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Feasibility analysis and development of on-road charging solutions for future electric vehicles

Wireless Power Transfer for Electric Vehicles:
Interoperability and Standards the critical factors towards mass adoption

International Energy Agency
IA-HEV Task 26 Workshop

28-29 June 2016
Rotterdam, Netherlands

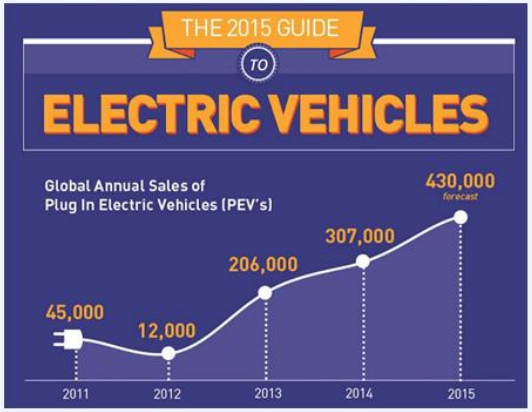
Electromobility trends (I)

Electric Vehicles

Range increases due to battery breakthroughs

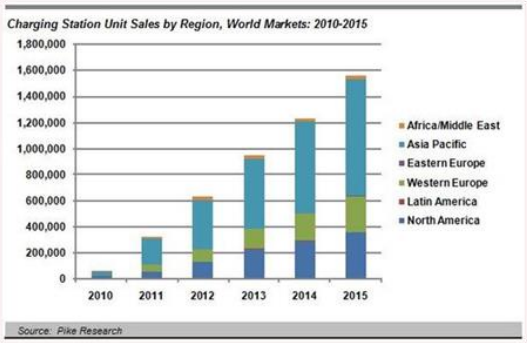
New models

Global adoption increases steadily



Infrastructure

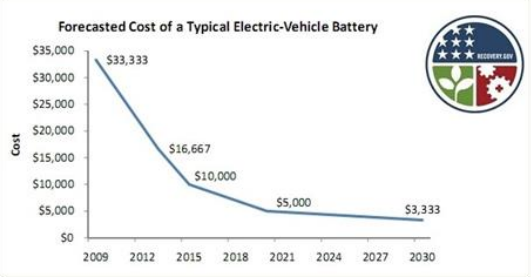
Static charging infrastructure is deployed fast



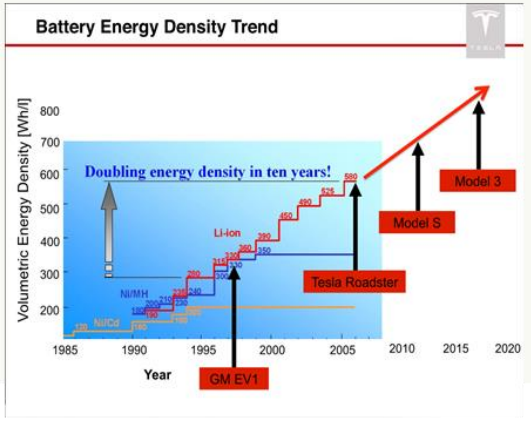
Very fast supercharger deployment (>250km range in 20 minutes)

Batteries

EV batteries' price dropping



Battery density increases linearly



Electromobility trends (II)

Investments on dynamic charging technologies

- UK government £500 million investment over the next five years for the creation and testing of electric highways.

- EU R&D project funding focused on dynamic charging
  - FABRIC
  - FASTINCHARGE
  - …

Lack of interoperability impact

- Diverse, early stage products begin to proliferate due to lack of standardization
- Uncertainty regarding control method (grid/vehicle side), coupling coil field pattern, data communications

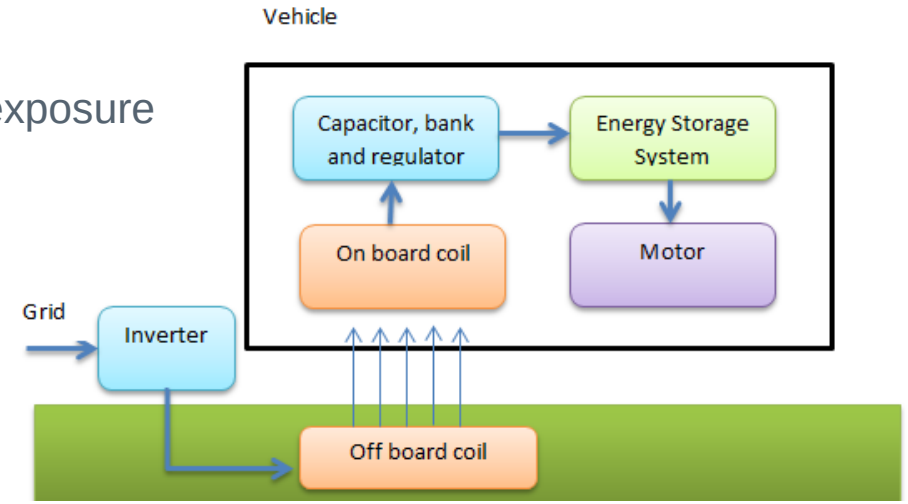
- Limited range
- Reduced user friendliness
- International travel impossible
- Congested charging infrastructures
- Redundant infrastructure > increased cost

System interoperability parameters

- Operating Frequency
- Magnetic Compatibility
- Power levels
- Misalignment tolerance
- Nominal air-gap
- Various mounting requirements for primary pad
- Vehicle pad position
- Efficiency levels
- EMC and EMF regulatory compliance
- Communications between vehicle and charging infrastructure

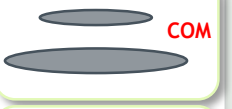
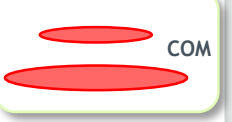
Solution (I) – Standardization

- What should standards do?
  - Protect customer
    - Consumer health
      - » Magnetic/Electric Field exposure
      - » Safety
    - Consumer cost
      - » Reliability
      - » Operations
      - » Maintenance
  - Simplify supply chain and contracts
  - Manage interoperability with non-electric vehicles



- What should standards not do?
  - Stifle competition
  - Limit innovation

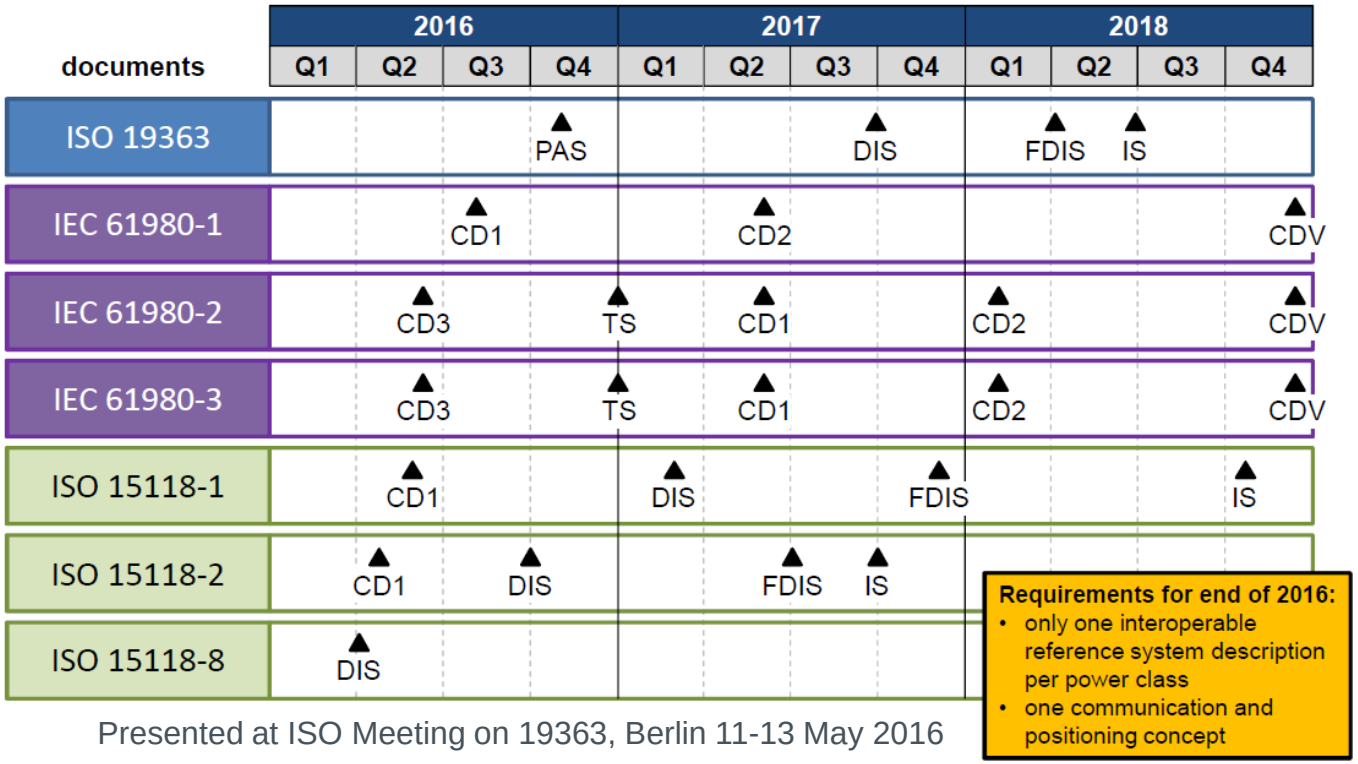
Solution (I) – Standardization

STANDARD			FOCUS
IEC 61980-1	IS	*Electric vehicle wireless power transfer (WPT) systems Part 1: general requirements*	
IEC 61980-2	TS	*Part 2: Specific requirements for communication between electric road vehicle (EV) and infrastructure with respect to wireless power transfer (WPT) systems*	
IEC 61980-3	TS	*Part 3: Specific requirements for the magnetic field wireless power transfer systems*	
ISO 19363	PAS	*Electrically propelled road vehicles Magnetic field wireless power transfer – safety and interoperability requirements*	
ISO/IEC 15118	IS	*Road vehicles – vehicle to grid communication interface*	
SAE J2954	TIR	*Wireless charging of electric and plug-in hybrid vehicles*	
SAE 2847/6	RP	*Wireless charging communication between plug-in electric vehicles and the utility grid*	

Steps toward an integrated vehicle - infrastructure system

ISO - IEC Standard coordination

Proposal for timeline of ISO19363

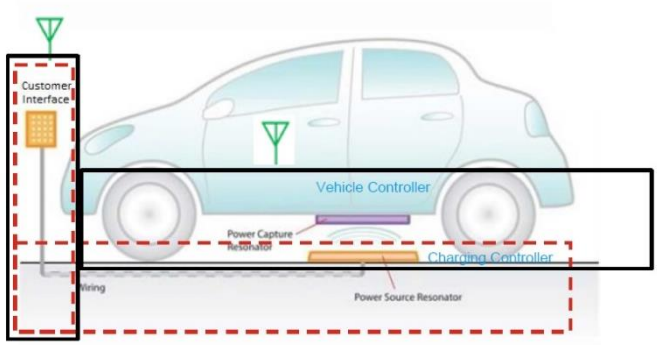


Presented at ISO Meeting on 19363, Berlin 11-13 May 2016

Solution (I) – Standardization

SAE TIR J2954* standardizes:

- Frequency band (81,39-90kHz)
- Safety
- Interoperability
- EMC/ EMF limits
- Coil definitions
- For WPT 3.7kW, 7.7kW, 11kW, 22kW



UL 2750: Verification of Wireless Charging Base Safety

MOU Between SAE and UL

SAE J2954: Wireless Charging and Alignment

IEEE Standards Organization has initiated a Electrical Vehicle Wireless Power Transfer Industry Connections Activity.

Motivation and goal:

This IEEE Standards Association Industry Connection Activity is related to pre-standardization efforts in the domain of Electric Vehicle Wireless Power Transfer with a particular focus on **dynamic wireless charging** as these efforts address the range limitation of electric vehicles as well as the cost aspect of the vehicle energy storage and complement the current standardization activities of the SAE (TIR J2954) which is centered on static charging.

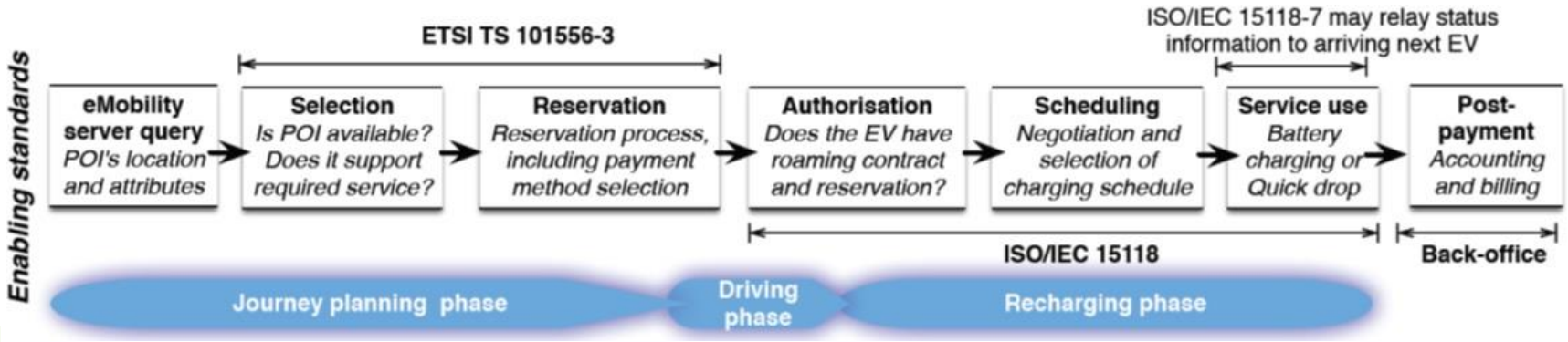
* available from the SAE website since May 31st

Solution (II) – Platform interoperability (physical)

MARCH 2 TSLA: 188.34 1.99

Fastned tries to appeal to Model S owners and adds Tesla CHAdeMO adapters to 50 charging stations in the Netherlands

Solution (II) – Platform interoperability (ICT)



USA

NOVEMBER 19, 2015 TSLA: 221.80 0.73

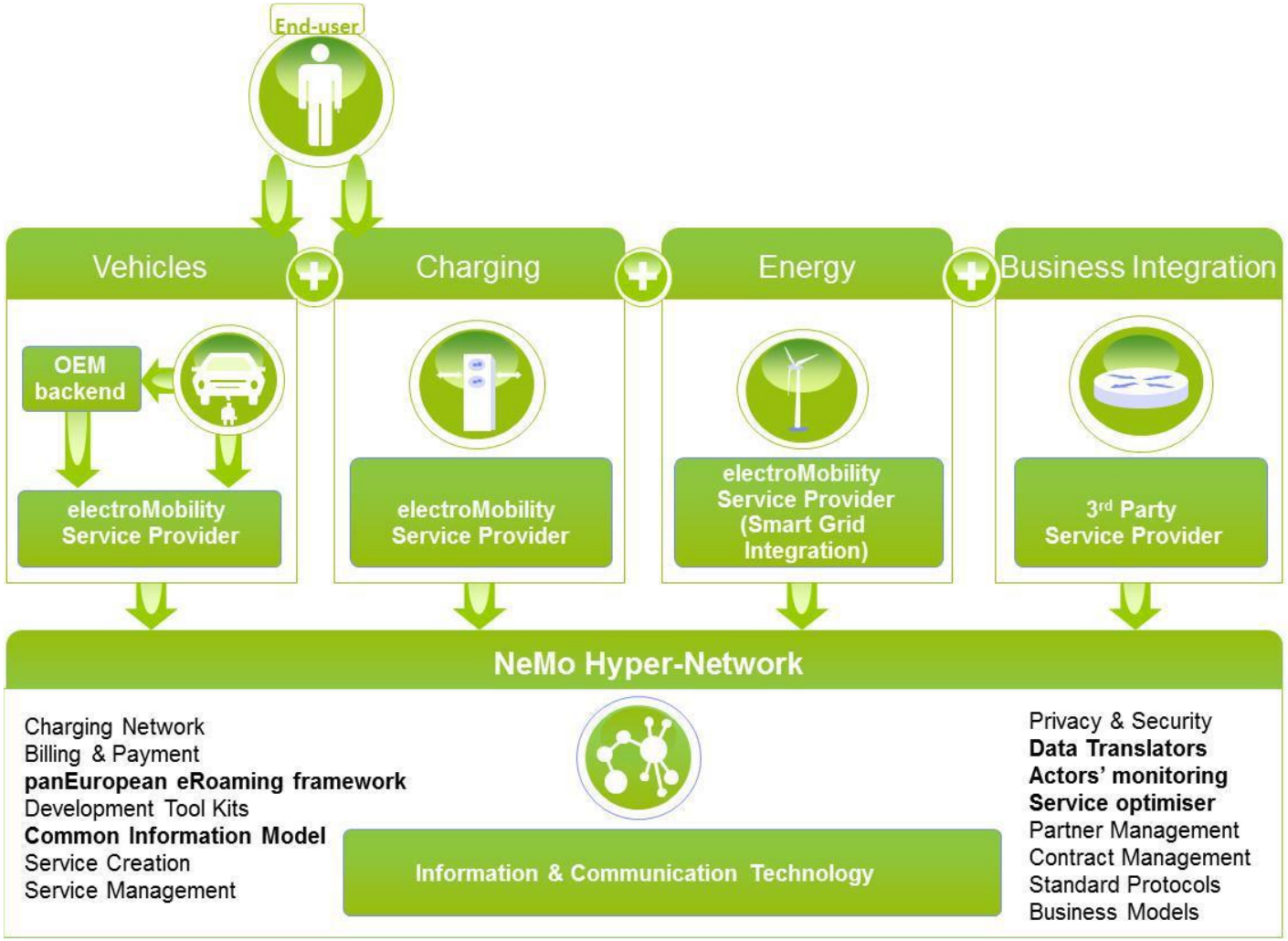
New partnership between Blink, ChargePoint and EVgo lets you access all 3 charging networks with a single account

Blink, ChargePoint and EVgo operate more than 17,500 electric vehicle charging stations or about 91% of all stations in the US

Europe

Hubject's eRoaming platform makes it possible to charge electric vehicles across Europe

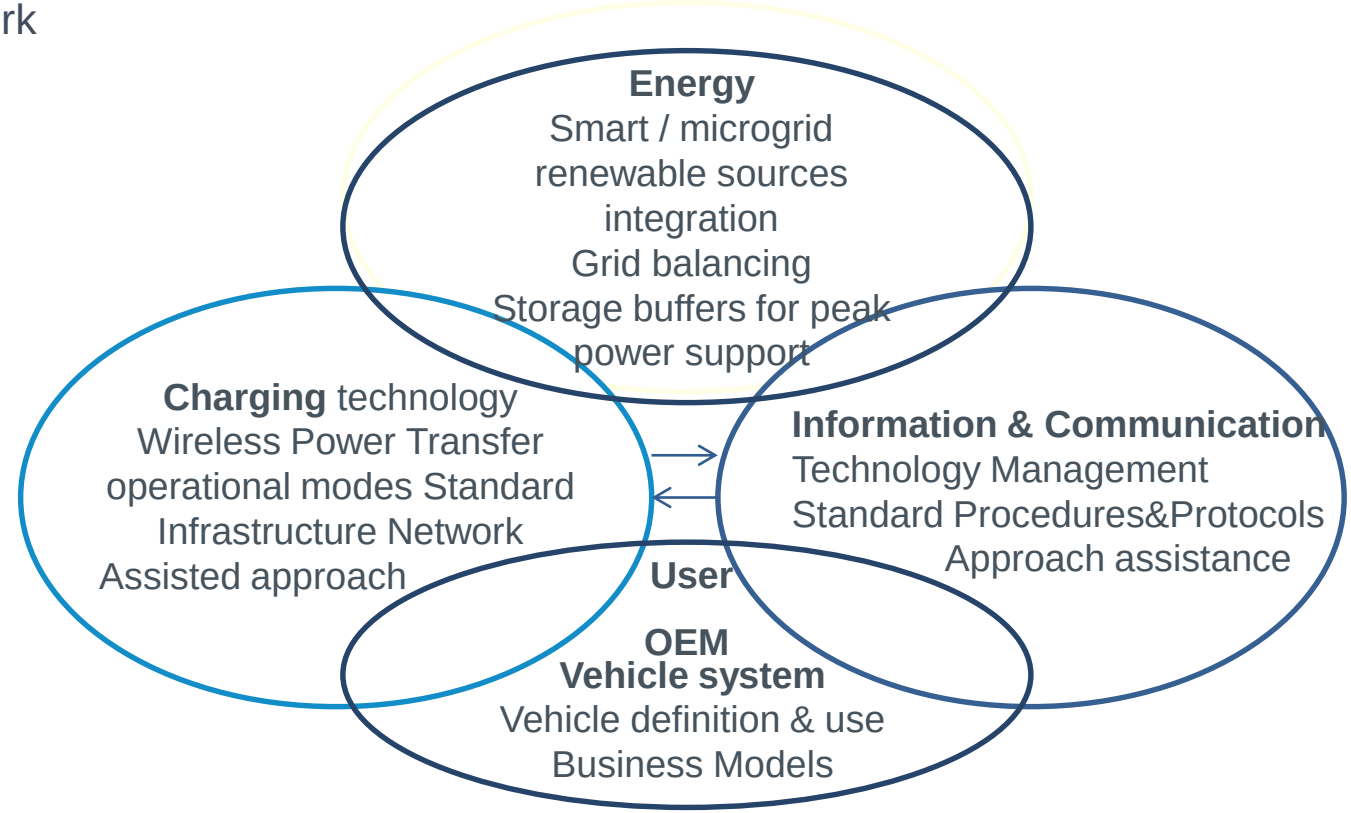
Future plan: bring everything together through middleware



Electric Vehicle Harmonization wthin the eMobility system

addressing the best use of the energy and the user convenience

The design of the vehicle system with particular regard to the on board storage and to the vehicle use can be considered in relation with the possible applicationf the new technologies on Wireless Power Transfer, the Information and Communication Technology and the functional support of the Service Providers acting in the Hyper Network



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Thank you!

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