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The 27th INTERNATIONAL
ELECTRIC VEHICLE
SYMPOSIUM & EXHIBITION.

Barcelona, Spain
17th-20th November 2013

US-EU Joint EV-Smart Grid Interoperability Centers



Keith Hardy, Argonne National Laboratory

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- Transatlantic Economic Council
'Work plan for Advancing Transatlantic E-mobility'
- DOE-JRC agreement to establish collaborative
EV-Smart Grid Interoperability Centers



- *Support harmonization of EV standards and test procedures*
- *Conduct normative research*

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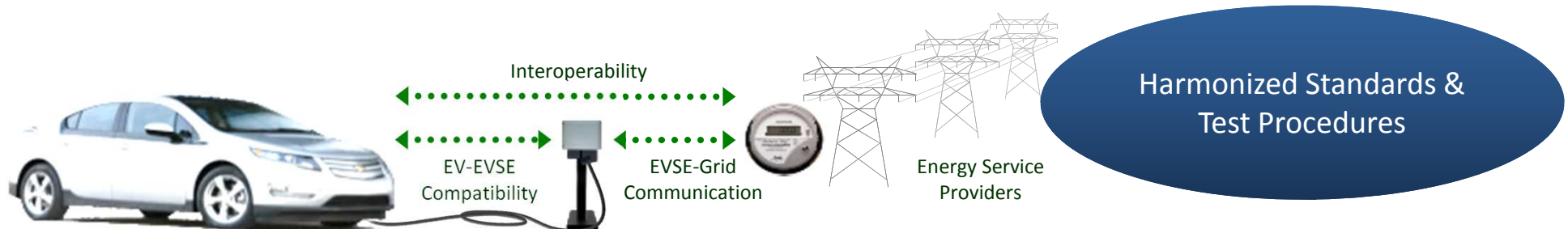
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eVS | 27 Interoperability

*the ability to charge conveniently, safely and securely ...
anywhere, anytime ... and enable smooth integration of
functions offered by energy service providers*



Technical EV-EVSE compatibility ... *does the car charge when connected?*

Communication ... *harmonized messages and protocols*

Business Full functional integration ... *roaming, billing, security, etc.*

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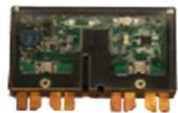
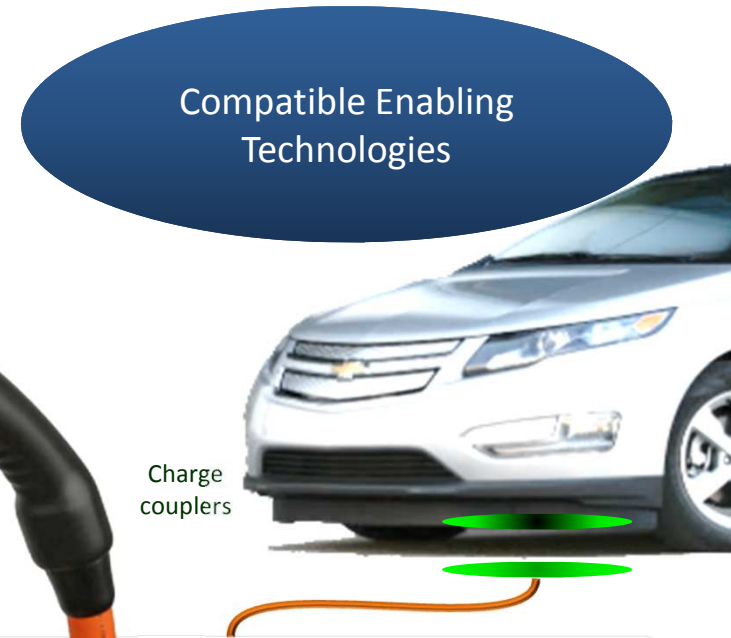
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- Standards and technology are directly linked
- Full functional integration requires new technology and standards



Metrology;
sub-metering



Communication controllers
& messaging protocols



Charge
couplers



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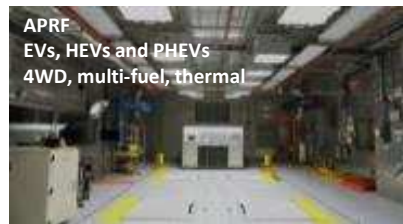
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Collaboration on test procedures:

- Advanced Powertrain Research Facility
- Electrochemical Analysis and Diagnostics Lab

Additional space and equipment to address:

- AC, DC and wireless charging
- Communication/networks
- Smart grid hardware-in-the-loop



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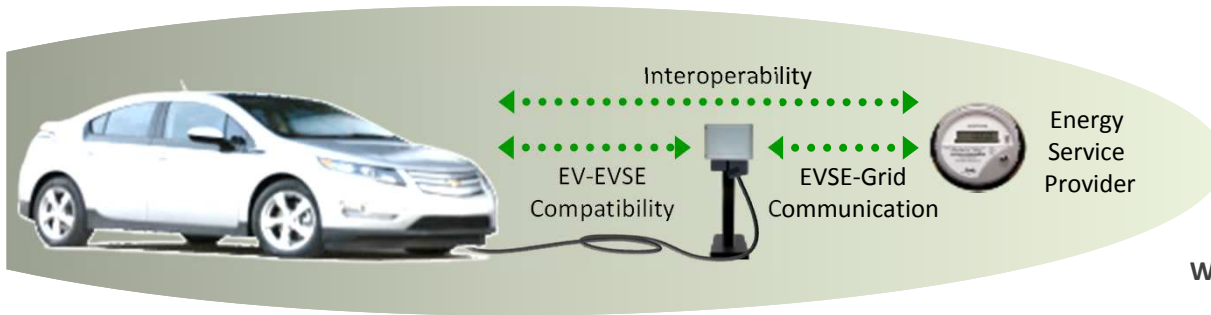


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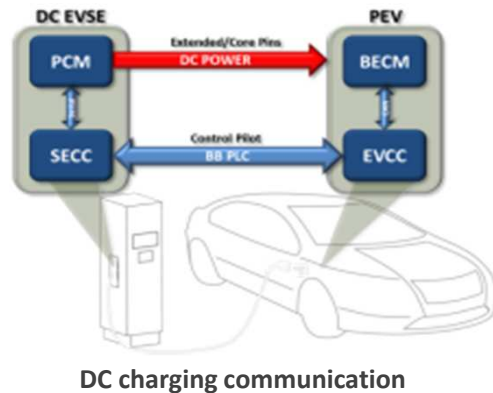


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Focus on Standards Development and Verification



SAE J2954
Wireless Charging
Test Fixture

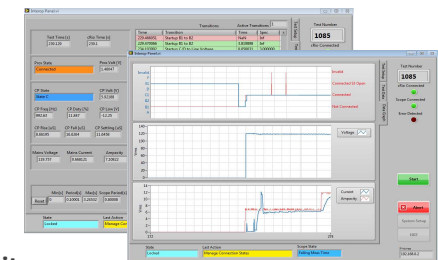


AC/DC Charging Comm. Controllers:
SAE J2931/4 (HGP) with
CAN/Ethernet Ports



High Power
DC Charging
PEV/EVSE
Emulation

Interoperability
Verification Tools



SAE J2953 Interoperability
Standard Development

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Vehicles
EV test at -7 °C
in the VELA labs



Components
X-ray CT of battery

Smart Grids
Pre-normative research



Vehicle testing and ICT in Ispra, IT;
Batteries, components and new materials testing plus smart grids in Petten, NL.

- **Vehicle and Engine Emissions Laboratories (VELA)**
All types of vehicles/engines;
Legislated and realistic conditions
- **EV-EVSE compatibility/interoperability**
Connectivity and functionality
- **EV component and battery testing**
Performance/safety validation;
Typical and abusive conditions
- **Smart grid simulation**
Offline/real-time simulation and testing;
Interoperability and communications

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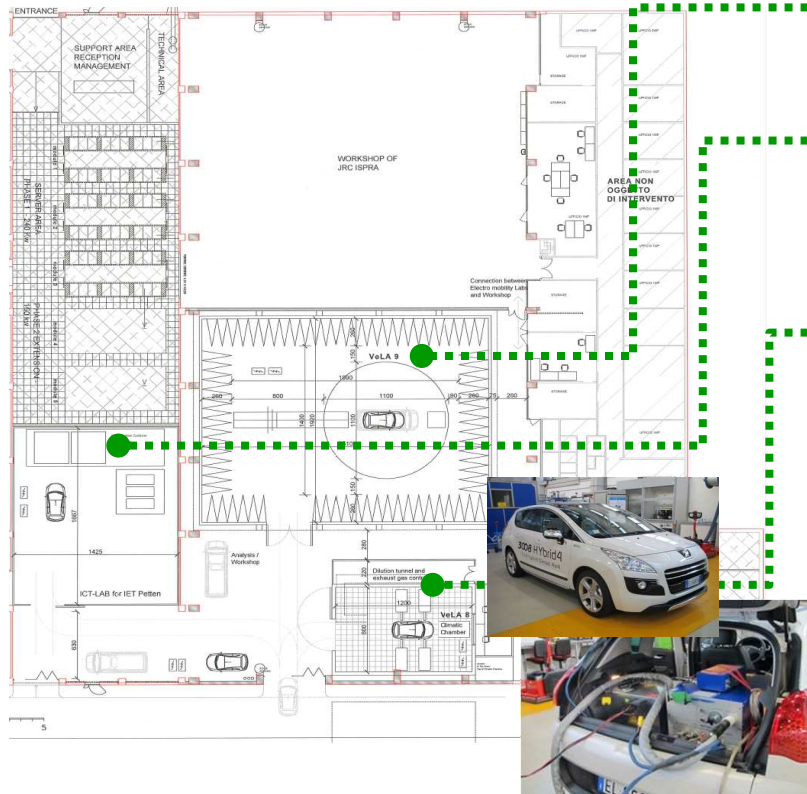


Build-up of New EV/HEV Laboratories:

- ➔ **Anechoic chamber (VeLA-9)** – Electromagnetic emission and immunity tests.
- ➔ **Smart Grid Simulation** – Lab with space for mounting ICT equipment in cars with smart grid simulation container.
- ➔ **Cold/Warm Cell (VeLA-8)** – Full exhaust gas analysis; for energy efficiency and HVAC issues

In addition:

- Industry Outreach
- Technical Staff Exchange
- Joint Publications in Process



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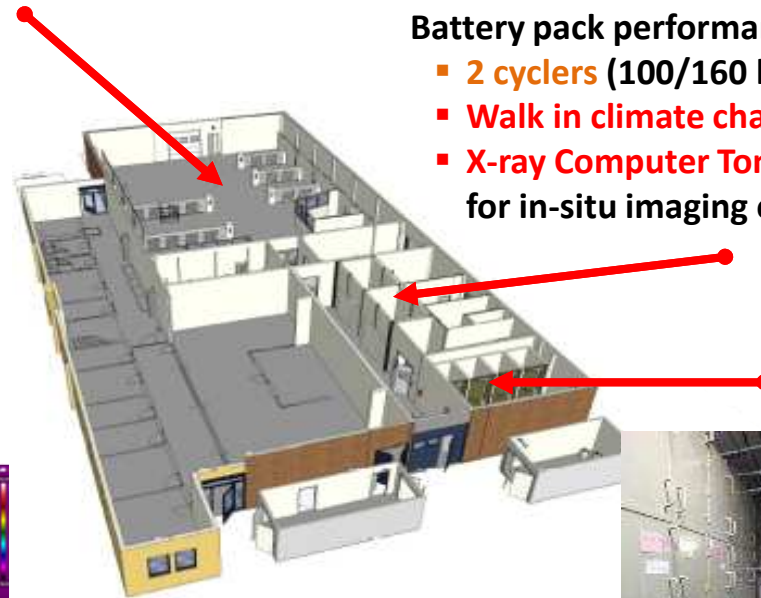
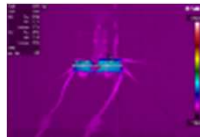
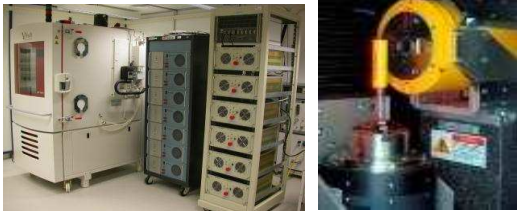


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Battery cell performance testing & material studies

- Cyclers (2 with 15 channels → 6 with 50 channels)
- 2 environmental chambers, 8 temperature chambers
- IR camera
- Glove box – plus extension
- STA with FTIR&GS/MS analysis
- Micro CT



Battery pack performance testing

- 2 cyclers (100/160 kW – 2 channels)
- Walk in climate chamber (limit 100 kWh)
- X-ray Computer Tomography System for in-situ imaging of modules



Battery cell abuse facility

- 4 abuse chambers (limit 450 Wh)
- 2 ARCs – cell and modules
- Mechanical, electrical and thermal abuse capabilities
- FTIR/GC/MS – gas emission analysis



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Support to policy customers

- Global Technical Regulation on EV Safety - UNECE WP29
→ DG ENTR
- IEA – IA-HEV (Accelerated Aging Testing for Li-ion Batteries)
→ DG RTD

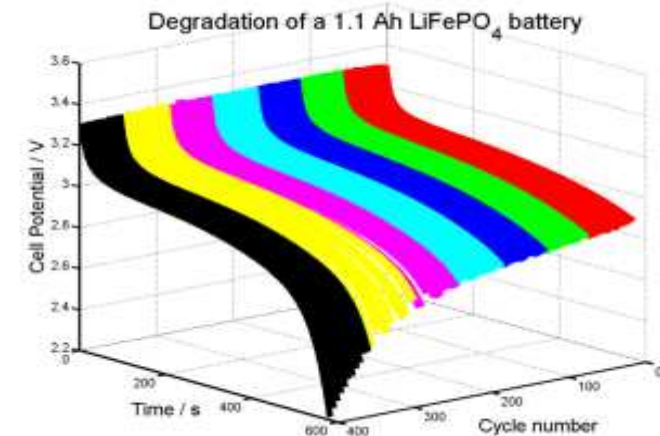


Industry needs ...

- EUROBAT – MoU signed November 2012
- Transatlantic Business Council (TABC)
- *European Reference Laboratory??*

Standardisation needs ...

- International – ISO/IEC
- European – CEN/CENELEC
- Harmonization – SAE/UL/JIS



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- EV-EVSE compatibility and interoperability
 - *Shared tools/procedures*
- PEV and battery test procedures/protocols
 - *Reference test articles*
- EV-EVSE-grid connectivity pilot projects
 - *Verification in realistic environments*

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- Standards development and verification
 - *Coordinated activities with interoperability centers in US and Europe*
- Universal grid connectivity/communication technologies (i.e., for grid integration)
 - *Transportation, buildings and infrastructure*
 - *Revenue-grade EUMDs and standard communication modules*
 - *Interface/interoperability test equipment*

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Contact Info

Alois Krasenbrink – Alois.Krasenbrink@ec.europa.eu

Harald Scholz – Harald.Scholz@ec.europa.eu

Lee Slezak – Lee.Slezak@ee.doe.gov

Ted Bohn – tbohn@anl.gov

Keith Hardy – khardy@anl.gov

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