Charging Ahead with Electric Vehicle Infrastructure

- **Stuart Irwin, Business Operations Manager – Midwest, ClipperCreek Inc.**

  Stuart Irwin manages all business operations for ClipperCreek in the mid-west U.S., Canada and parts of Europe. Being based in the Detroit, Michigan area, he also supports ClipperCreek's activities with plug-in electric passenger car and electric truck manufacturers worldwide. His involvement in the electric vehicle industry includes experience with EV powertrains, batteries and EV charging products and technologies. Stuart is also President of EVolution Electric Vehicle systems, a company that provides high voltage on-board and stationary EV chargers systems to the light and medium duty electric truck manufacturers.

ClipperCreek, Inc

- In EV industry since 1993
- Manufactured in the USA
- Ship charging infrastructure to the US, Europe and Asia
- Developed 14 generations of EVSE's
- Over 5,700 shipped since January 2009
- Products field tested for over 12 years

What's the Point?

Ford Focus BEV 2012

Smart Electric BEV
Mercedes Dealers

Nissan Leaf BEV
Select Markets First
Smyrna, TN

Mitsubishi iMiEV BEV
Normal, IL

Chevy Volt EREV
Select markets
60,000 Hamtramck
Nationwide Fall 2011

Think City BEV
Elkhart, IN

VAN METER'S thinkGREEN SUMMIT 2011

Chevy Equinox BEV
Conversions available
Future GM

Tesla Roadster BEV
Supercar 2010

Tesla S BEV
July 2012

Mercedes ML350 BEV
Conversions available

Fiat 500 Electric BEV
Est 2015

Toyota Prius Plug-in PHEV

Navistar PHEV
School bus

DesignLine Electric Bus
Built in Charlotte, NC

Navistar EStar

PHEV Utility Truck PHEV

Smith Electric Newton

American EV
Fall 2011

Power delivery to an electric vehicle – Primarily a Safety Device --

Includes:

- Safety electronics (GFI, GMI)
- Vehicle Power cord 25' max
- SAE J1772 Standard connector
- SAE Communications Interlock

EVSE Product Specifications

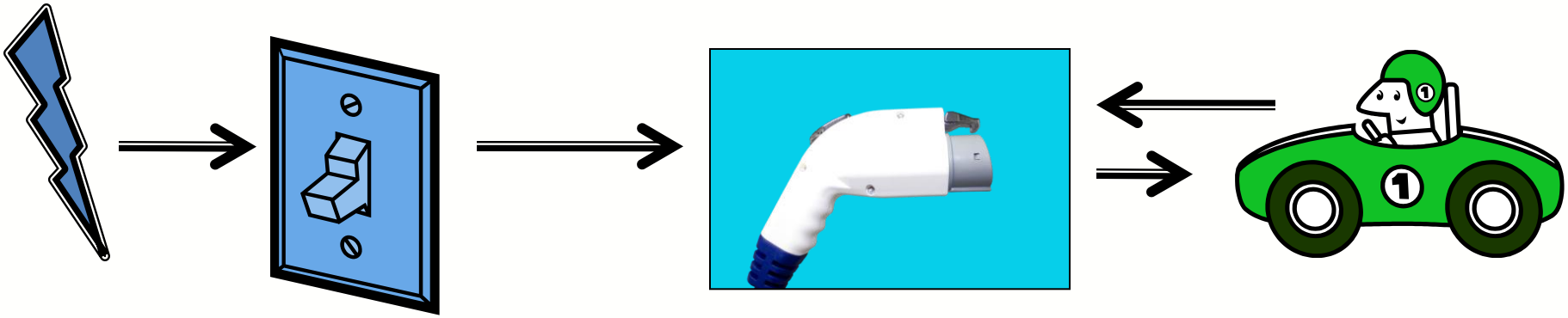
SAE – Vehicle Specifications

OEM – Time to charge/power level

UL – Product Safety Requirements

NEC 625– National & Local Building Codes

SAE-J1772 Automotive Standard



Level 1 Cord set

- ✓Level 1 = Cord sets 120 V/ 13 A
- ✓Level 2 = 208-240V 80 Amps
- ✓Level 3 = DC Fast Charging

- Vehicle Connection
- Communication
- Vehicle Interlock

Level 2 Charge Station

OE Vehicle Manufacturer Requirements

On-board Power Conversion – AC to DC HV

EV's are Smarter vehicles

- Charge Scheduling & Preconditioning

– First Generation Charging
  - 3.3 kW Max power, but doubling and more in future vehicles

– Typical Infrastructure - EV Charging Power Availability
  - 16 to 30 amps continuous per EVSE
  - No demand factor
  - Select appropriate systems for each type of site
    – A practical approach to Infrastructure; Cost vs. Quantity

Listing to UL Standards

- UL 2202

  Standard for Electric Vehicle (EV) Charging System Equipment

- UL 2231

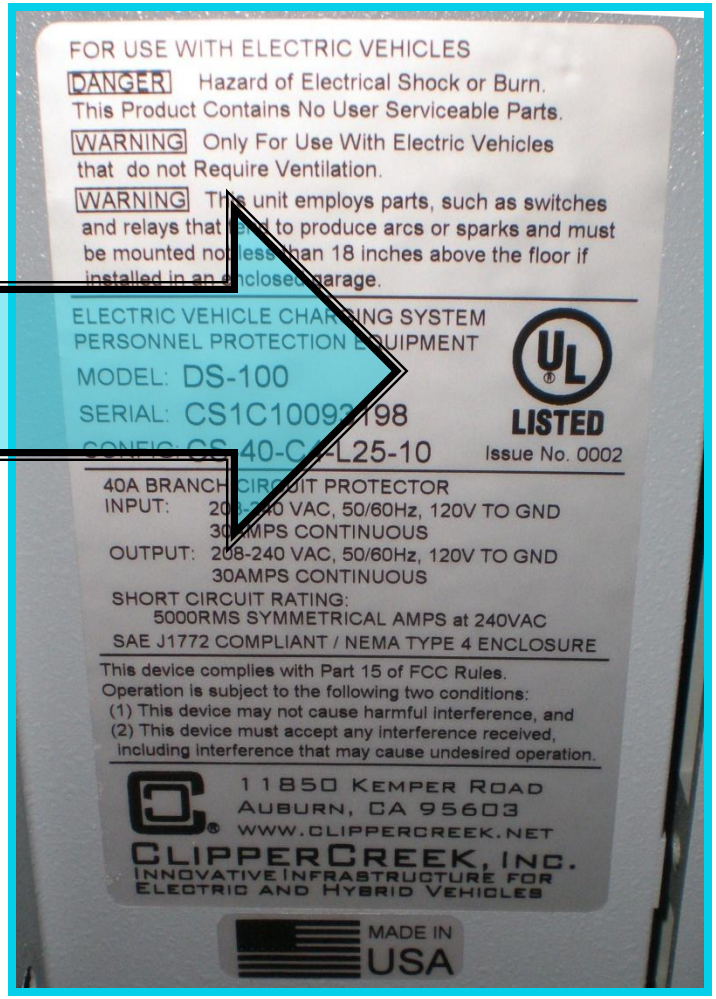
  Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits

- UL 2594

  Electric Vehicle Supply Equipment

- UL 2251

  Plugs, Receptacles and Couplers for Electric Vehicles



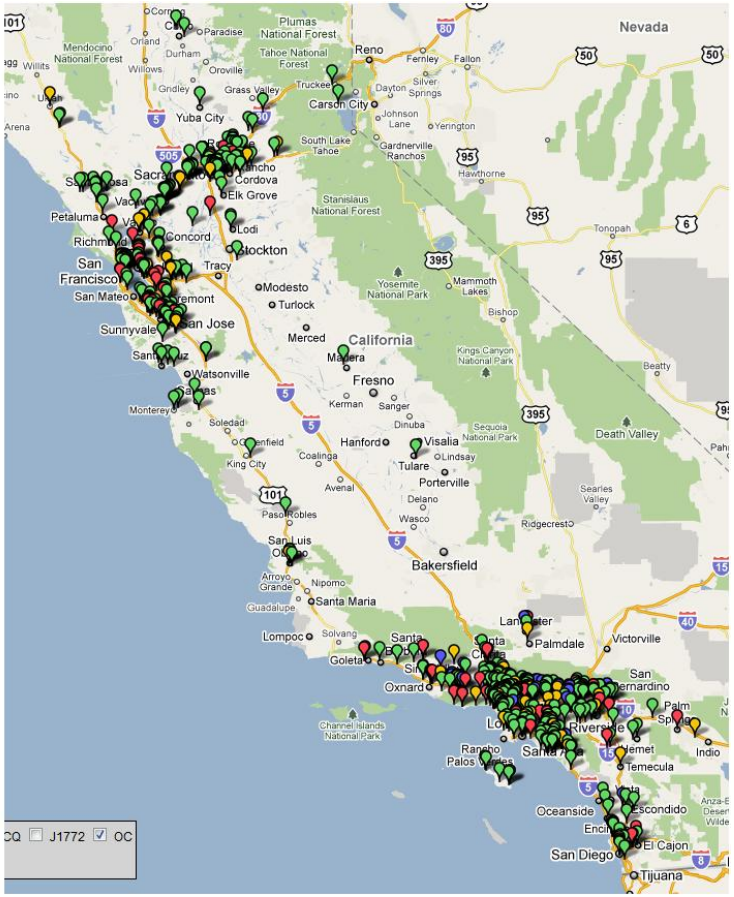
National Electric Code

- Section 625 Defines Electrical Installation Requirements
- Inspections
  - Requires a listed EVSE
  - National NECA Training Program
    - EVITP

ClipperCreek CS

Charging infrastructure

- Utility Grid Impact - Minimal
  - Gradual growth in power demand
  - Early generation vehicles have lower power requirements
  - Off-peak charging incentives
- Vehicle to control charging schedule
- **Free EVSE Location** data by GPS & Google
- **Smart Grid** is the Future for managing the impact on the Grid



http://evChargerNews.com/

Any location where cars are parked over 30 minutes

- Commercial buildings for employees
- Public Parking Structures
- Residential
- Postal Delivery Fleets
- Strip shopping centers
- Large retailers
- Airports
- Restaurants
- Hotels

ClipperCreek Products

- CS Line - Public infrastructure product
  - Available from 30 to 75 amps cont.
- PCS-15 Portable in-cord EVSE for delivery with the vehicle
- TS-90 Tesla Roadster
  - Designed exclusively for the Tesla Roadster

- **LCS-25 Low cost Level 2 Residential**
  - Residential/Light commercial
  - 20 amps cont., 208 to 240 VAC
    - Full-power charging for all first generation EV's
    - NEMA 4 enclosure
    - Immediately available - $995

- **Liberty Plugins Access Control**
  - Flexible Access control without "Networking" Cost
  - Unlimited flexibility for payment processing
  - Compatible with:
    - Credit card processing/Smart Phone App
    - Park Mobile/MobileNow pay-by-phone

ClipperCreek LCS-

ClipperCreek Advantages

- ✓Immediate delivery of NRTL listed Products
- ✓All EV's confirmed to work with ClipperCreek EVSE Products
- ✓Mercedes, Smart, Mitsubishi, Fisker, Ford, Chrysler, Azure, Smith, Chevy, Wheego, Navistar, EVI, Tesla, Eaton, Nissan, Toyota, BMW, Th!nk, Magna, etc
- ✓Proven performance based on over 10 years in use
- ✓Best Value/Lowest cost of ownership and service
- ✓Easily integrated to existing Point-of-Sale, Access Control, and Energy Management Systems
- ✓Smart Grid capable with SilverSpring Networks

Fisker Karma PHEV
Fall 2011

Thank You!

Stuart Irwin

Business Operations Manager - Midwest

stuart@ClipperCreek.net

248-408-4162

CLIPPER CREEK, INC.

INNOVATIVE INFRASTRUCTURE FOR ELECTRIC AND HYBRID VEHICLES