



APRIL 17TH, 2018 / BUCHAREST, ENERGY BREAKFAST CLUB

ABB EV Charging Infrastructure

ABB Ability and E mobility


Constantin Ichimoei – Executive Manager

Transport & Infrastructure Segment



A global leader in power and automation technologies

Leading market positions in main businesses

~135,000 
employees

 **\$36** billion
In revenue
(2016)

Present
in

+100



countries

Single “A”
credit rating

HQ Zurich

Formed
in

1988



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

ABB EV Charging

Mission Statement – EV Charging Team

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

...from 3-600kW...



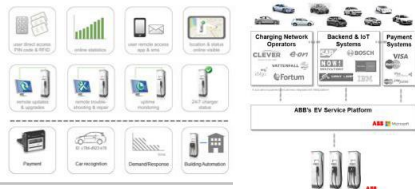
...based on standards...



...in all countries...



..with cloud connectivity..



...using ABB technology...



and ABB manufacturing.



EV fast charging and global standardization

ABB leading in major developments this decade



April 17, 2018

©ABB

ABB

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



ABB FORMULA-E

 FORMULA-E CHAMPIONSHIP



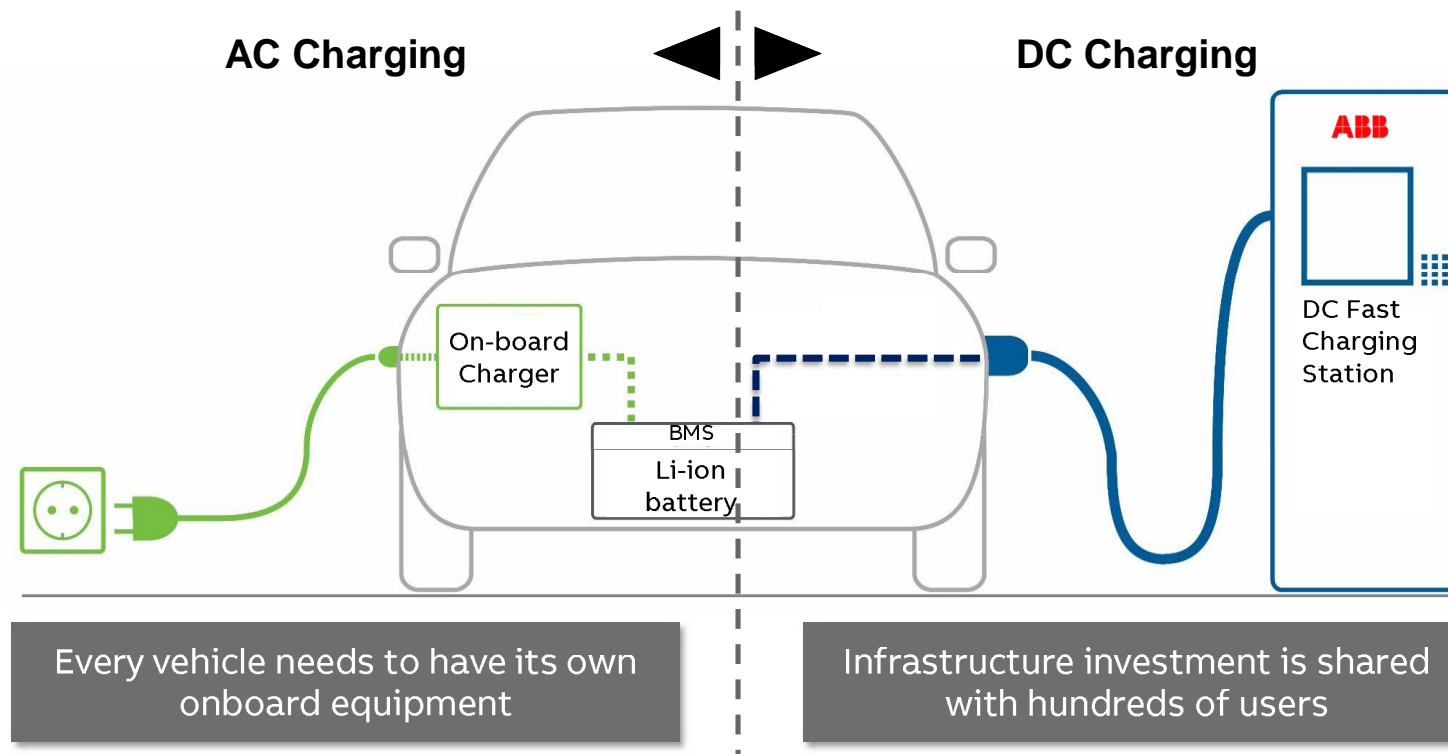
Together, Formula E and ABB are defining the roadmap for electric mobility through motor sports.

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.

DC charging versus AC charging

On-board versus Off-board equipment



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

Batteries get bigger, range gets longer / DC Charging power increases in the coming years

2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Mass market EVs										
~140km				>180km		>250km		>400km		
24 kWh				>30 kWh		40-60 kWh		>70 kWh		
Premium EVs						>450km				
						>80 kWh				

Small cars:
50 - <150kW



Mid/high segment:
120 - 150 kW



Top segment:
~300/350 kW



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

Batteries get bigger, range gets longer

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Mass market EVs										
~140km			>180km			>250km		>400km		
24 kWh			>30 kWh			40-60 kWh		>70 kWh		
Premium EVs										
						>450km				
						>80 kWh				
50 kW			Charging on the road					150-350 kW		
3-20 kW		Charging at commercial locations						20-50 kW		
3-6 kW AC		Charging at home / office						10-25 kW		

Small cars:
50 - <150 kW



Mid/ high segment:
120 - 150 kW







Top segment:
~300/350 kW



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 segment

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

Available



**Terra 53/54 CT
DC+AC
Highway Charger**

50kW DC CCS-2

22kW AC

Available



**Terra 53/54 CG
DC+AC
Highway Charger**

50kW DC CCS-2

43kW AC

Available



**Terra 53/54 CJ
DC
Highway Charger**

50kW DC CCS-2

50kW DC CHAdeMO

Available



**Terra 53/54 CJG
DC + AC
Highway Charger**

50kW DC CCS-2

50kW DC CHAdeMO

43kW AC

Available



**Terra 53/54 CJG
DC + AC
Highway Charger**

50kW DC CCS-2

50kW DC CHAdeMO

22kW AC

Available



**Terra 53/54 CJT
DC+AC
Highway Charger**

50kW DC CCS-2

50kW DC CHAdeMO

22kW AC

Terra HP Series: 350 kW dual output

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



350 kW
500 A
150-920 V_{DC}

350 kW
500 A
150-920 V_{DC}



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

eBus and heavy vehicle charging: 50 kW – 600 kW

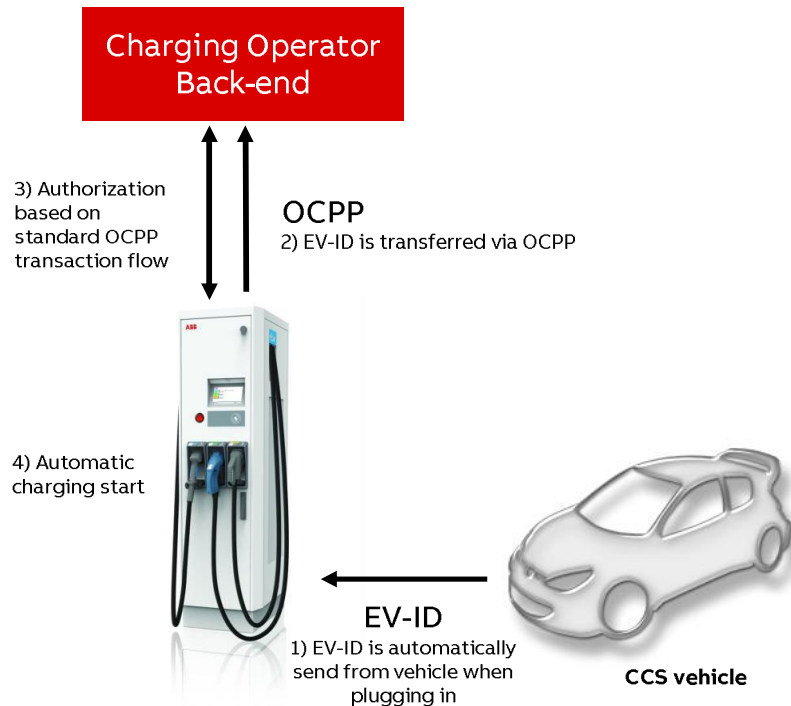
Overnight and on-street opportunity charging



- Automated connection system
- High power DC transfer to bus
- Wireless communication to bus
- Based on
 - EN/IEC 61851-23
 - ISO/IEC 15118
 - **OPPcharge** compatible
- Industrial quality power cabinet
- 150kW, 300kW, 450 & 600 kW modular
- Redundancy per each 150 kW module
- 200-920 VDC
- Galvanic isolation
- Remote management

ABB chargers will support AUTOCHARGE function

Plug-in-and-walk-away: payment processed automatically via vehicle identifier



What is AUTOCHARGE?

Automatic authorization solution based on open standards (OCPP/CCS)

Working principle:

During start-up of charging a unique identifier is sent from CCS vehicles. This can be used in standard OCPP flow to identify a car and perform a transaction

KEY BENEFITS:

Maximum user-friendliness

- After first-time enablement the user can just plug in and walk away

Works with “old” and new CCS cars

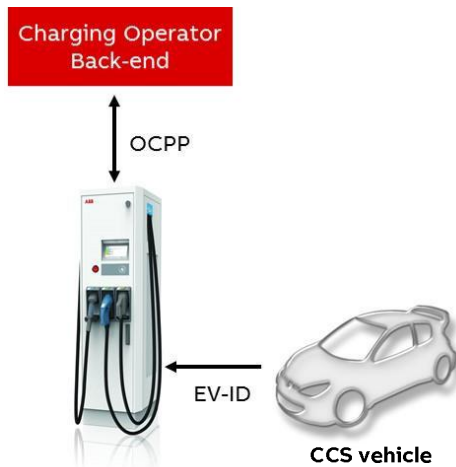
- Most CCS cars on the road today (since 2012) will send the EV-ID

Works with standard OCPP back-ends

- Limited software changes required, simple implementation

AUTOCHARGE function

Details



Unique identifier: EV-ID

- The vehicle identifier used is the EV-ID message which is included in standard CCS communication of the vehicle. In most cases it is a unique MAC address

First time authorization: how to link a user account and vehicle?

- In a first time authorization sequence the user account must be linked to the drivers car ID. This is a very user friendly 1-time action which can be performed by a simple approval in app or back-end

Compatibility with vehicles

- In principle AUTOCHARGE will work with all CCS vehicles released on the market since 2012. The EV-ID should be transmitted by the vehicle as per CCS standard.
- CHAdeMO cars at the moment do not support the function, however it is already part of the next generation standard

Security improvement

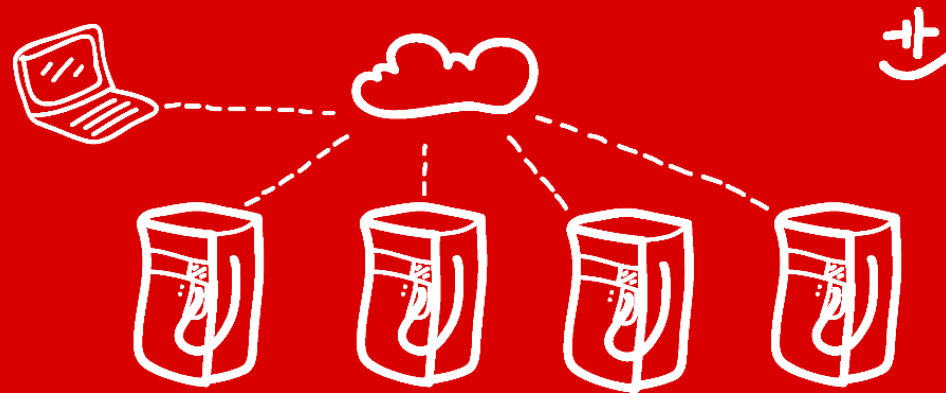
- Compared to RFiD card usage AUTOCHARGE offers an increased level of security

Robustness

- Field tests show robust and reliable performance, in the coming period AUTOCHARGE will be handled as usecase in the OCPP committees to further improve where necessary

Connection to back-office & payment systems

Manage, monitor and connect to your business



Connected Services



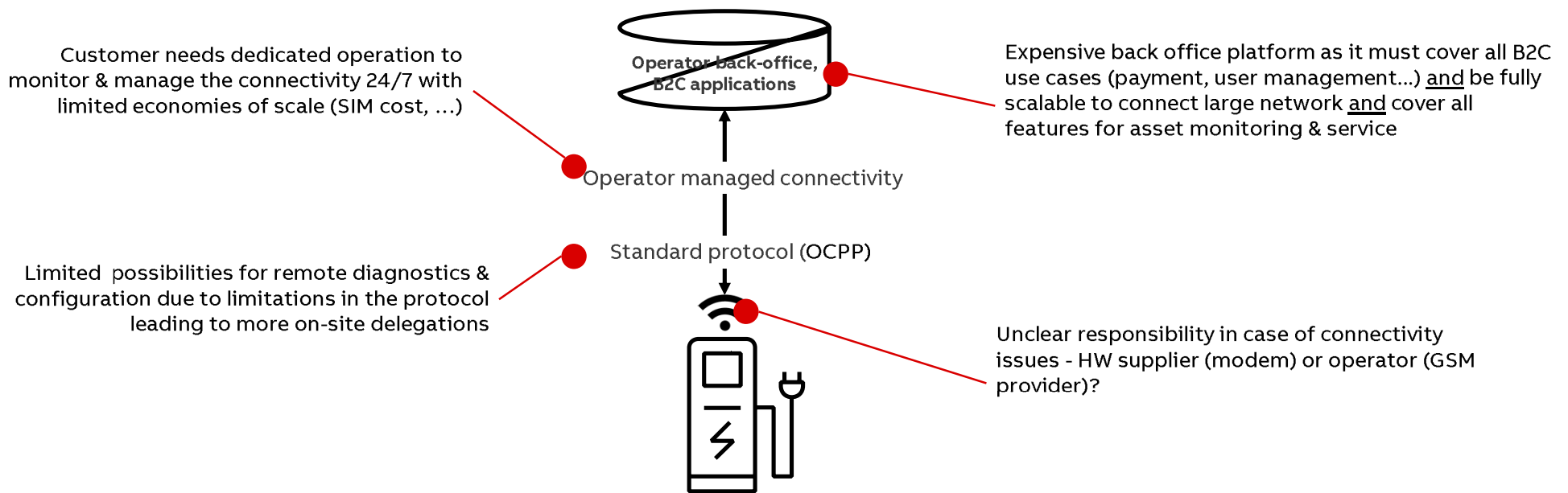
Connectivity is needed to:

- 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!

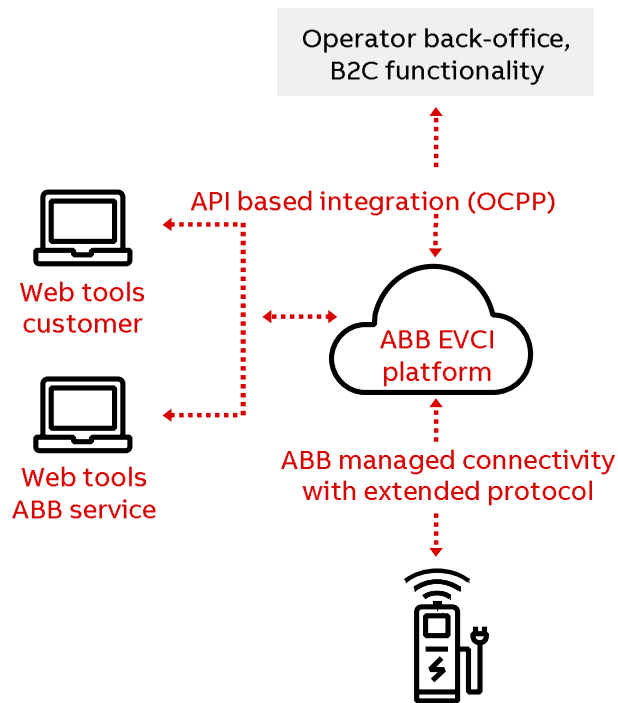
Digital integration of a conventional EV charger

Limitations of the model



A setup purely based on direct OCPP integration leads to higher investments & higher operational cost. It also limits the remote service possibilities for the service team of the operator and ABB – leading to lower uptime.

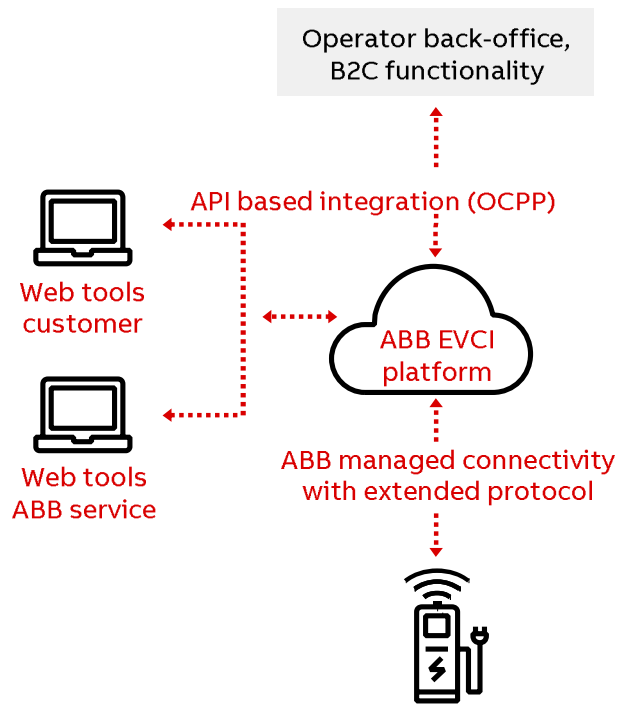
Digital integration of an ABB EV charger



ABB's Solution

- Highly redundant cloud platform
- Extended protocol to the charger
- Over 4.000 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

EVCI Global Service

Charger Care and Internet of Things, Service and People

ABB is able to diagnose more than 90% of the service cases remotely,
solving over 60% of these cases without any on-site intervention.

This results in significant savings on down-time, travelling, transportation, man-hours and resources.
Charger Care increase the safety, profitability and availability of our customers charging network.

The result is best customer experience at low total cost of ownership!

EVCI Global Service

Charger Care

Charger Care and Internet of Things, Service and People

By connecting chargers, service solutions and people,
ABB is able to diagnose more than 90% of the service cases remotely,
solving over 60% of these cases without any on-site intervention.
This results in significant savings on down-time, travelling, transportation, man-hours and resources.
Charger Care increase the safety, profitability and availability of our customers charging network.

The result is the optimum customer experience.

Reasons to choose ABB

ABB has the **highest uptime** in the market.

Standard design of the housing in **stainless steel**, i.e. much less affected by environmental influences on exposed areas (e.g. corrosion problems due to salt spreading).

ABB's EMC design is according to **IEC 61000-6-3**, so suitable for residential areas, homes, offices, petrol stations, etc.

Many others are according to IEC 61000-6-4 (industry standard), i.e. lesser safety and for example warning are attached to the chargers on the effect on pacemakers etc.,

Third Party, independent, CE measurements and certifications on electric safety and EMC immunity and radiation. Most others only have CE-self certification.

In **depth remote diagnosis and remote curing**.

Remote S/W Updates: most probably each new car, and e.g. also the DIN- to ISO-step in CCS will require S/W update of all chargers. All software on ABB chargers are made by ABB.

ABB's competitors are buying third party CCS communication boxes, OCPP modules, user interface modules, etc., and do not have the knowledge and capability to develop and upgrade software themselves. Each subsystem in ABB fast chargers is remotely software updateable by ABB itself.

Use of up to **5 power modules with 10 kW** instead of one big power block. In case of Terra chargers, if a power module becomes defective, it can be switched off remotely and the charger can continue to operate. With one large power block, as most competition has, when this one big power block fails, the total system is down.

Reasons to choose ABB

Ease and speed of maintenance: most modules can be replaced within 20 minutes in ABB's Terra chargers by swapping; 3-door design.

The Terra 50kW charger can give **continuous high power levels** also at long charging times (e.g. charging a Tesla for 1 to 1½ hour with Tesla's CHAdeMO Adapter).

ABB is the first in Europe to receive **CHAdeMO V1.0 certification** of the T53CJ and T53CJG (and also the comparable T23 models). All others only have the outdated CHAdeMO V0.9 certification.

Lower noise level of ABB, due to more, distributed fans for cooling the power module(s).

Delivery times 4-6 weeks (Ex Works) of ABB for standard products.

Retrofittable payment system (can be retrofitted to any T53/T23 Charger, with this it is possible next to RFID, to also use common EU credit cards (Visa, MasterCard, etc.) and NFC for payment.

ABB's charger total weight is around 350 kg to about 800 kg of other providers (foundation cost-effective and space saving).

Advantages of **ABB Cloud connection**: proven technology and already connections to over 50 back office systems. Extremely reliable.

Certified, own ABB service teams in many EV-countries oriented countries, and established, national organizations in over 100 countries.

Reasons to choose ABB

The **largest installed base of chargers**. Together with the detailed remote diagnosis, ABB are the furthest in the learning curve in DC fast charging.

ABB chargers are at test tracks of some German automotive companies: not only at the polar circle or in the desert, but also at test tracks in Germany and France.

Here the chargers are **used 24 hours/day and 360 days/year**. Our chargers are showing a very reliable behavior here; this “stress test” is much tougher than any other charger in the market is experiencing.

Secure data handling: The communications line from the EV fast charger to the customer end-point is completely secured and on our platform, data is handled according to ISO 27001 by a certified data center.

The combination of **ABB's leading EV charging stations with Microsoft's Azure cloud-based services** will ensure stability, global scalability and advanced management features for ABB customers. The collaboration will also take advantage of machine learning and predictive analytic capabilities to drive future innovations.

ABB is a global player in EVCI (China, Rest of Asia, US, Europe etc.). Next to that ABB is a company, **active in solar, energy storage, power quality** etc. etc.

From this perspective the **roadmap of EVCI-products** for the future can easily be imagined. Smaller, less diversified companies will have a problem in the future to follow this direction.

A conceptual illustration of a modern electric vehicle (EV) charging infrastructure. In the foreground, a white sedan is plugged into a charging station. Behind it, a large white electric bus is also at a charging station, with a red robotic arm extending from the station towards the bus. The background features a modern building with large glass windows. The entire scene is overlaid with a faint, glowing red wireframe grid, suggesting a digital or smart infrastructure theme.

It is all about making your business work
We are looking forward to empowering you!