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# EVSE INTEROPERABILITY

July 29, 2015 Rich Byczek, Jeffrey Wishart

Intertek



# An Extensive Global Network



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## What We Do for You



Testing



Inspection



Certification



Auditing



Outsourcing



Advisory



Training



Quality Assurance

More than  
**100**  
countries

More than  
**1,000**  
laboratories  
and offices

over  
**38,000**  
people

- FTSE 100 company in the Support Services sector
- Market capitalization: ~\$7.1 billion USD in 2014 (£4.8B)
- Revenue generation: ~\$3.2 billion USD in 2014 (£2.1B)

# Electrical Vehicle Testing Systems

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## Electric Vehicle Technology Services

- Energy Storage/Battery testing small cells to modules to large format full pack systems
- EPA and Global Emission certifications on hybrid drivetrains
- Charge Station Certification:
  - UL 2594, 2202. IEC 61851, Chademo
  - ETL listings, Global Market Access, International Certifications



## EV's... Not so NEW Energy Vehicles

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## Will they work with every EV ????



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# SAE INTERNATIONAL J2953 STANDARD

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## J2953 has three levels of interoperability testing:

### Tier 1

- Mechanical Interoperability
- Charge Functionality
- Safety Feature Functionality

### Tier 2

- Indefinite Grid Events
- Dynamic Grid Events

### Tier 3 (Not all EVSE are capable)

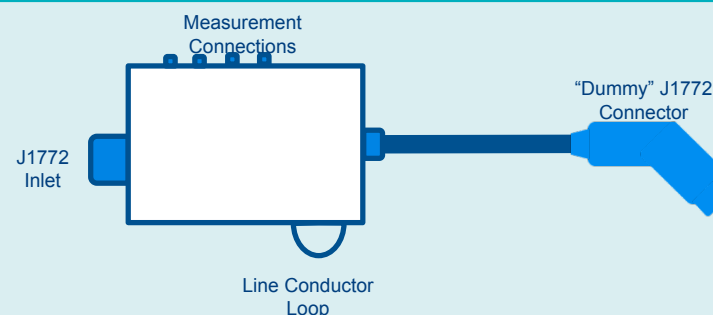
- Ampacity Control
- Scheduled Charge
- Staggered Scheduled Charge
- Charge Interrupt/Resume





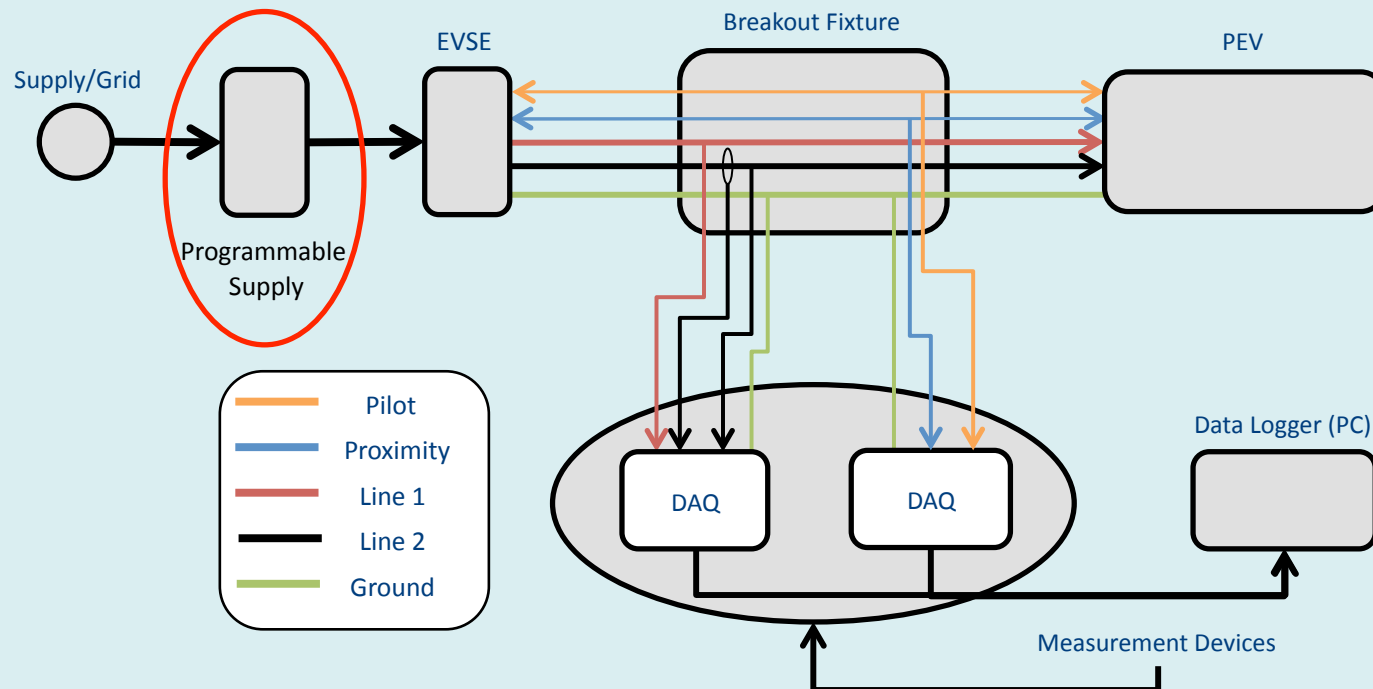
## 4.3.2 BREAKOUT FIXTURE

The breakout fixture is a tool used for all tiers of testing. It must be made custom to accommodate measurement devices that will be used by the operator during testing. The tool is designed to pass through all line and signaling conductors between the EVSE and PEV while being able to breakout the conductor nodes for measuring by the data acquisition and data logging system. It is required that the fixture does not break any of the line or signaling circuits to the measurement equipment; i.e. the measurements must be in parallel, not series.



Required features include UL listed SAE J1772 inlet and connector. Inlet, connector and all conductors must be rated for voltage and current limits exceeding the capabilities of all EVSE and PEV articles to be tested. The SAE J1772 connector requires modification such that it does not terminate the proximity circuit, rather it is to pass the proximity conductor through the breakout fixture and ultimately to the EVSE connector for termination.

## 4.3.2 BREAKOUT FIXTURE



The programmable supply will be used for plausible real-world static and dynamic power modifications to test robustness of the charging system.

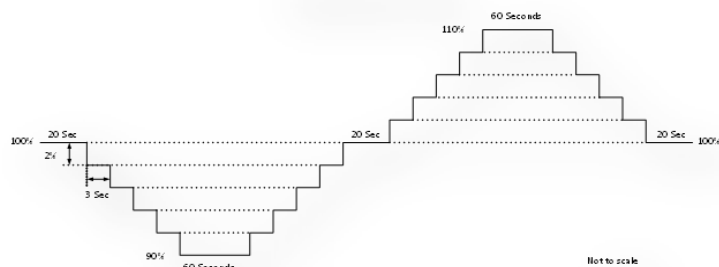


# TIER 2 TESTING

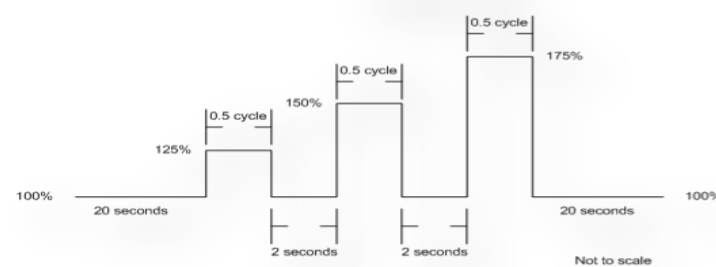
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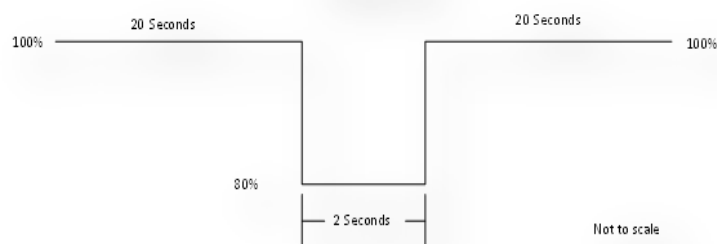
Voltage Range Variation



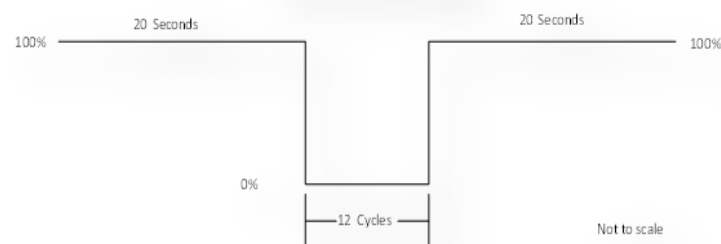
Voltage Swell



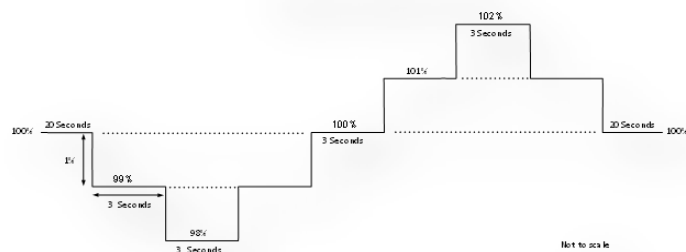
Voltage Sag



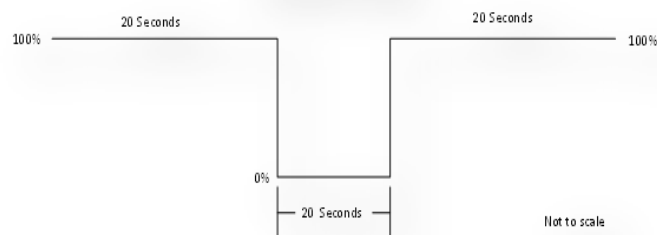
Momentary Outage



Frequency Range Variation



Indefinite Outage



# PEV Project Participants

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- 14 PEVs from 12 OEMs
- 10 EVs
- 4 PHEVs

PEV Make and Model
Mitsubishi i-MiEV
Toyota Prius Plug-in
Toyota RAV4 EV
Nissan Leaf
Kia Soul EV
Ford Fusion Energi
Ford Focus EV
VW e-Golf
BMW i3
Chevrolet Volt
Honda Fit EV
Honda Accord PHEV
Fiat 500e
Smart fortwo ED

# EVSE Project Participants



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- 14 EVSE units from 12 OEMs

EVSE Units Make and Model
Eaton Marina EVSE L230CNBW
Clipper Creek CS-100
Clipper Creek LCS-25
GE WattStation
Siemens VersiCharge
Schneider-Electric EV230WS
ChargePoint CT 4020-HD-GW
Merit Charge ergl-01
AddEnergie CoRe+
AddEnergie Smart Two
Aerovironment EVSE-RSW30B15CXXW-0001
Bosch AWU70217BEN-B
EVSE LLC Watt Point
Telefonix L1x2

# INTERTEK PLYMOUTH J2953 TEST CENTER

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# EVSE Wall

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SIEMENS



Schneider Electric

chargepoint



## Collaborations: National Laboratories



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- **Idaho National Laboratory**
  - Overall AVTE program management
  - Publication of project report
- **Argonne National Laboratory**
  - Automation software development
  - Test equipment source





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- **SAE International**
  - Solicitation of project Participants
  - Test results dissemination
- **SAE J2953 Committee**
  - Test procedure development
  - Test results discussion





## Phase 1 Testing Completion



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- **Testing took place from May 15, 2014 to December 23, 2014.**
- **2500 individual tests on various PEV-EVSE pairs:**
  - **664 Tier 1 Tests**
  - **1573 Tier 2 Tests**
  - **262 Tier 3 Tests**
- **Some EVSE units and PEVs experienced failures and not all pairs could be fully tested.**

## Phase 1 Test Results Dissemination



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- Each PEV and EVSE Participant was provided test results from PEV-EVSE pairs involving their product via SAE International partner.
- The test results were then anonymized and included in a report that also includes observations made in four general areas:
  - General testing observations
  - Equipment observations
  - SAE J2953 standard observations
  - ANL software observations
- The report was submitted to INL and has been published on the AVTA website at <http://avt.inl.gov/evse.shtml>.

# Acknowledgment



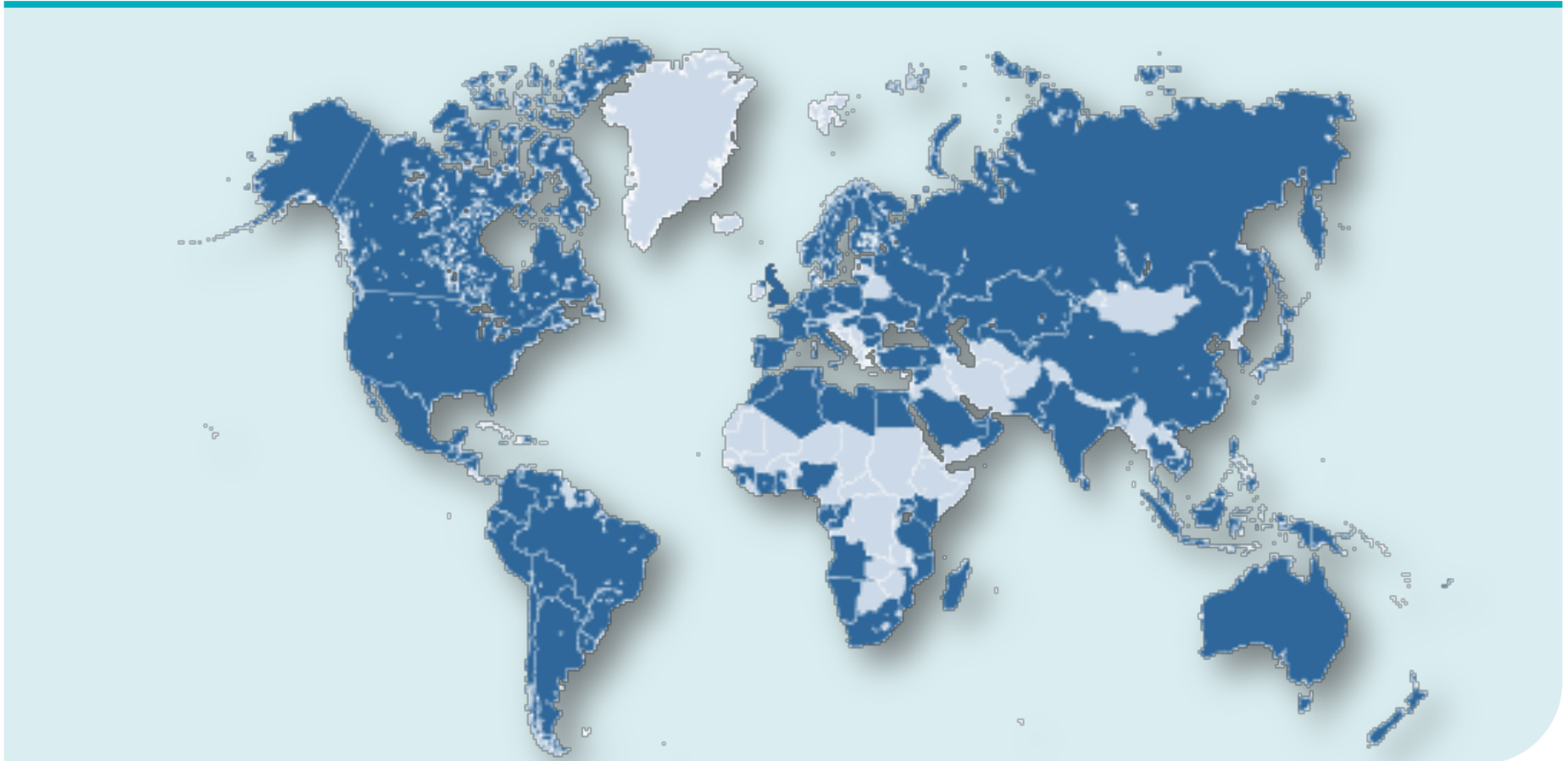
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# QUESTIONS?

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# THANK YOU

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