Charging ahead

Introducing the GE WattStation™

Electric Vehicle Infrastructure

Electric Vehicles are Coming …

	OEM Collection	Fuel Production	Fueling Location	Data
Gasoline	Ford, GM, Toyota	Shell, Exxon		 
Electric	Chevy Volt, Smith	Xcel Energy, Duke Energy	 	

EV Tax Credits

Leaf, Volt

Prius, Focus

Escalade, Caravan

150K+ EVs *built* in U.S. (Ford, GM, Nissan)

25% of new vehicles electric*

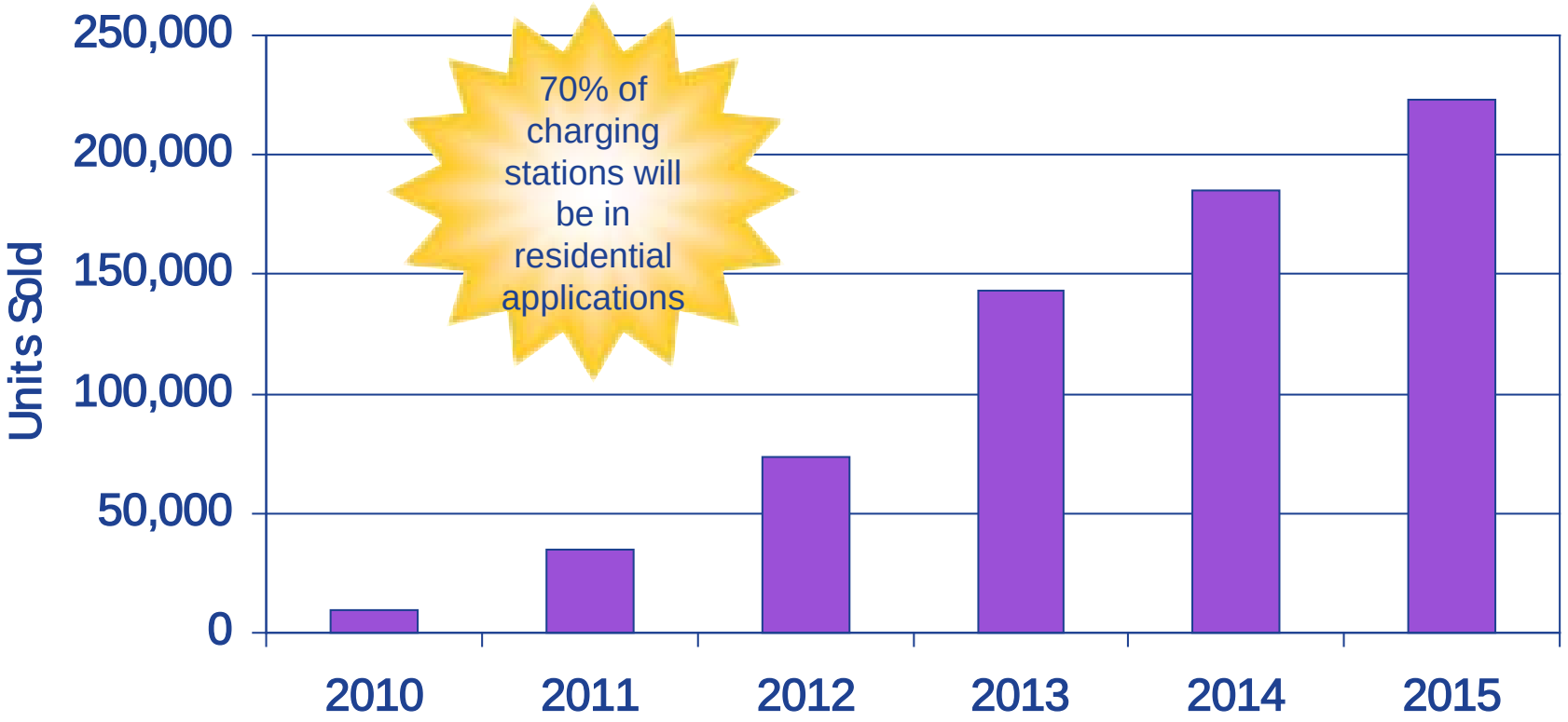
90% of new vehicles electric by 2030*

Electric Vehicle Timeline

2010 **2015** **2020** **2025**

* - Needed to achieve Electrification Coalition goal of 75% electric miles by 2040

Electric Vehicle Sales in US: 2010-2015



Source: Pike Research

For every EV sold, we expect there will be 1.5 charging stations

3 Key Drivers for EV Growth

1. Government Funding and Incentives

2. Auto Manufacturer EV Pipeline

3. The Environmental Consumer

#1 Federal Government Activity

1. **American Recovery and Reinvestment Act (ARRA) Funding – $2.4B for manufacturing and infrastructure**
   - $1.5B for US-based manufacturers to produce batteries and EV components
   - $500MM to produce other EV components like motors
   - $400MM to demonstrate and evaluate PHEV and related infrastructure
2. **Auto Manufacturer Incentives - $8B loans for Advanced Vehicle Technologies**
   - $5.9B to Ford (factories in Ohio, Illinois, Kentucky, Michigan, Missouri, Ohio)
   - $1.6B to Nissan (factory in Tennessee)
   - $465MM to Telsa (factory in California)
3. **Fuel Efficient Vehicles Tax Incentives for Consume**
   - Tax credit for EV's, up to $7,500
   - Tax credit for charging stations up to $1,000 for consume and $30,000 for public charging or 50% of the cost
   - Final guidance is pending the issuance of EV regulations

GE imagination at work

#2 Auto Manufacturer Activity

Battery Electric Vehicles (BEV):

2010 Coda Automotive Sedan
2010 Mitsubishi iMiEV BEV
2010 Nissan LEAF
2010 Ford Battery Electric Van
2010 Tesla Roadster Sport EV
2010 Chevy Volt Extended Range EV

2011 Peugeot Urban EV*
2011 Renault Kangoo Z.E.
2011 Renault Fluence Z.E.
2011 Tesla Model S
2011 BYD e6 Electric Vehicle
2011 Ford Battery Electric Small Car
2011 Opel Ampera Extended Range*

2012 Fiat 500 minicar
2012 Renault City Car*
2012 Renault Urban EV*
2012 Audi e-tron

2013 Volkswagen E-Up*
2016 Tesla EV

Source: www.electricdrive.org

*European Launch

Hybrid Electric Vehicles (PHEV):

2010 Lexus HS 250h
2010 Mercedes E Class Hybrid
2010 Porsche Cayenne S Hybrid
2010 Toyota Camry Hybrid
2010 Toyota Prius Hybrid

2011 Audi A8 Hybrid (likely introduction)
2011 BMW 5-Series ActiveHybrid
2011 Honda CR-Z sport hybrid coupe
2011 Lexus CT 200h Hybrid Hatchback
2011 Peugeot Diesel Hybrid*
2011 Suzuki Kizashi Hybrid
2011 Audi Q5 Crossover Hybrid
2011 Hyundai Sonata Hybrid
2011 Infiniti M35 Hybrid

2014 Ferrari Hybrid

#3 The Environmental Consumer

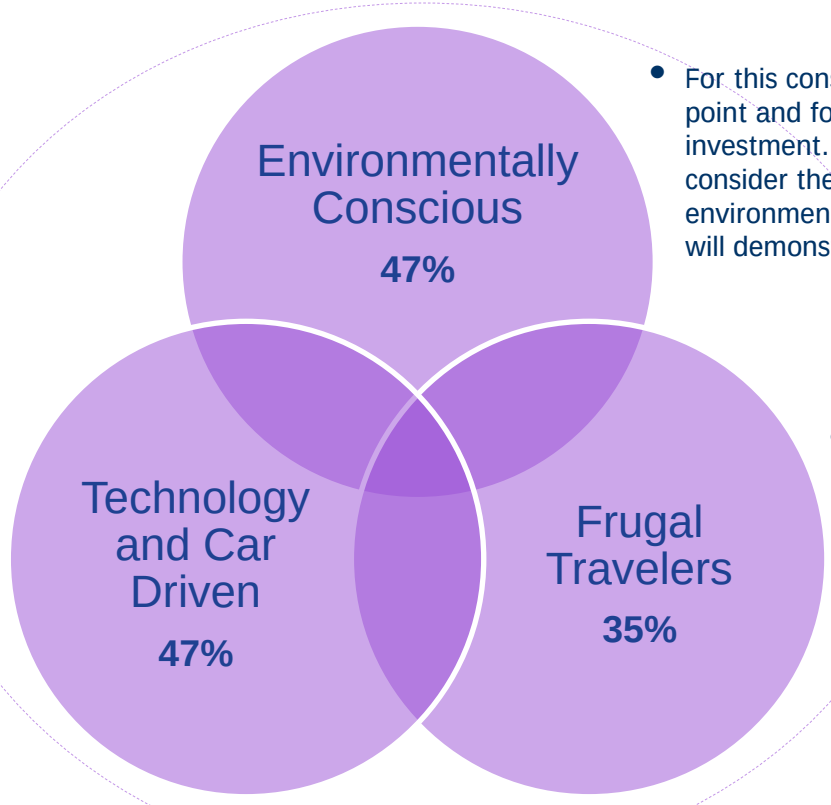
GE research identified three key themes driving consumer interest in Electric Vehicles:

1. The emergence of the Hybrid/Electric tag as a status symbol

2. The personal desire for fuel efficiency

3. ‘Voting with your wallet’ – the desire to express your own personal politics through vehicle choice

#3 The 3 Core Consumer Mindsets



- For this consumer, an EV at the right price point and form factor will be an obvious investment. They see the benefits and consider themselves part of the environmental movement: driving an EV will demonstrate that commitment.

- The innovative design, fast charging, and cool display will entice these drivers - they'll be intrigued by electric cars as a technology item first and foremost, so design cues and feature sets that reference other high tech brands will stand out.

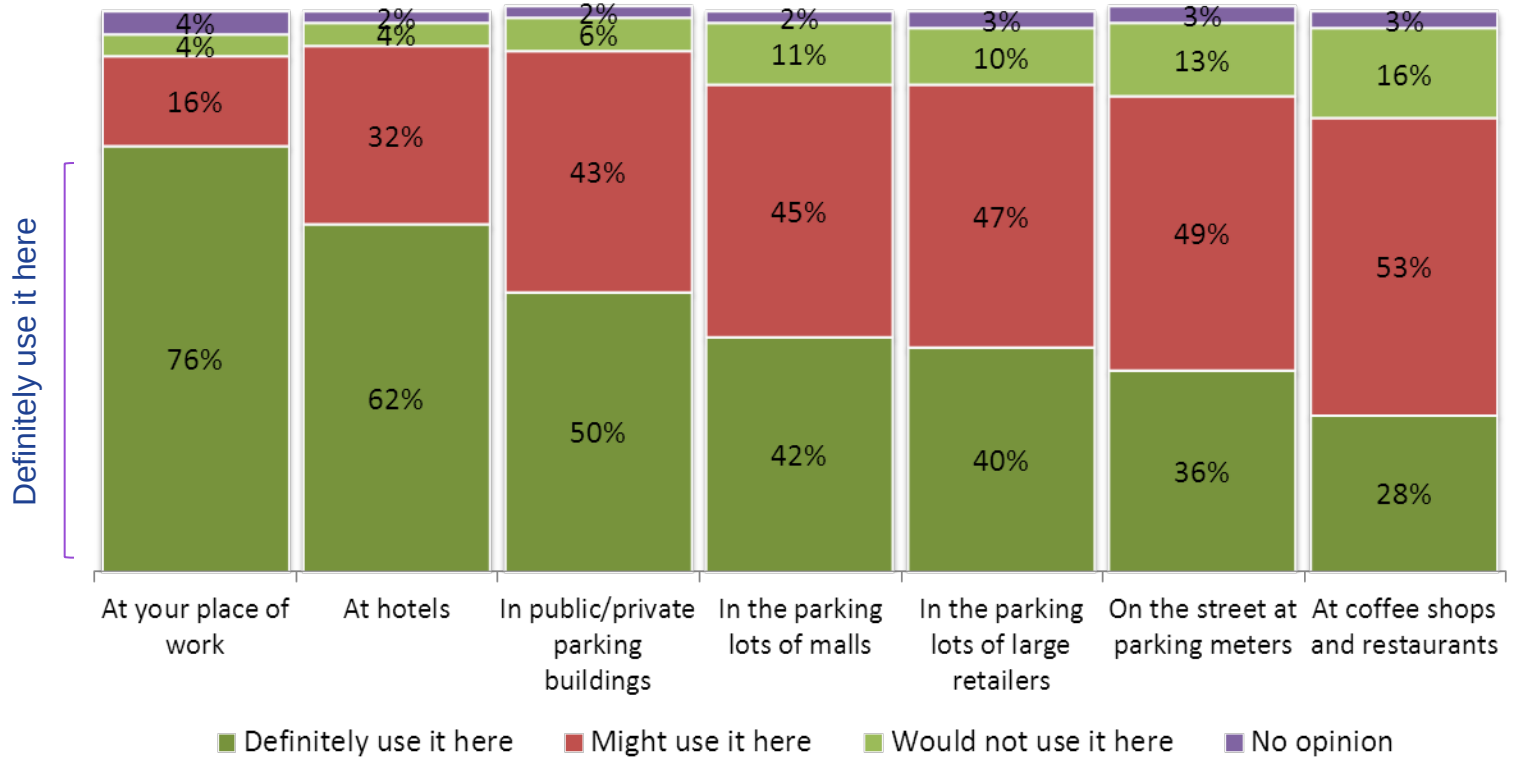
- These consumers are driven more by the money that comes out of their wallets. While some are concerned about the total cost of ownership, the main pain point is how much they pay at the pump each visit. Reducing those charges by 2/3s is highly compelling.

Political Arguments

- Regardless of need, everyone wants to see America's dependence on oil (particularly foreign oil) reduced.

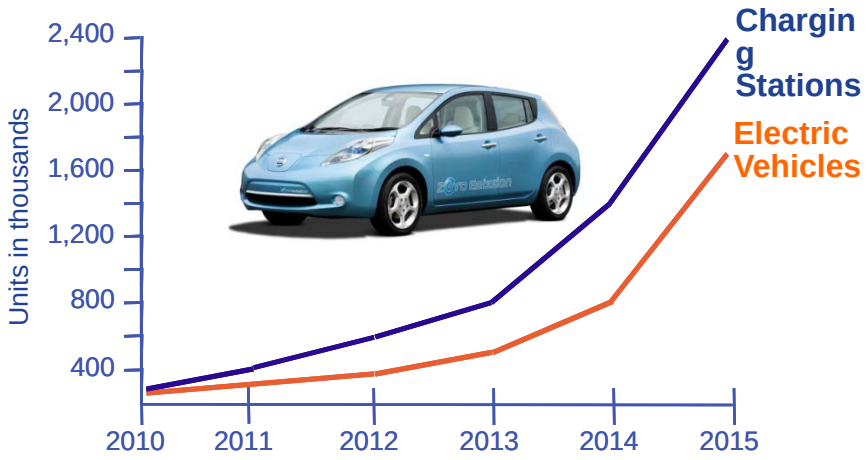
Consumer Choices for Charging Location

GE research concluded consumers gravitate towards locations where their vehicles will be parked for extended periods of time. Hotels were one of the most desirable charging locations.



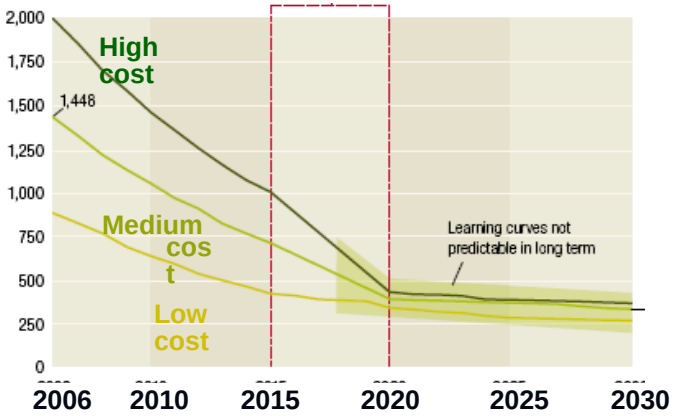
GE Infrastructure

Global unit sales



Source: Pike Report July 2010

Battery cost curve



Source: McKinsey.

GE uniquely positioned with complete solution

Distribution Equipment (IS) | **EV Charging Hardware (IS)** | **EV Sub-systems** | **EV Services**

GE imagination at work

Electric Vehicle Terminology

Terminology
EVSE: Electric Vehicle Supply Equipment
PHEV: Plug-In Hybrid Electric Vehicles
BEV: Battery Electric Vehicles
EV: Electric Vehicles – generic name for PHEV & BEV

Example: Nissan Leaf
-24 kWh battery
-100 mile range
-Level 1 = 20 hours
-Level 2 = 8 hours
-Level 3 = 30 mins
Source: NissanUSA web site

Level 1 - Slow Charging

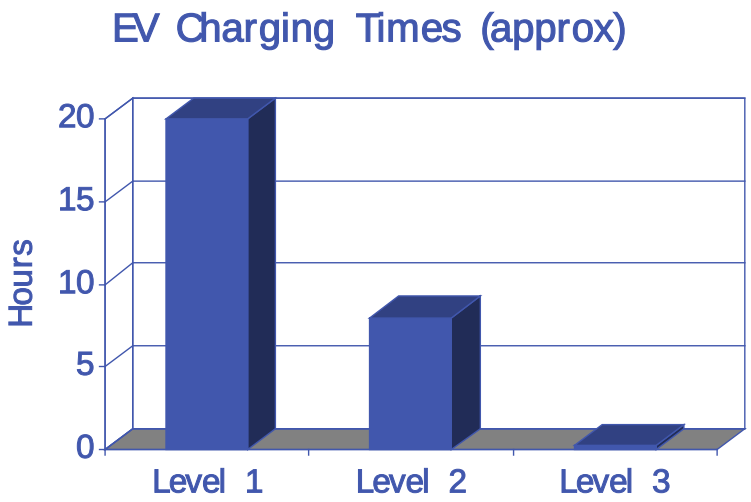
- 120VAC, 15A, compatible with the most commonly available grounded electrical outlet
- Typical charge time: 15-20+ hours

Level 2 Charging

- 208-240VAC, up to 80A
- Typical charge time: 4-8 hours

DC Charging Fast Charging

- Typical charge time: 15 - 30 minutes



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Note: actual charge time depends on a number of factors

Cost of charging an EV

BEV battery capacity

Nissan LEAF	24kWh
GM Volt	16kWh
CODA sedan	34kWh
Tesla model S	56kWh

Level 1 … 120Vac, 24A

Charge time (hrs)	Total kWh	% of capacity (LEAF)	Retail electricity cost*
1	2.9	12%	$0.35
2	5.8	24%	$0.69
3	8.6	36%	$1.04
4	11.5	48%	$1.38
5	14.4	60%	$1.73
6	17.3	72%	$2.07
7	20.2	84%	$2.42
8	23.0	96%	$2.76
9	25.9	100%	$3.11

Level 2 … 240Vac, 30A

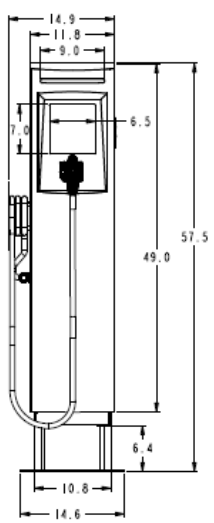
Charge time (hrs)	Total kWh	% of capacity (LEAF)	Retail electricity cost*
1	6.6	28%	$0.80
2	13.3	55%	$1.60
3	20.0	83%	$2.40
4	26.6	100%	$3.19

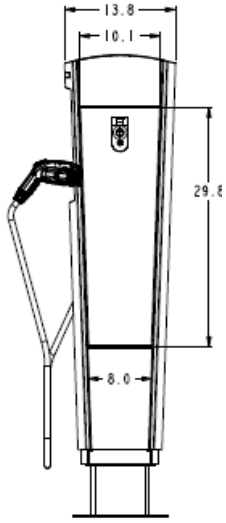
*** at avg retail rate of $0.12kWh**

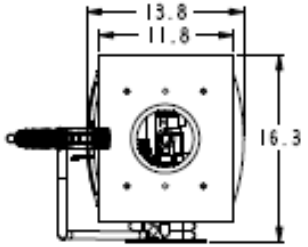
Retail electricity cost is ~$3 per full charge

Product Overview

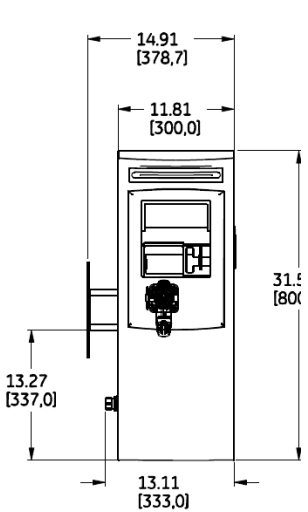
Introducing the EV Charging Station

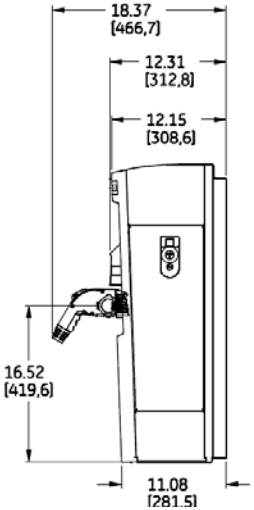


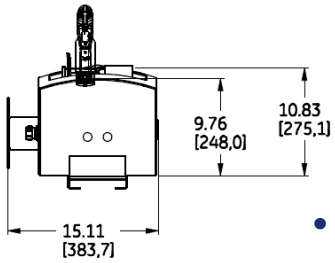




Pedestal







Wall

Product Overview

- Level II Charging
- Charge time: 4-8 hours , assuming 24kWh battery and full cycle charge
- 208-240VAC at 40A
- 4 mounting options:
  - Single pedestal
  - Double pedestal
  - Wall Mount
  - Pole Mount (wall design with pole mounting brackets)
- Modular design

GE imagination at work

GE EV Charging Station Specification

GE EV Charging Station will be a modular design that can be upgraded as new technology arrives and customer needs change

Basic:

1. Supply Needs: 208-240VAC @ 30A with 40A overload (2 pole)
2. GF Protection with Ground Monitor (UL 2231)
3. Charger & Vehicle Communication (NEC 625)
   - Connection Interlock
   - Personnel Protection
   - Automatic De-Energizing Device
   - Ventilation Interlock
4. Connection for SAE J1772 Plug & Cord
5. LED Lights & Display
6. Indoor & Outdoor Enclosure (NEMA 3R)
7. RFID User Authorization Option

Communication Options:

Open Network Communications – Ethernet CAT5, RS232

GE WattStation
Available April '11

Introducing the GE WattStation™

An easy-to-use charger designed by renowned industrial designer Yves Behar

"The GE WattStation achieves this with a welcoming design that is seamlessly integrated in the urban landscape and becomes a natural part of our daily driving routine."

"Good design is when a new technology enters our life and makes it simpler, beautiful and healthy"

GE WattStation™ … a closer look

What's inside?

Controller

-Provides user with charger status and messages via LED Ring, Interactive Display Panel, or external communications
-Manages Intelligent charging
-Allows user configurable overload protection
-Performs CCID20 ground fault protection per UL 2231
-Provides single phase metering
-Performs communication to Building Management Systems (BMS), EV and smart meters

Contactor

-Responsible for energizing and de-energizing of EVSE connector
-Operates in conjunction with controller to meet UL and NEC requirements

Connector

-Compliant with SAE J1772 standard
-UL listed for EVSE applications

Fuses

-Provides overload and short circuit protection

GE Charging Station Aesthetic Options

Enclosure and mounting options for different applications

	Pedestal	Back to Back	Pole	Wall
EV Charger Stainless Steel - Dec 2010				
WattStation™ Design - mid 2011				

U.S. Compliance and Standards

U.S. Electric Vehicle Standards

- **UL 2594, for EVSE**
- **UL 2231, the Standard for Safety of Personnel Protection Systems for EV Supply Circuits**
- **NEC Article 625, Electric Vehicle Charging System**
- **SAE (Society of Automotive Engineers) J1772, Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler**

GE's UL Expertise

- **Certified UL lab facilities for witnessing and testing at Industrial Solutions HQ in Plainville, CT**
- **UL lab capabilities include: handling overload, endurance and short circuit, EMI testing, material and environmental analysis**
- **GE Industrial Solutions has over 3,000 unique catalog numbers that are UL listed**
- **UL collaborates with GE for industry guidance in technology and safety, and managing policy and technical content**