



technology that moves the world

Efacec electric mobility

1. Electric mobility at Efacec – an innovation episode
2. Timeline of main achievements
3. Main differentiating solutions
4. How do we stand and what's next?

Electric Mobility at Efacec

An innovation episode



- Efacec endorses the following definition of *innovation*
value creation in a context of change
- Our recent progress in delivering solutions for EV charging infrastructure is such a case
- It results from a virtuous combination of
 - anticipation of market trend towards emergence of EV → - Back in 2008, EVs were identified as a medium term trend for sustainable mobility
 - active knowledge management → - Efacec had important purses of knowledge in *energy automation* and electronic power systems
 - proper time-to-market → - The Mobi.e project, launched in Portugal, set the opportunity for fast development of innovative charging solutions for EM, particularly in the area of fast charging

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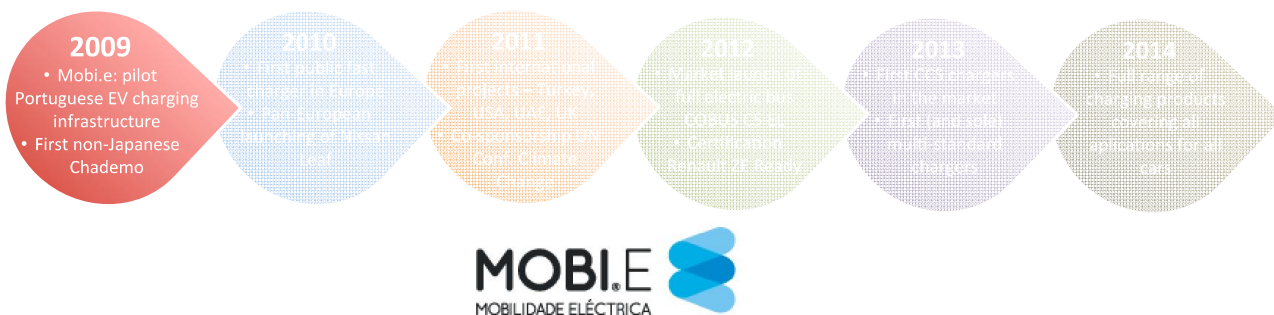
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Timeline of main achievements



- Launching of the electric mobility business line as the technology partner of the Mobi.E consortium (nationwide pilot project for EV charging infrastructure)

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Timeline of main achievements



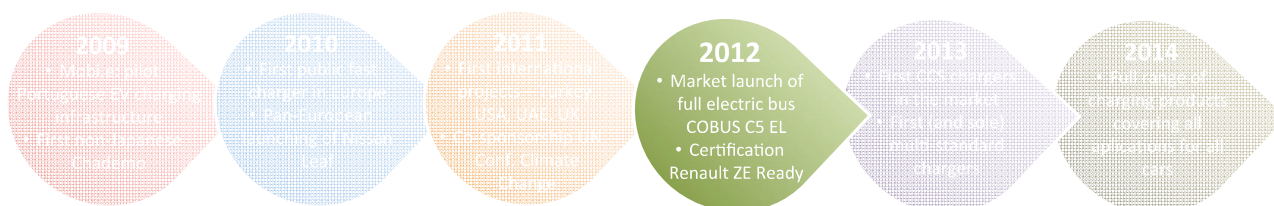
- First charging solutions for EVs; first fast charger certified CHAdemo outside Japan
- Installation of public charging infrastructure in Portugal (Mobi.E)
- First public quick charger in Europe – Galp petrol station at the A5
- Charging stations for the Nissan Leaf pan European tour

Timeline of main achievements



- First international projects (Turkey, USA, UAE, UK)
- Charging solutions for European Press presentation of Renault Fluence and Kangoo
- Sponsorship with Nissan of ONU COP 17 (Climate Change Conference, Durban Dec2011)

Timeline of main achievements



- Market launch of the CaetanoBus/Efacec full electric bus Cobus C5 EL
- Certification Renault ZE READY by Renault; new charger models in the market



Timeline of main achievements



- First fast charger in the market with the new Euro-American standard CCS
- First (and sole) manufacturer to offer multi-standard chargers



Combined Charging System



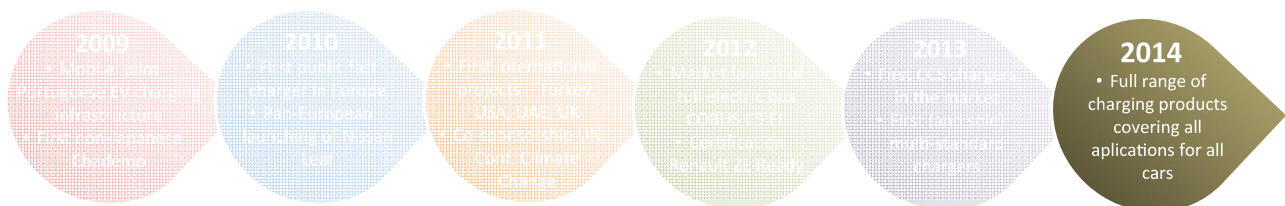
Audi



DAIMLER



Electric Mobility activity at Efacec



- Full range of charging products covering **all applications for all cars**

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Main differentiating solutions

Full range of chargers



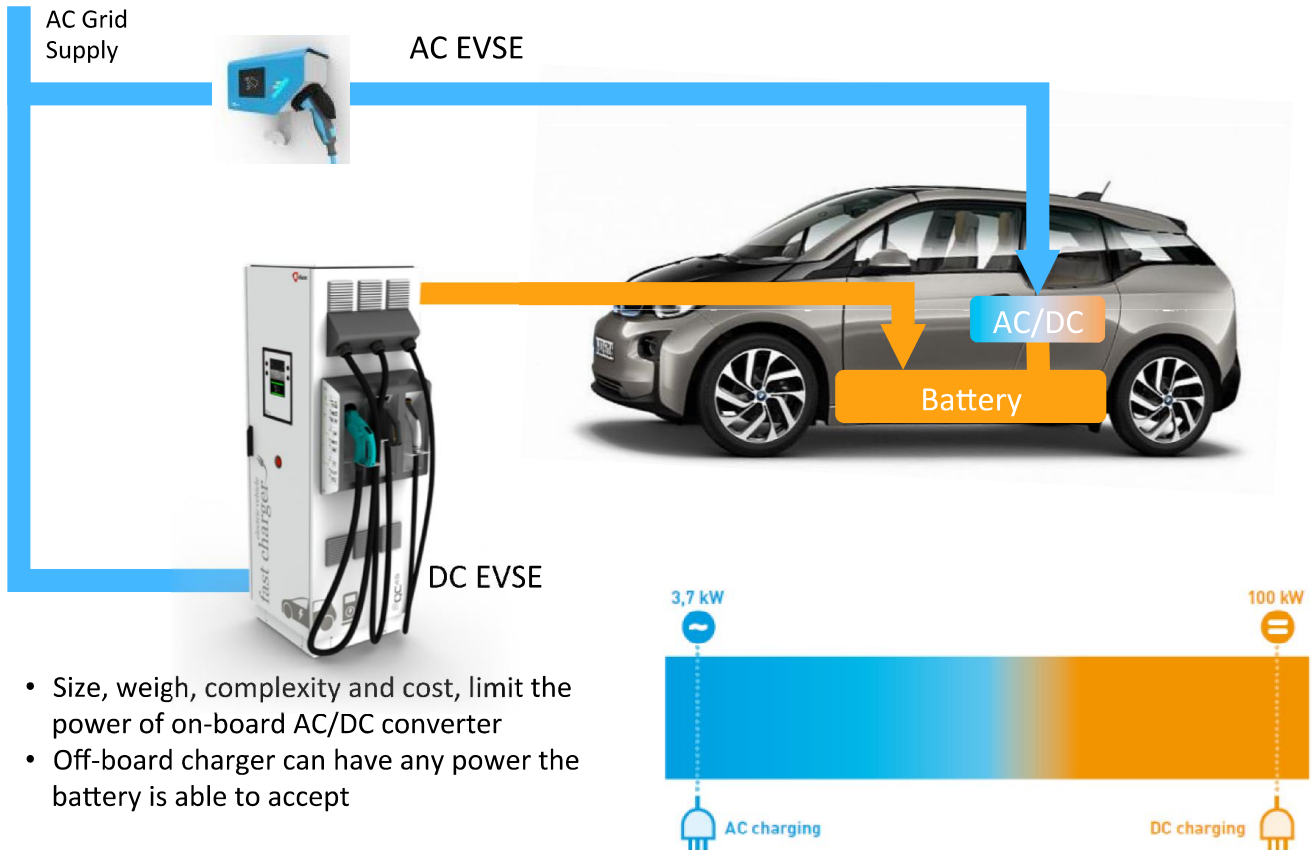
Charger Type	Quick Charger		Public Charger				HomeCharger			
	DC + AC		AC				AC			
Output Power (kVA)	20 kW	50 KW	3,7	7,4	11	22	3,7	7,4	11	22
Estimated Charging time ⁽¹⁾	<60m	<30m	~6/8h	~3/4h	~2h	~1h	~6/8h	~3/4h	~2h	~1h
Price	€€€		€€				€			
Network connectivity and data statistics	✓		✓				✓ (limited)			
Modularity	✗		✓				✗			
Size and footprint	Large		Medium - Small				Small			
Delivery time	+++		++				++			



(1) - Depending on the battery total capacity, SOC and on-board charger

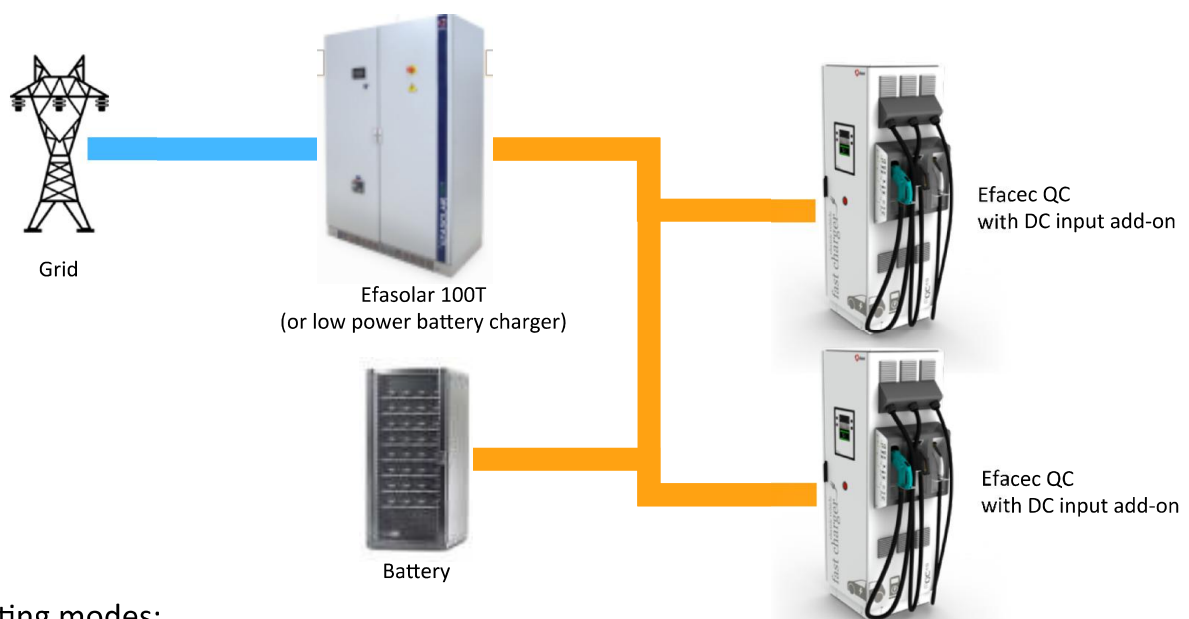
Main differentiating solutions

A strong bet on DC fast charging



Main differentiating solutions

Highly sophisticated management environments



Operating modes:

- Power drawn from battery until low level is reached; then, if and when EV charging, drawn from grid or stop charging
- Grid power limited to a low value: always, or unless battery empty and EV charging
- Optional bi directional operation of battery charger
- Optional PV source (or hybrid with other energy sources)

Main differentiating solutions

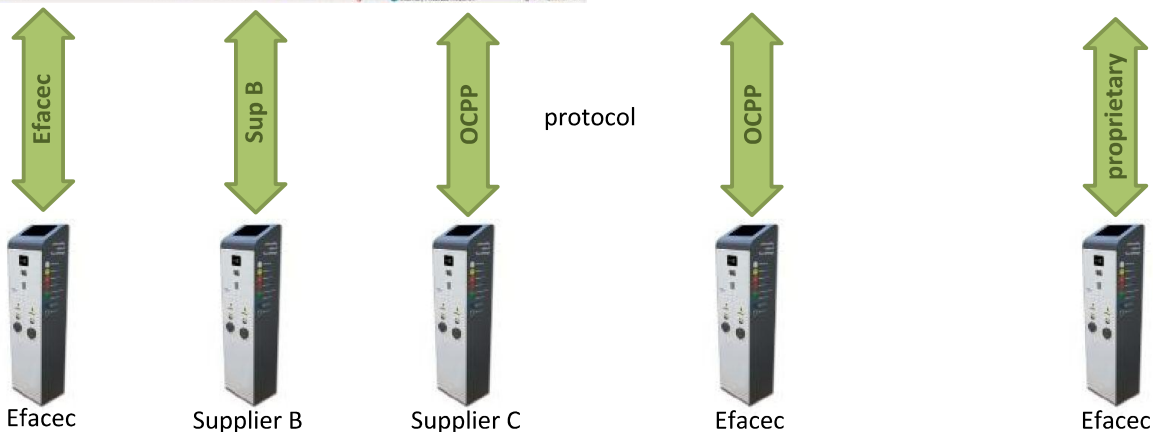
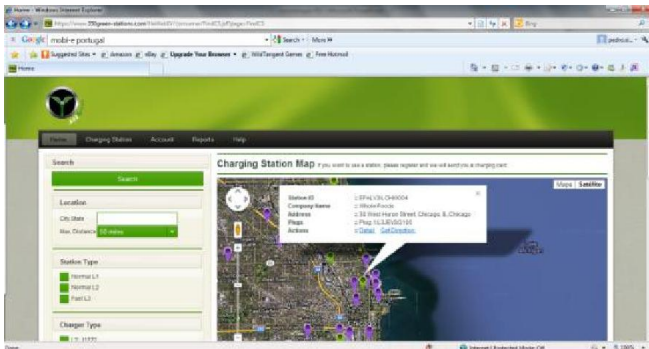
An open systems approach



Mconverge

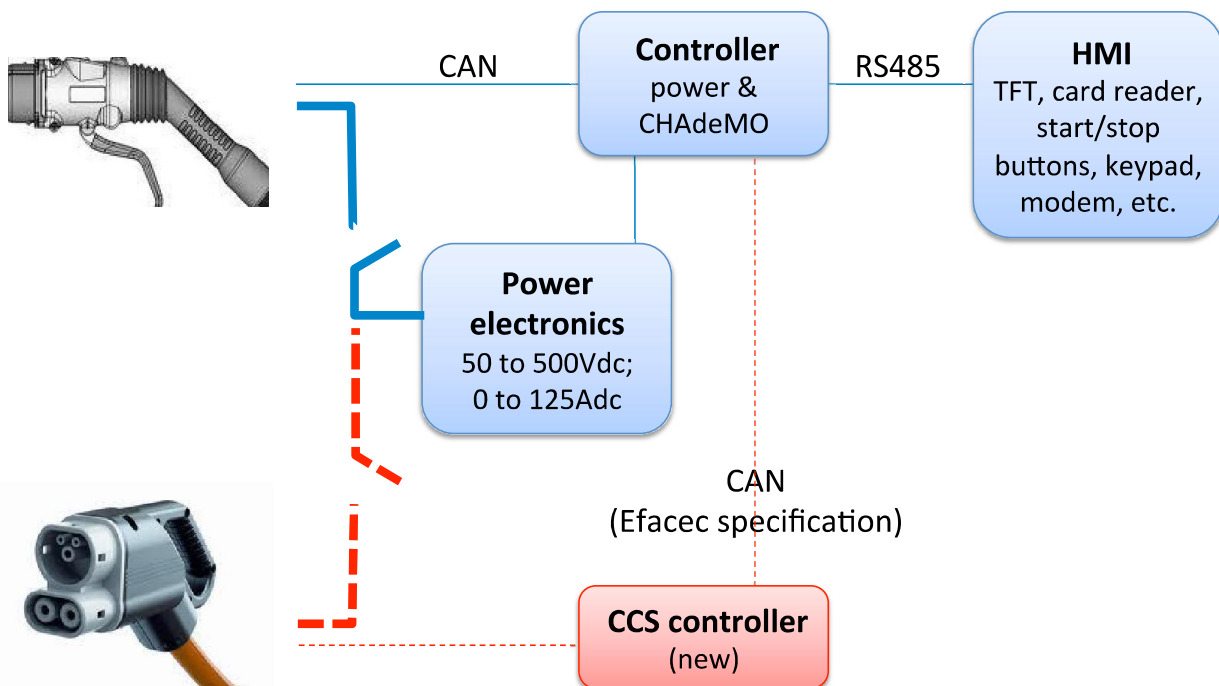
Efacec management System

Third party Management System



Main differentiating solutions

Multi-standard approach



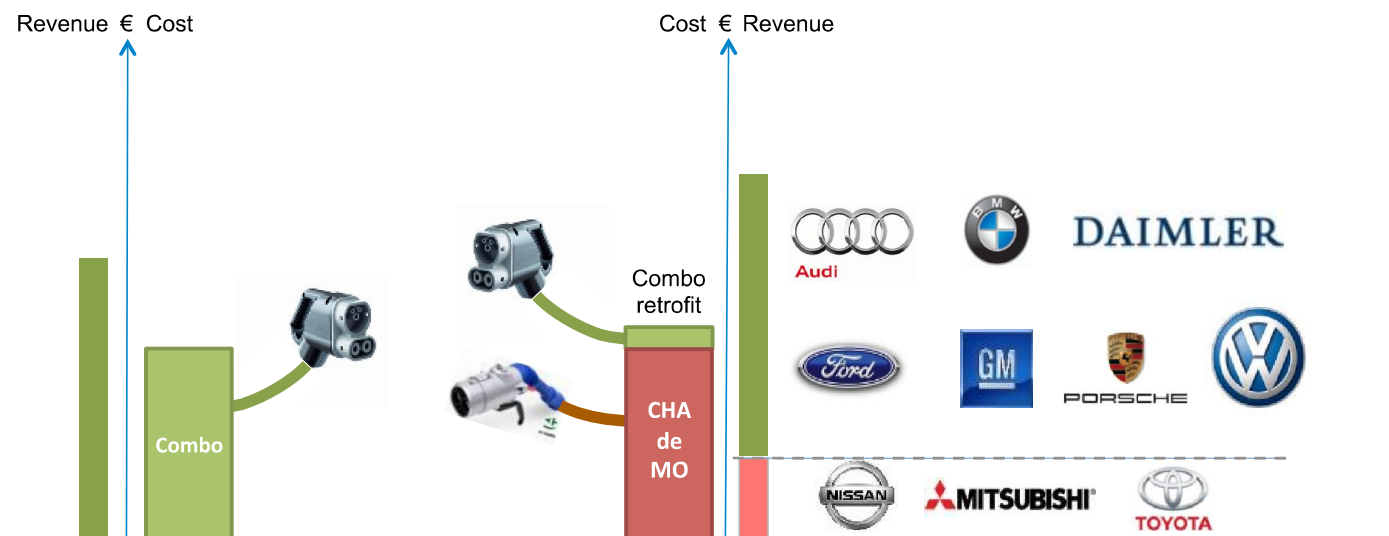
Blue: Efacec QC50; QC45; QC20

Red: CCS add-on

Significant innovations



Legacy + Combo Retrofit



Upgrading legacy through *Combo retrofit technology* to boost profitability

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Significant innovations

Quick Charger - QC45



- ✓ 50 kW DC output
- ✓ Triple output (CHAdeMO, CCS, AC⁽¹⁾)
- ✓ Network integration
- ✓ OCPP Protocol (and others)
- ✓ User-Friendly HMI (Color display; RFID reader; 2-click to charge)
- ✓ High power factor and efficiency
- ✓ Customized design

(1) - Up to 43 kVA

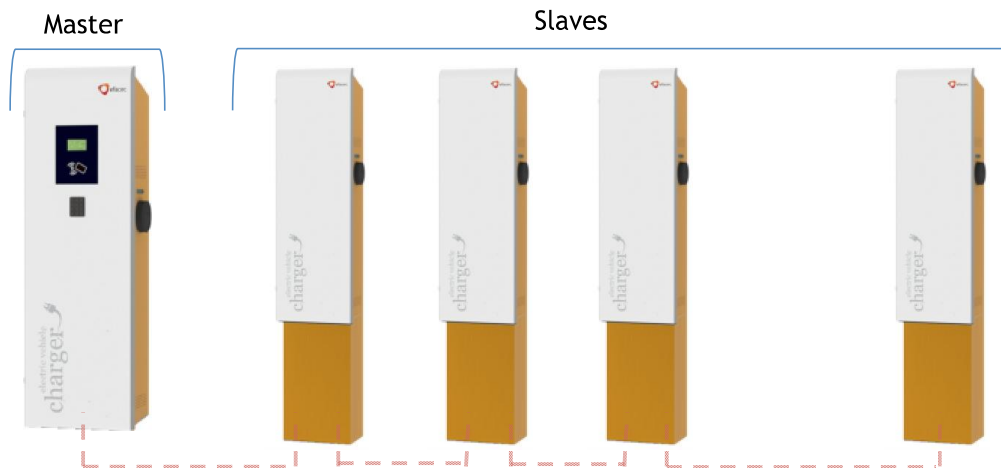


Significant innovations

Public Chargers – Modular master-slave architecture



- 1 Command station
 - with network connectivity and user authentication
- Cheaper slave outputs
- Less wiring (simpler bus topology)



Example 1 - Public Master Slave configuration

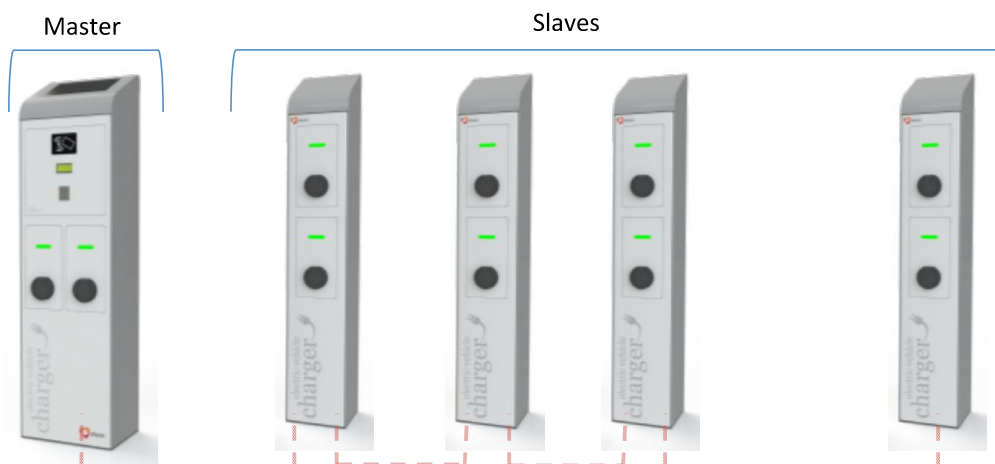


Significant innovations

Public Chargers – Modular master-slave architecture



Public Modular Master Slave configuration

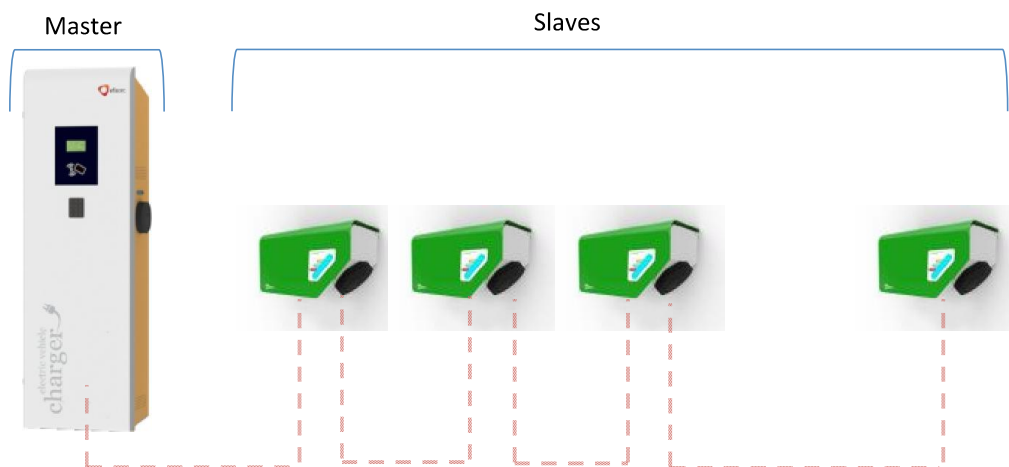


Significant innovations

Public Chargers – Modular master-slave architecture



Public Master Slave configuration

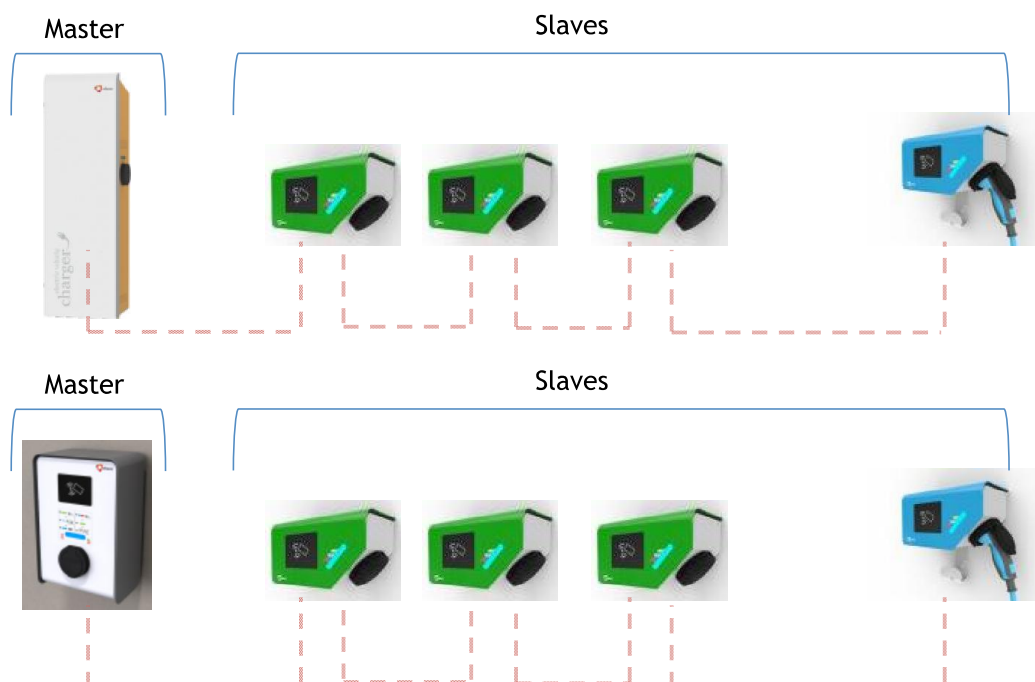


Mandatory to have Homecharger Plus (HC + MID Meter)



Significant innovations

Public Chargers – Modular master-slave architecture



Mandatory to have Homecharger RFID Plus (HC + RFID + MID Meter)

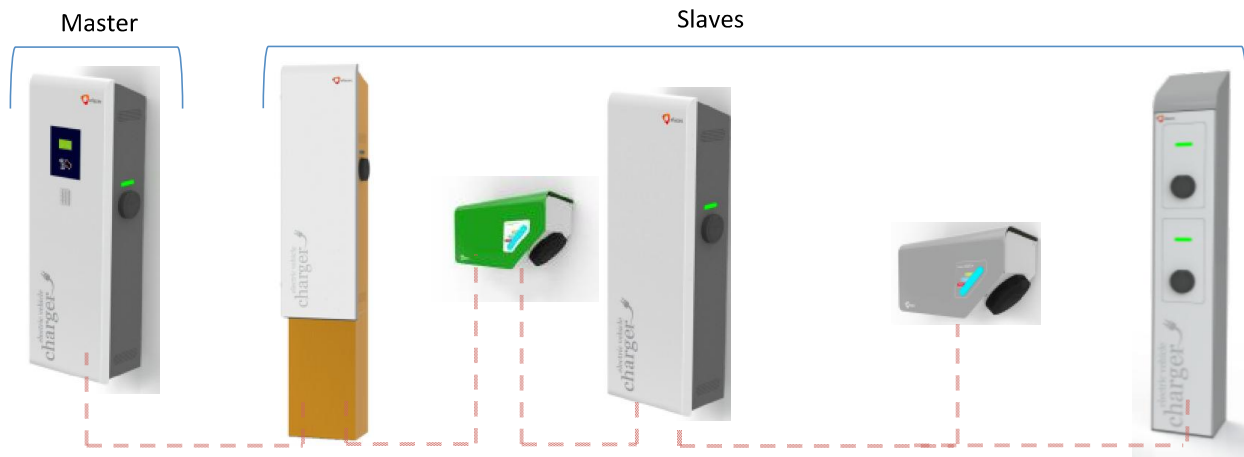


Significant innovations

Public Chargers – Modular master-slave architecture



Different output configurations



Mandatory to have Homecharger Plus (HC + MID Meter)



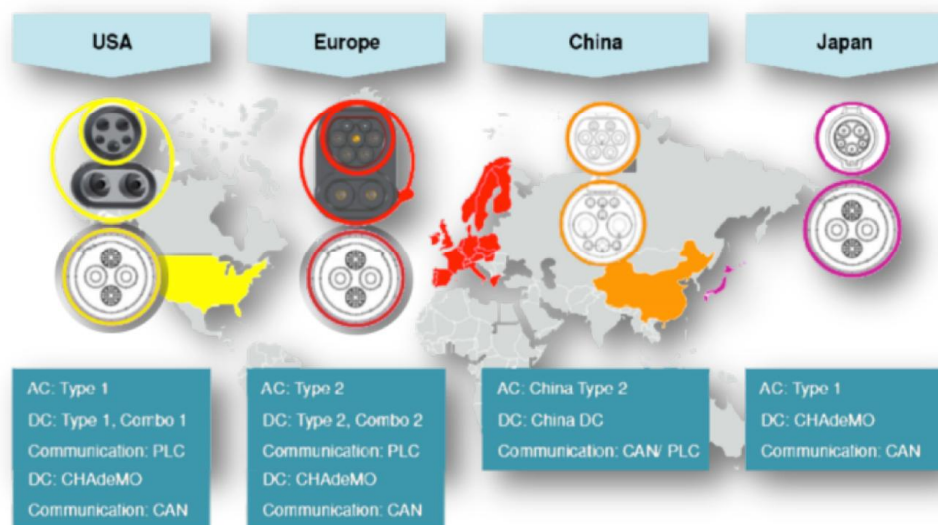
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How do we stand and what's next?

Market leader in Fast Chargers



CHAdeMO 



AC Fast Charging 43kVA



Combined Charging System 



AC Charging 22kVA



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References of Clients



Customer vehicles using Efacec Chargers:



Some of our clients:



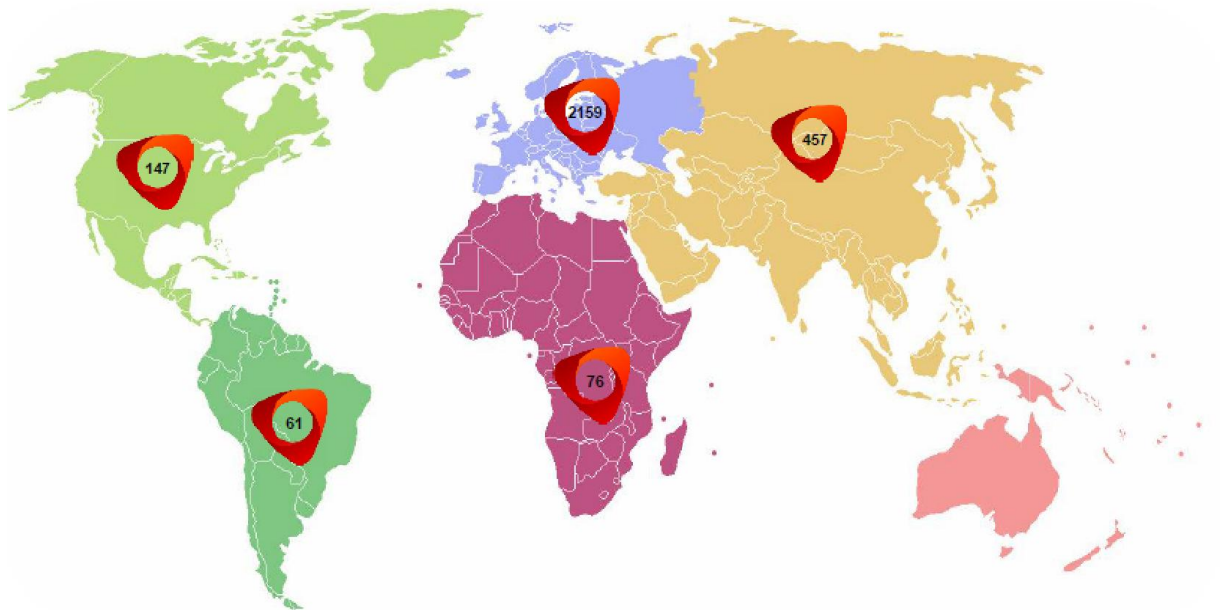
Our Partners:



Installed EV chargers



2900 Installed Plugs (DC+AC)
(September 2014)

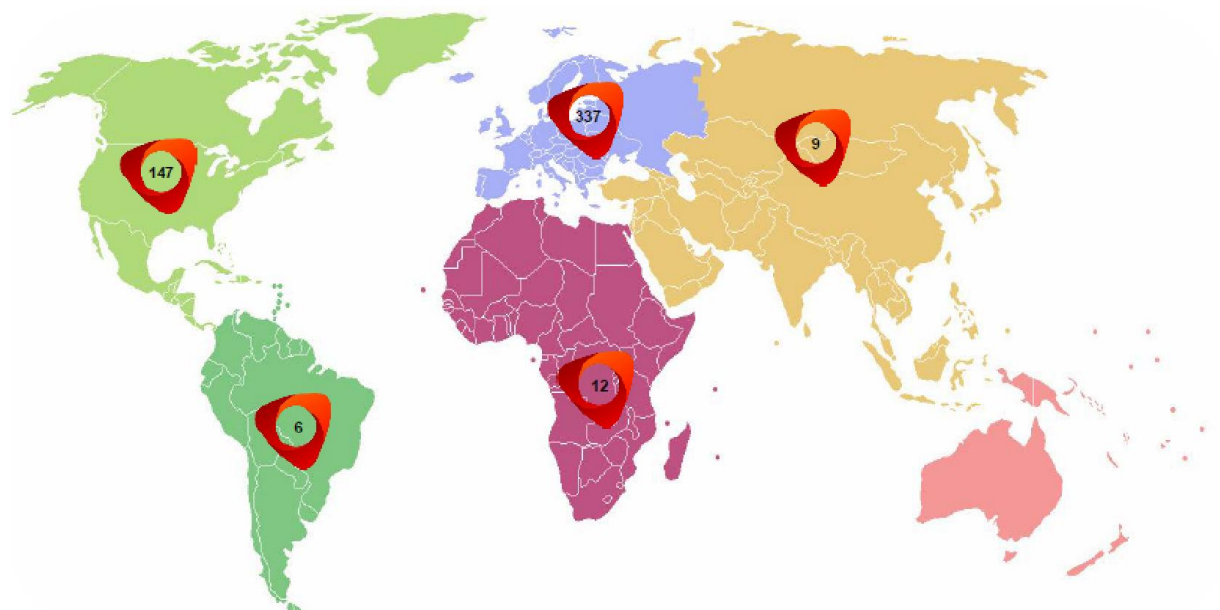


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Installed EV chargers



Efacec has more than 500 Quick Chargers sold Worldwide
(September 2014)



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Presented at eCarTec in Munich, october 2014

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How do we stand and what's next?

Main areas of present R&D



Efacec maintains numerous ongoing R&D programs, most on international partnerships with other companies or academic groups

- Smart charging
- Demand management
- Solutions for fleets and condominiums
- v2x
- Communication EV – charger
- New charger models
- Lower and higher power chargers
- Wireless charging
- Payment systems, roaming, integration with different systems
- Open protocols
- Energy storage solutions
- Energy and traction systems for electric buses

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Choose the color of your **energy!**