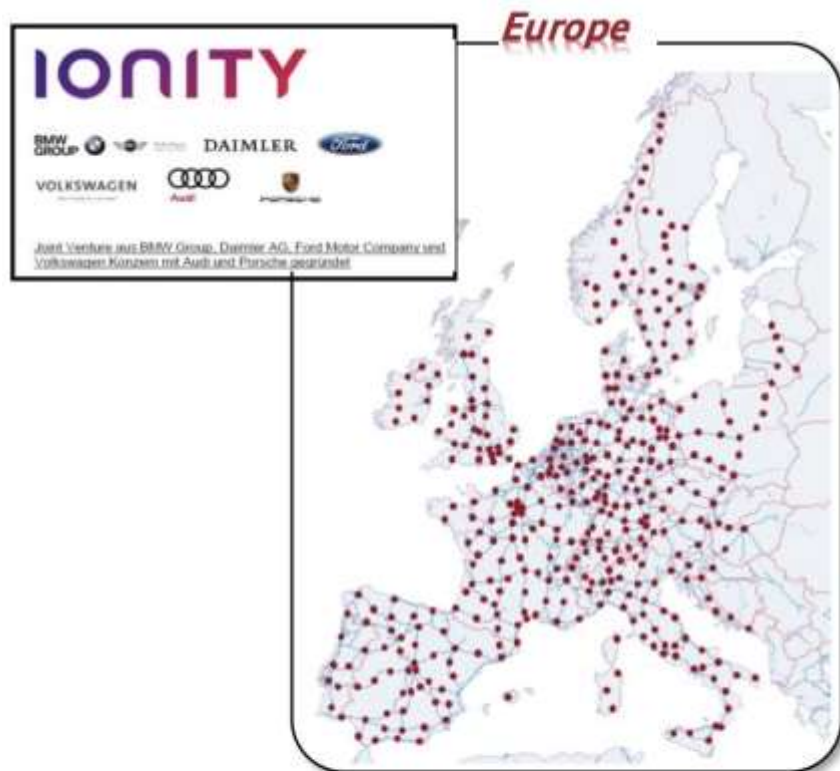
**Total 7.000 units sold
of which more than one thousand
150 and 300kW High Power Chargers
(for car and bus)**



Car Corridors, Trend 1

High Power Highway charging.

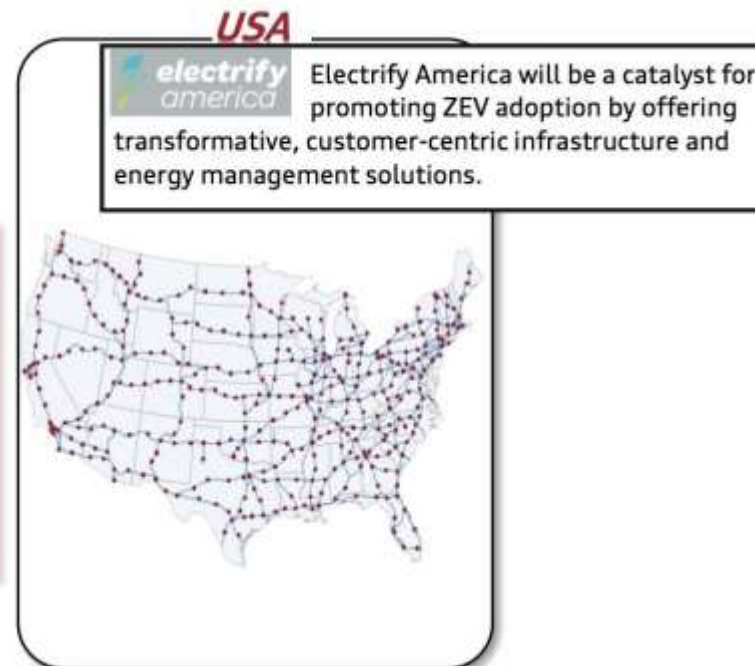
<https://electrek.co/2018/02/06/map-ionity-ultra-fast-charging-network/>



- 400 sites until end of 2019 planned
- Roughly 6 charge points per site

**≥ 150 up to 350 kW
Charging Power!**

HPC-Charging



- 290 sites until end of 2019 planned
- Further roll-out planned (until 2026)

**Cars have to be capable of this charging power.
AUDI e-tron will be first car to market (150kW)!**

E-Busses, Trend 2

Full Electric Busses are an undeniable trend in inner-city transport.
Three dominant concepts.



- Pantograph on Infrastructure
- OppCharge
- More likely combined with Cable based depot charging.
- Europe, North America
- Example: Volvo, Iveco (not exclusive list)



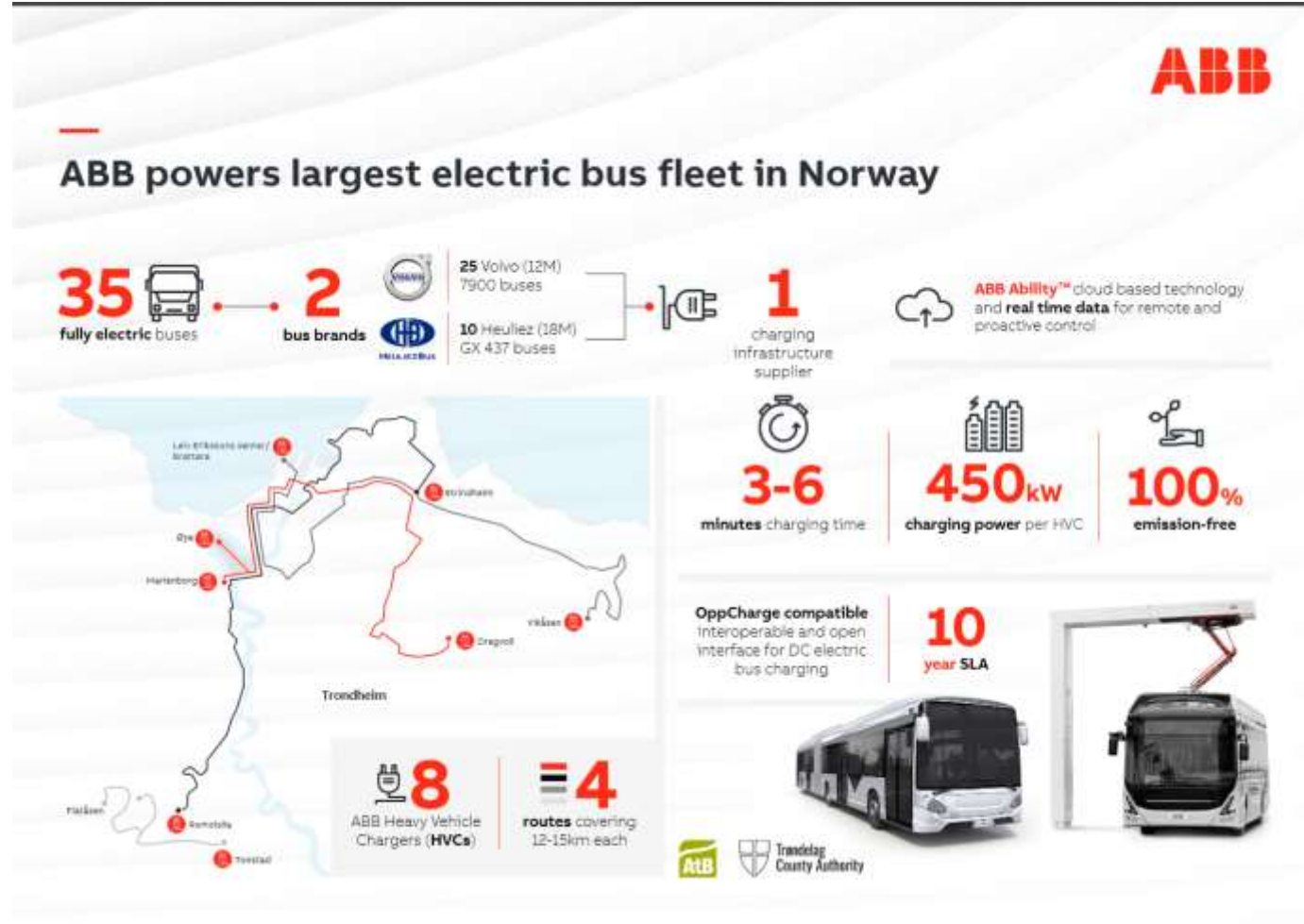
- Pantograph on bus
- Schunk (...)
- Very unlikely to be combined with Cable based depot charging.
- Europe, New Zealand
- Example: VDL, Solaris (not exclusive list)



- Overnight charging only /Battery Bus
- All cable based, no pantograph
- CCS-2 or AC
- China, North America, Europe
- Example: BYD, Volvo (not exclusive list)

Bus interoperability, Trend 3

E-Bus Interoperability



- One infrastructure, two bus manufacturers in Trondheim.
- Enabled by open standards.
- Necessary to bring down costs by having more purchasing power for cities & operators.
- Necessary since infrastructure (15 years) last longer than busses (8-12 years). No bus OEM lock-in.
- Cable based interoperability (CCS-2) is typically interoperable between various

Trucks, Trend 4

Refuse / light-duty Trucks.

MAN and CNL to bring eTrucks to our roads

From the end of 2017, MAN and CNL member companies will be testing electrically-powered trucks for various purposes in daily service // By starting to manufacture electric trucks at its Steyr site, MAN is taking a major step closer to electromobility in urban distribution transport



Volvo unveils its first all-electric truck with 'up to 300 km' (186 miles) of range

Fred Lambert - Apr. 12th 2016 9:24 am ET @FredericLambert



- Connector seems preferred by most Truck OEMs
- OEMs agree on using CCS2
- Power ranging from 50 to 350kW and more
- A lot of interest for liquid cooled cable charging
- First vehicles up to 150kW
- Tesla uses proprietary connector, "design may change"

Standardization, Trend 5

ABB leading in major developments this decade

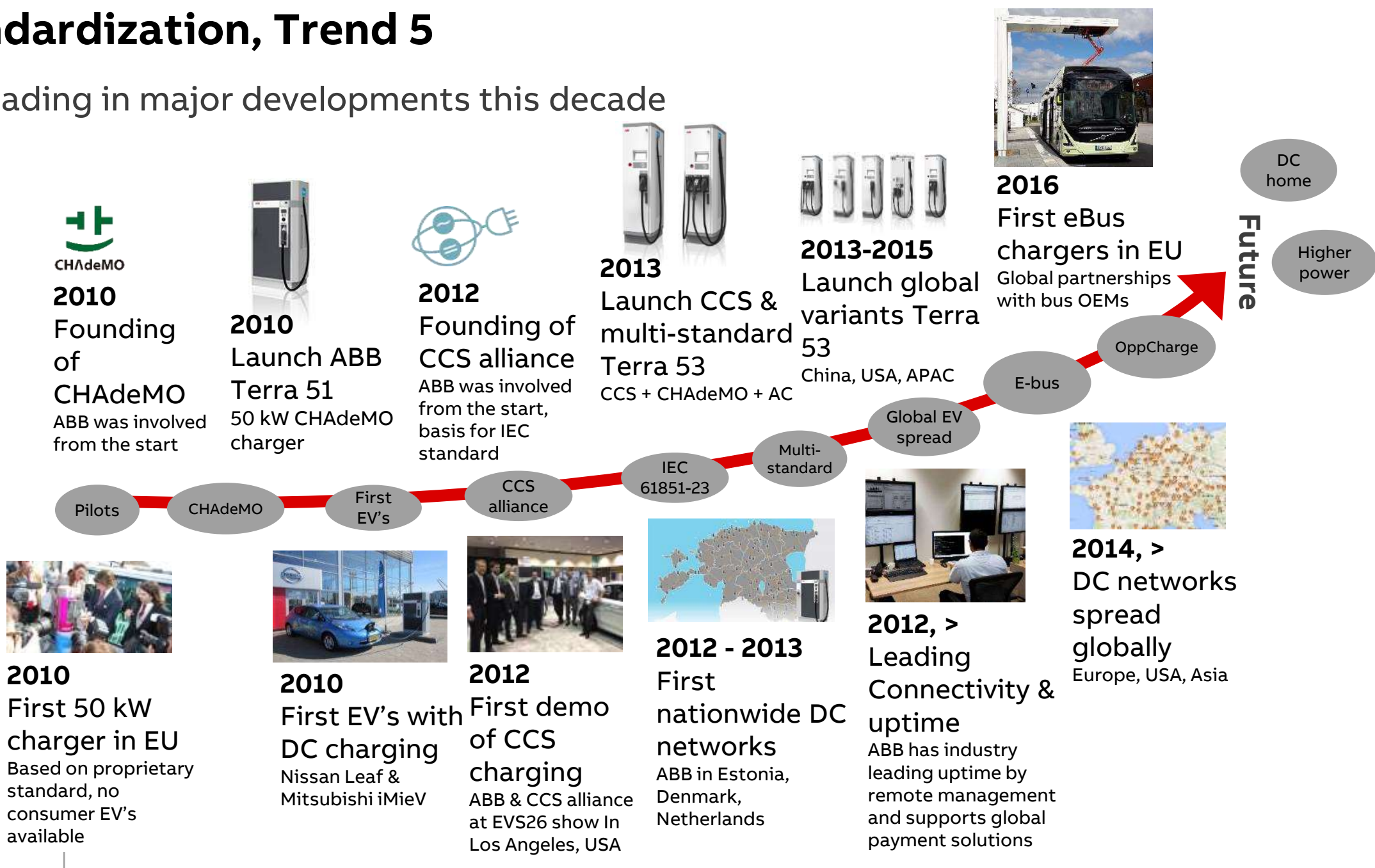


ABB EV Single Charging Infrastructure for car, bus and truck

Connectivity

Remote diagnostics, payment, building management



Overnight Charging

Opportunity Charging

4-22 kW AC
Charger



24kW DC
Wallbox



50kW
All-in-one



50kW-150kW with
sequential charging



150kW-350kW with
liquid cooled cable



150kW-600kW with
Automated Connection



Grid Integration

Compact substations, transformers, switchgear




Service & maintenance

Global service, spareparts, maintenance & 3rd party training



One Infrastructure, for all vehicles



Opportunity for Smart Cities: create shared charging infrastructure

Multimodal highway charging hub



Opportunity for Smart Cities: create shared charging infrastructure

New business models for “commercial” scale chargers.

Win-Win for cities and commerce: retain customers, while reducing need for public infra.

Combine distribution e-trucks with passenger car.



<https://electrek.co/2018/05/22/electrify-america-ultra-fast-ev-charger-new-partner-locations-simon/>

<https://electrek.co/2018/04/18/vw-electrify-america-walmart-ultra-fast-charging-stations/>

Opportunity for Smart Cities: create shared charging infrastructure

Inner-city Bus Depots can offer in-city charging services.



- Bus depots can be located in densely populated, urban areas.
- High power (150 kW – 350 kW) car and (light) truck charging is valuable
 - Car Charger operator: 1 Euro per 3 kWh
 - Bus Tender: 1 Euro per 10.000 kWh
- Advantages for cities:
 - High power charging infrastructure available near city centers
 - Reduced need for high power infrastructure in cities.
 - No digging
 - No space sacrificed for e-mobility
- For bus operator.
 - Great way to offer something “extra” when competing for tenders.
 - New business model, new ways of *making* money with infrastructure.

Contact information



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