



SEPTEMBER 18TH, 2018/ CONSTANTIN ICHIMOAEL

ABB EV Charging Infrastructure

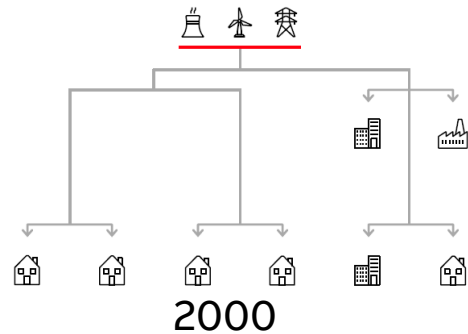
ABB Ability and E mobility



Power systems of the future

Grid evolution today and in the future

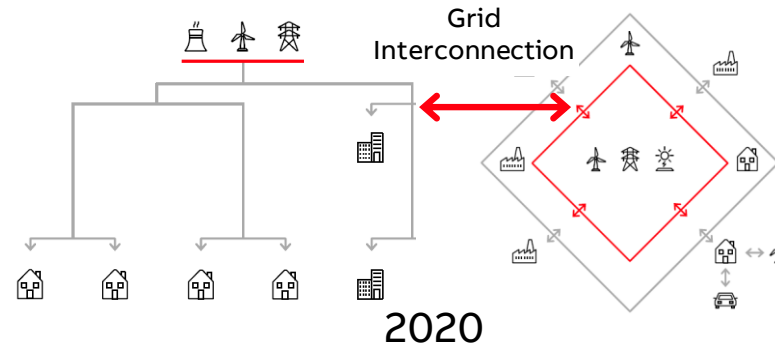
Yesterday



Factors:

- Global warming – ecological threats
- Stimulated, regional introduction of renewables
- Exponential reduction of photovoltaics & battery storage costs
- Consumer to Prosumer development
- Digitalization trend
- Interconnection technology development

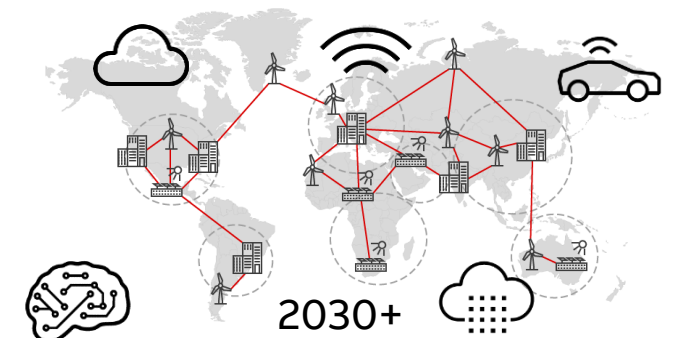
Today



Factors:

- Full scale deployment of renewables across all regions
- Increased share of energy by wire
- Massive introduction of grid connected Electrical Vehicles
- Power exchange with related data transfer («Internet of Energy»)
- Artificial Intelligence enabling complex autonomous processes

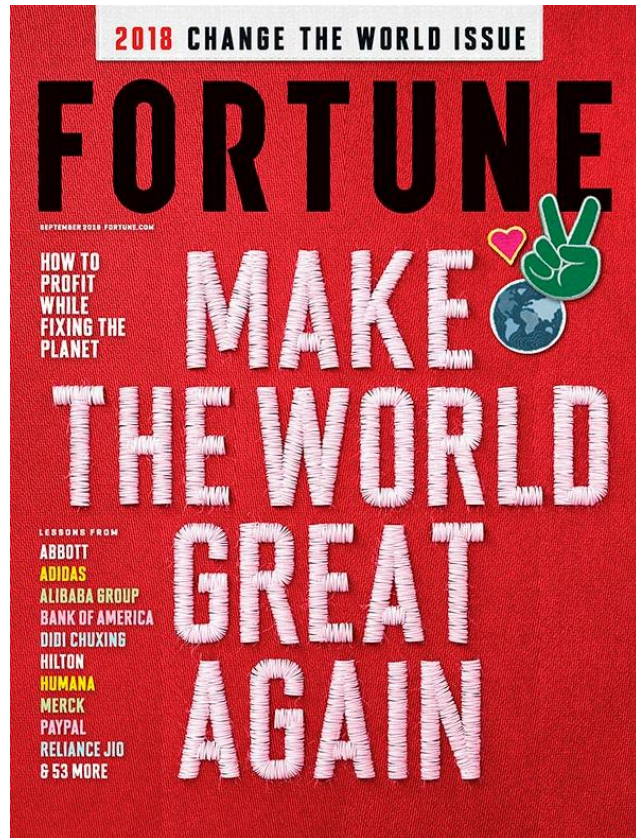
Tomorrow



New opportunities & challenges require new ideas – evolutionary & revolutionary

ABB ranks #8 on list of companies that are "changing the world"

Fortune Magazine's / August 20th, 2018



Recognizing ABB's groundbreaking leadership in e-mobility, Fortune Magazine today selected ABB as #8 on its 2018 "Change the World" list, a global ranking of companies whose innovative work is making a significant, positive social impact around the world.

At ABB, we believe it is possible to run the world without consuming the Earth. Today, our pioneering technology is helping to move transportation from fossil-fuel dependence – the biggest contributor to climate change – to electric cars, trains and marine vehicles that reduce greenhouse gas emissions and deliver a more sustainable energy future

Fortune's fourth annual "Change the World" list is developed by the magazine in partnership with: FSG, the Shared Value Initiative, and Professor Michael E. Porter of Harvard Business School.

Companies selected for the list must deliver measurable social impact, socially beneficial business results and high levels of innovation.

ABB and Formula E

Group press release Zurich, Switzerland, 09 January 2018



Together, Formula-E and ABB are defining the roadmap for electric mobility through motor sports.

Our partnership for the ABB FIA Formula E Championship is fostering high-performance racing around the world to pioneer the latest energy and digital technologies – one electrifying race at a time.

Let's write the future. Together.



EV fast charging and global standardization

ABB leading in major developments this decade

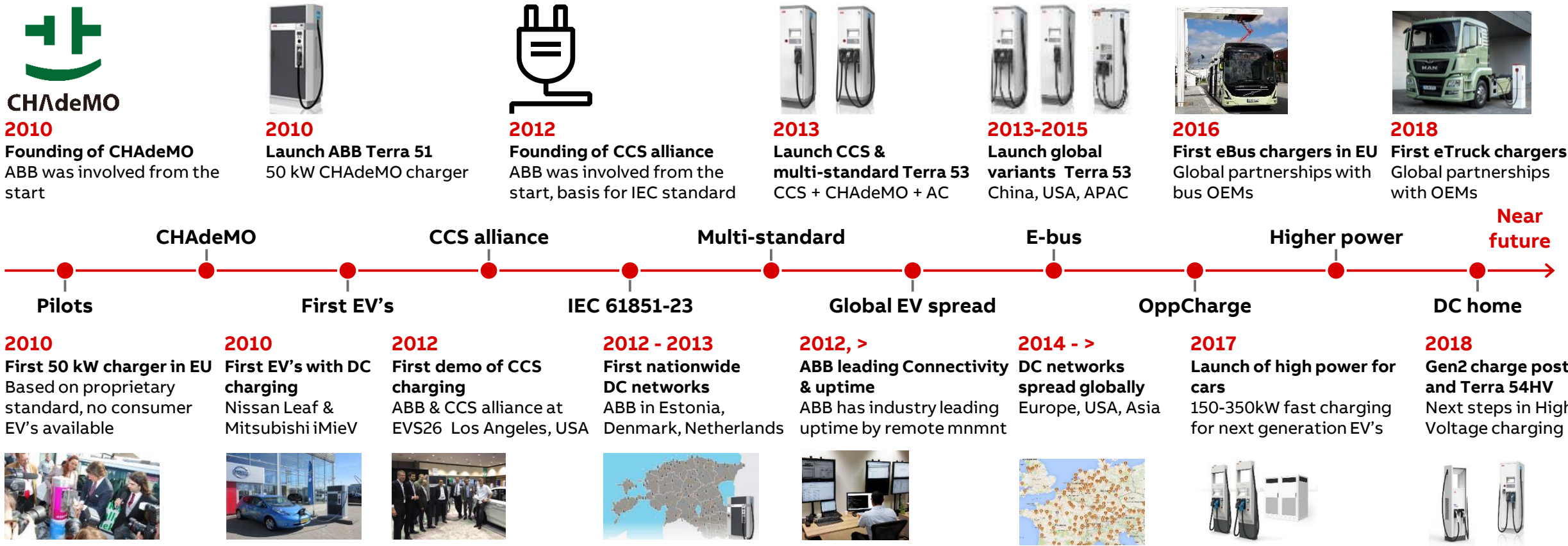


ABB DC fast charge installations

Proven technology in the field since May 2010, now in **68 countries**

Actual

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

Total more than 8.000 DC fast charging units sold
of which more than 1.000
150 and 300kW High Power Charging systems (for car and bus)



Country leaders impressed by ABB's breakthrough e-mobility technologies

German Chancellor Angela Merkel and Mexican President Enrique Peña Nieto at Hanover Fair

From left to right: German Chancellor Angela Merkel, Mexican President Enrique Peña Nieto, ABB CEO Ulrich Spiesshofer, First Lady Mrs. Angélica Rivera, Managing Director of ABB Germany Hans-Georg Krabbe, Managing Director of ABB Mexico Vicente Magana

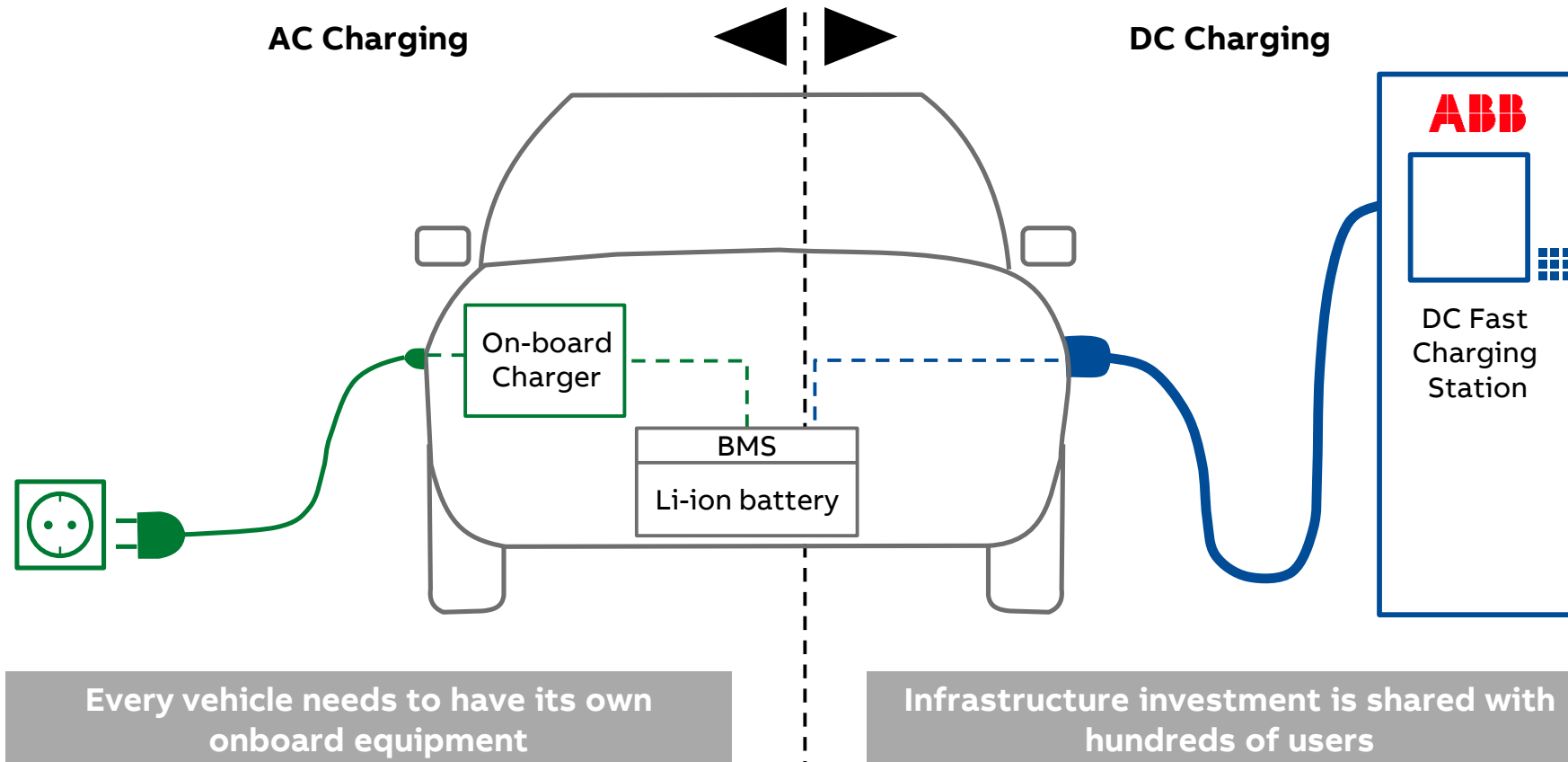
The two leaders, along with ABB CEO Ulrich Spiesshofer, were shown a demonstration of the company's new high power fast charging solution: the Terra HP EV charging station with a power output of up to 350 kW recharges a car battery in just eight minutes for 200 km reach.

“This high-power fast charger provides electric vehicles with up to seven times more range in the same charging time than with previous models,” Spiesshofer said. “Together with our comprehensive ABB Ability™ digital offering, we easily connect chargers to back offices, payment platforms or smart grid systems and offer our customers leading functionality.”







AC charging versus DC charging

On-board versus Off-board equipment







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 kW | 150 to 350 kW+ |
| 4-16 hours | 1-3 hours | 20-90 min | 10-20 min |
|  |  |  |  |
| <ul style="list-style-type: none">– Office, workplace– Multi family housing– Hotel and hospitality– Overnight fleet– Supplement at DC charging sites for PHEVs | <ul style="list-style-type: none">– Office, workplace– Multi family housing– Hotel and hospitality– Parking structures– Dealerships– Urban fleets– Public or private campus– Sensitive grid applications | <ul style="list-style-type: none">– Retail, grocery, mall, big box, restaurant– High turnover parking– Convenience fueling stations– Highway truck stops and travel plazas– OEM R&D | <ul style="list-style-type: none">– Highway corridor travel– Metro ‘charge and go’– Highway rest stops– Petrol station area’s– City ring service stations– OEM R&D |

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|  |  |  |  |

Highway and metropolitan segment

Terra 53 / Terra 54: CE-approved 50 kW Multi-standard chargers – Input: 3x 400V

Terra 53/54 CT DC+AC Charger

50kW DC CCS-2
22kW AC



Available

Terra 53/54 CG DC+AC Charger

50kW DC CCS-2
43kW AC (also 22kW version)



Available

Terra 53/54 CJ DC Charger

50kW DC CCS-2
50kW DC CHAdeMO



Available

Terra 53/54 CJG DC + AC Charger

50kW DC CCS-2
50kW DC CHAdeMO
43kW AC



Available

Terra 53/54 CJG DC + AC Charger

50kW DC CCS-2
50kW DC CHAdeMO
22kW AC



Available

Terra 53/54 CJT DC+AC Charger

50kW DC CCS-2
50kW DC CHAdeMO
22kW AC



Available

Terra HP Series: 350 kW dual output

Ultra high output current & ABB's unique **Dynamic DC** feature

Ultra high output current

- 375 A per 175 kW cabinet
- 2 x 500 A dual configuration
- Can charge cars with both 400 V_{DC} & 800 V_{DC} drivetrain at maximum power

Dynamic DC feature

- **Dynamic DC** power allocation delivers power dynamically to multiple outputs
- Create a multi-output charging site in a highly cost-efficient way



350 kW
500 A
150-920 V_{DC}



350 kW
500 A
150-920 V_{DC}



Connected services

Connectivity is needed to

- Monitor and operate a network of chargers
- Get paid for a charge session
- Help EV-drivers in case of questions
- Maintain and service a charger at lowest cost

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



Digital integration of an ABB EV charger

ABB's solution

Highly redundant cloud platform

Extended protocol to the charger

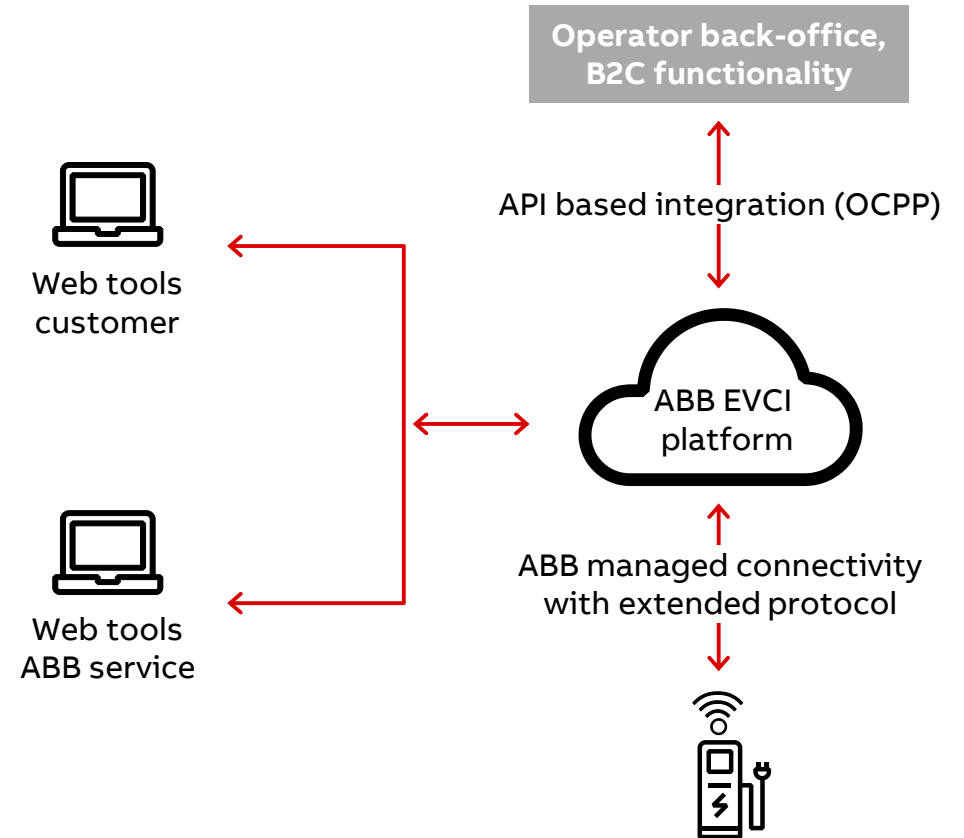
Over 5.500 chargers connected

24/7 network operation center, enforcement of SLA with GSM provider, outage mitigation & resolution

SW updates and car interoperability updates

Advanced remote service concept (by ABB or 3rd party)

APIs & web tools available based on a SaaS model



Digital integration of an ABB EV charger

Customer benefits

Minimize investments in own IT infrastructure and SW solutions

Predictable cost based on SaaS model

High uptime due to reliable connectivity

Reduced operational cost

- lean network operation
- less on-site delegations
- fast time to repair

Fully scalable setup that can adapt to changing requirements

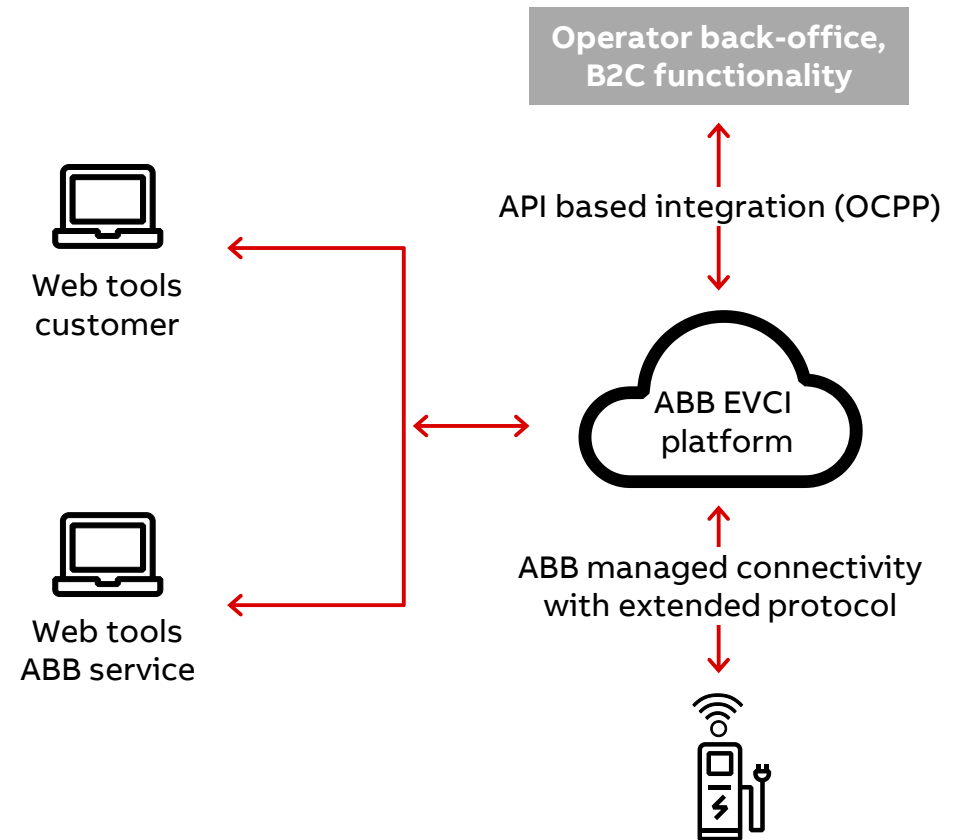


ABB joins select group of Nobel International Partners

Builds on the company's commitment to research, innovation and education



ABB's pioneering work in science and engineering, its commitment to education and its deep history in Sweden are at the root of a new, global partnership with the Nobel organization.

ABB has joined a select group of innovative companies to become a Nobel International Partner. The partners program operates in collaboration with Stockholm-based Nobel Media, the global outreach arm of the Nobel Foundation – whose annual prizes in physics, chemistry and other scientific fields recognize the world's most transformative breakthroughs.

"Nobel and ABB share a deep commitment to innovation and the power of ideas," said ABB CEO Ulrich Spiesshofer, "and we are inspired by this opportunity to spotlight the groundbreaking work of Nobel Laureates, to celebrate science and discovery and to inspire the next generation of extraordinary pioneers. We look forward to working closely with Nobel and to involving our customers, employees and communities around the world in this exciting partnership."

ABB