CEC VGI F2F Meeting

San Francisco, California

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August 7, 2017
Benefits of Collaboration and Economies of Scale

“In this day and age, the research and development of a new vehicle for a major automaker has become a global project and can cost billions of dollars, the more of that cost you can share with another automaker, the better…” **Tim Urquhart, Principal Analyst at IHS Automotive**

OEM collaboration not only reduces development and production costs but also enables achievement of broader research and development goals.
Common Electric Vehicle Components
Non-Intelligent vs Intelligent

Minimal investment required to go from a Non-intelligent eV to an Intelligent eV
ISO\(^1\) – 15118 eV\(^2\) Intelligence

Small delta due to reuse of chip and basic messaging

ISO 15118 Capable AC Charging
AC Messaging PnP\(^7\) + Load\(^8\)

ISO 15118 Capable DC Charging
PLC-Chip mandatory

Basic AC

ISO 15118 Capable DC Charging
PLC-Chip mandatory

PLC-Chip optional

ISO 15118 Capable AC Charging
PLC-Chip required

ISO 15118 Capable DC Charging
(PLC-Chip mandatory)

Basic AC

DC only
DC + AC add on
AC only

Basic AC

DC only

AC only

Sunk costs for Smart eV and Porsche

Additional SW\(^3\)/HW\(^4\) Development Required
CEC\(^5\) assistance may help to get cost efficient solutions similar to DC

1: ISO – International Organization for Standardization
2: eV – Electric Vehicle
3: SW – Software
4: HW – Hardware
5: CEC - California Energy Commission
6: PLC – Powerline Communication
7: PnP – Plug and Charge
8: Loadb – Load Balancing
Integration of eV\(^1\) Intelligence via ISO\(^2\) 15118

Cost Reduction proposals for Intelligent eVs:
(a) Government grants to reduce OEM development costs,
(b) Economies of scale: OEM collaboration to reduce piece price

Definitions
- **DC Solution**: OEMs that support CCS\(^3\) (Combo, AC & DC), but have integrated ISO 15118 only for DC Charging
- **AC Solution (with available DC)**: OEMs that support CCS (Combo, AC & DC), and have integrated ISO 15118 for AC & DC Charging both
- **AC Solution (without DC)**: OEMs that support AC charging only, and have integrated ISO 15118 for AC charging

\(^1\): eV – Electric Vehicle  
\(^2\): ISO – International Organization for Standardization  
\(^3\): CCS – Combined Charging System

Sunk cost for Mercedes-Benz (Smart EV), Porsche

ISO 15118 Integration Cost

CEC Augmentation of OEM Development Costs

Sunk Cost $0.
Importance of Interoperability

What to Standardize?
1. eV to EVSE interface
   - Associated communication messages and protocols
   - Hardware/Software Interfaces
2. Cybersecurity Requirements

Customer Benefits of Standardization?
1. Accessibility to eMobility infrastructure (e.g. Vehicle Roaming, Charging connectors/stations)
2. Enhanced customer experience (e.g. Plug n Charge)

Infrastructure Benefits of Standardization/Interoperability?
1. Cost effective integration of eMobility assets
2. Efficient grid/Load Management (e.g. Demand Response)
3. Reduced green house gas emissions

Interoperability between the eV and the charging station ensures quality, efficiency, service and reliability of the consumer charging experience

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Next Steps: California State Government Funding

1. Likelihood of California government funding for OEM programs?
   - Government Funding to augment OEM development and hasten market introductions
   - Smart Charging:
     - Associated OEM cost to move from an ISO\(^1\) 15118 enabled DC architecture to an ISO 15118 enabled AC/DC architecture ensuring Load balancing
     - enhanced utilization of available grid capacity

2. Are all eV\(^2\) cost categories eligible for government funding?
   - Associated eV development Costs
     - Engineering Development Costs (material, hardware, software, engineering resources)
     - Supplier Development Costs (A-Sample, B-Sample, etc)

3. Reporting Requirements associated with receipt of government funds

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1: ISO – International Organization for Standardization
2: eV – Electric Vehicle
Thanks for Your Attention
## Backup

### Appendix 2: Examples of collaboration and how it can help

| Engine co-operations | Selling or sharing core business with other OEMs to realize scale effects  
|----------------------|--------------------------------------------------------------------------|
|                      | • BMW - PSA  
|                      | • Daimler - Renault  
| Platform sharing     | Selling or sharing core business with other OEMs to reduce investments  
|                      | • Volvo - Ford  
|                      | • PSA - Toyota  
| Process sharing      | Adoption of the best practice processes  
|                      | • Toyota processes for production  
|                      | • PSA processes for purchasing  
| Development of new business fields | Providing car sharing service to establish oneself on a long term base as mobility provider  
|                      | • Car2go from Daimler  
|                      | • Mobi by Peugeot  
| Cooperation with electric companies | Participation in the development of smart grids  
|                      | • Daimler AG/Fiat - RWE  
|                      | • Renault - Better Place  
| Strategic partnerships with suppliers | OEMs define strategic partnerships with suppliers for e.g. transmissions, fuel injection systems to realize scale effects and to shift investments to the suppliers leads to a consolidation and globalization process within the supplier industry  

Source: [https://www.slideshare.net/mattblair09/automotive-industry-analysis-of-the-big-3](https://www.slideshare.net/mattblair09/automotive-industry-analysis-of-the-big-3)
ISO – 15118 eV Intelligence

**ISO 15118 Capable DC Charging**

**ISO 15118 Capable AC (with available DC) Charging**

**ISO 15118 Capable AC (without DC) Charging**

- Sunk Costs
- Time
- Cost