US-EU Joint EV-Smart Grid Interoperability Centers

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Electro-mobility is a Common Growth Sector

- 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
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.*
Standards and technology are directly linked

Full functional integration requires new technology and standards
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
Focus on Standards Development and Verification

Interoperability

SAE J2954
Wireless Charging Test Fixture

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

High Power DC Charging PEV/EVSE Emulation

Interoperability Verification Tools

SAE J2953 Interoperability Standard Development

DC charging communication

Interoperability

Energy Service Provider

Support by
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
Enhancing Vehicle Test Facilities

**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
Enhancing Battery Test Facilities

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
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
Planned Joint Activities

• 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
Opportunities for Industry

• 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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