



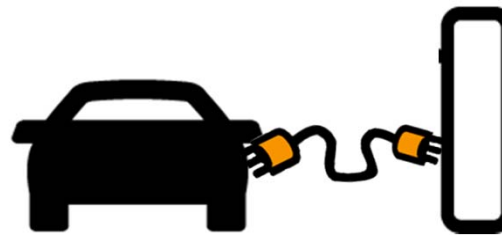
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Combined Charging the universal charging system

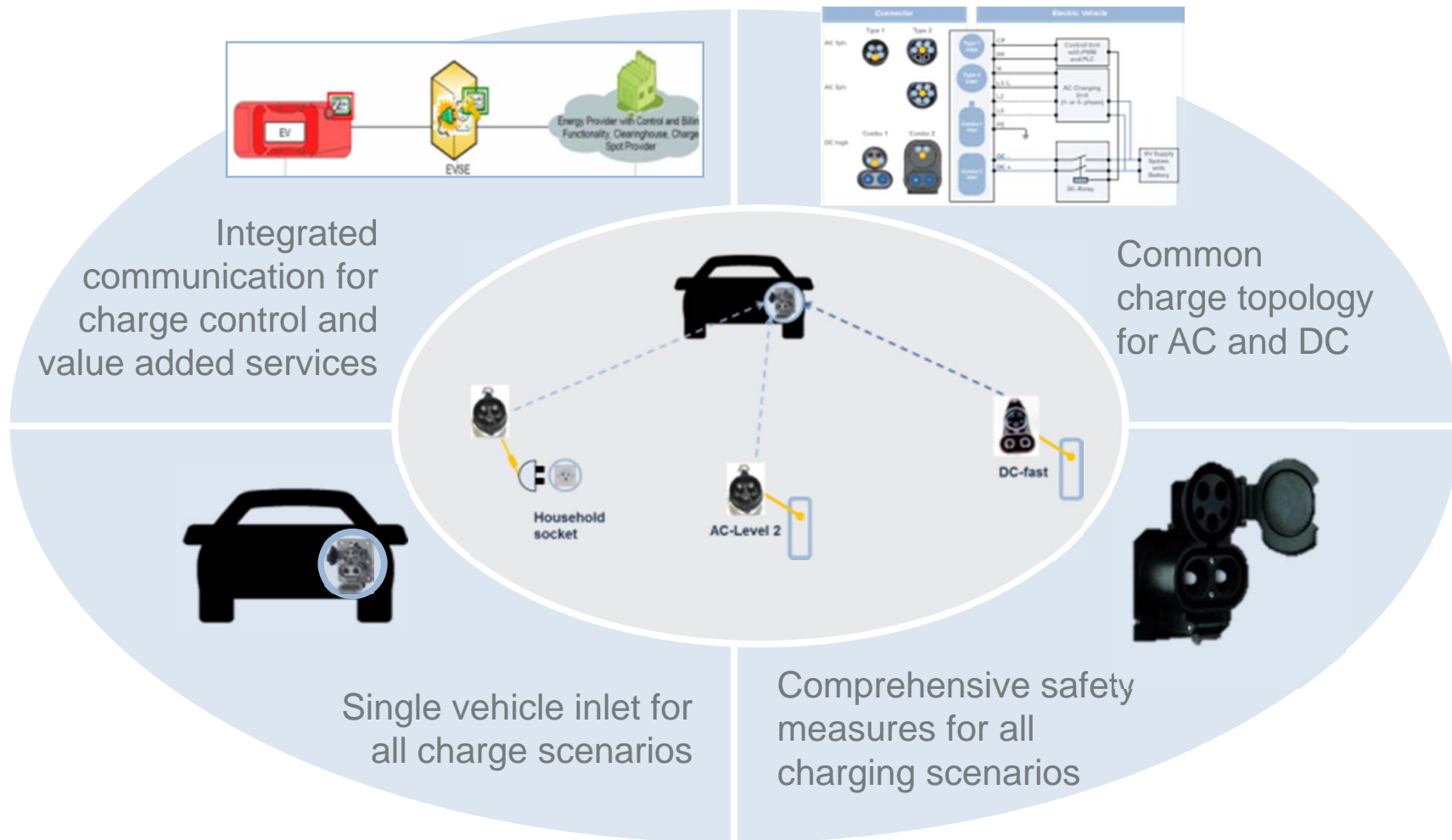
Summary

Britta Gross, General Motors



Summary Combined Charging System

The Combined Charging System serves all needs of electric vehicles.



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Considerations for DC Fast-Charge Public Infrastructure

OEMs give clear directions for infrastructure rollout.



Future of EV Charging

- Combined Charging System will be the globally expanding solution (US, Canada, Europe, ...)
- Combo with Broad Band Home Plug GreenPHY is most compatible with future smart grid and home energy management systems communication protocols
- Supported/Validated by ACEA, IEC, ISO, DIN, SAE
- Vast majority of all OEMs designing vehicles with Combo System

Timing

- SAE standard now in voting - July approval
- Combo chargers certified and available for install Dec. 2012
- Vehicles using Combined Charging System coming in 2013

Chevy Volt Infrastructure Learnings

Opportunities for both more use of 120V charging and for DC fast charging.



Opportunity

- Roughly 50% of Volt customers charge at 120V (\$0)
- 240V grant programs likely driving some 240V demand
- 240V installation costs range from \$500 to \$6,000
 - Average installation cost is ~\$1500 (plus hardware)
- 2nd Meters (to access preferred time-of-use rates) are installed in 20% of home EVSE installs
 - Average 2nd meter installation adds \$900 to the cost (CA, MI,...)
- 85% of 240V installs are in Single Family Homes
 - Multi-family residences more complex
- INL data
 - Average distance traveled per day = 30.8 miles
 - Home @ 240V = 10 hrs connected; 2 hrs drawing power
 - Public @ 240V = 7 hrs parked; 2 hrs drawing power

120V

DC

120V

DC

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Strategic Assessment of existing Charging Systems

Main bodies have adopted the Combined Charging System as charging technology.



- All members of the European Association of Automotive Manufacturers ACEA support the Combined Charging System for Europe:



- BMW, DAF, Daimler, Fiat, Ford of Europe, General Motors Europe, Hyundai Motor Europe, Jaguar Land Rover, MAN, Porsche, PSA, Renault, Scania, Toyota Motor Europe, Volkswagen, Volvo Cars, and AB Volvo.

SAE *International*®

- SAE has developed the Combined Charging System in the U.S.
- The Combined Charging System is the US solution for electric vehicle charging – from AC charging to ultra-fast DC charging.
- Nearly all global automotive companies support the Combined Charging System including US manufactures Chrysler Group LLC, Ford Motor Company, and General Motors.

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Strategic Assessment of existing Charging Systems

Let's get recharged.



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