

GENERAL



MOTORS

Volt Infrastructure Update

How Electric Vehicles are impacting our Community



Chevrolet Volt: Electric Vehicle (with a Range-Extender)



Designed for **40** miles
BATTERY
Electric Drive
(typically 25-50 mile EV range)



Designed for over **300** miles
EXTENDED RANGE
Driving on Gasoline



- Available in all 50 states
- 2,600 dealers nationwide, trained to sell and provide service to Volt customers
- 2011 - focus on supply (ramp up technology, production, sales, service, infrastructure)
- 2012 - focus on demand (both retail consumers and fleets)
- Vehicle incentive programs growing – Federal, State (25) and Canada (3)
- GE has ordered 12,000 Volts (200 thus far delivered) - leading the way in corporate commitment
- Need increased collaboration between plug-in ready communities, state and municipal leaders, and corporate stakeholders



How are customers using their vehicles

OnStar Data Collected through April

- 2/3 of miles driven are electric
- 34 million electric miles to date
- 1.8 millions gallons of gas saved
- Driving 900 miles between fill ups
- Volt is being used as expected
 - Customers are primarily driving electrically
 - Range extender is critical to Volt's success



Early adopters will influence the next generation of buyers



- EACH SUCCESSIVE WAVE OF CONSUMERS RELIES ON THE EXPERIENCES AND RECOMMENDATIONS OF PREVIOUS BUYERS

- THE FIRST VOLT BUYERS ARE PRIMARILY EARLY ADOPTERS

VOLT
NATIONWIDE
LAUNCH

12/10 2011
Volt launch

EARLY ADOPTERS

FAST FOLLOWERS

EARLY MAJORITY

LATE MAJORITY

LAGGARDS

100% OF
MARKET

Influencers
needed to
convert
early
majority

AREA BETWEEN
CURVES
REPRESENTS
NUMBER OF
CUSTOMERS
(ILLUSTRATIVE)



GM's Line-up of Plug-in Vehicles:

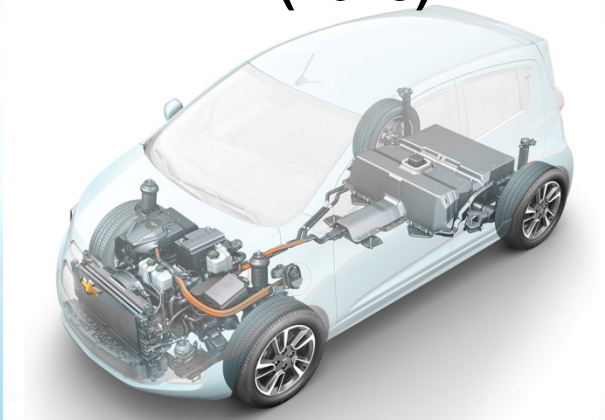
**Chevrolet Volt EREV
(2010)**



**Opel / Vauxhall Ampera
EREV (2012)**



**Chevrolet Spark
BEV (2013)**

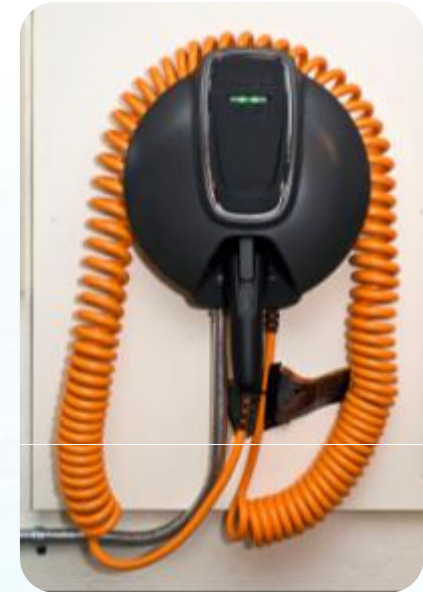


**Cadillac ELR EREV
(Timing to be announced)**



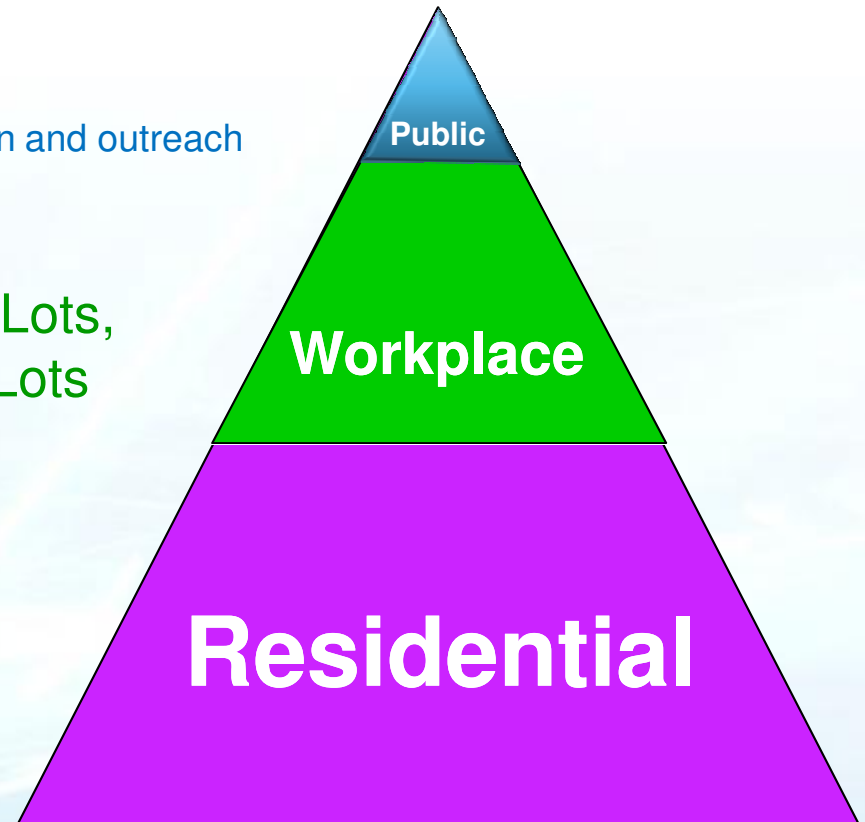


CHARGING AND INFRASTRUCTURE



Charging Infrastructure: Home ... Work ... Public

- Public charging
 - High Visibility
 - Destination
 - Public education and outreach
- Workplace
 - Corporate Parking Lots, Municipal Parking Lots
- Residential (majority)
 - Satisfying consumer-driven home installation process
 - Permits, electricians, inspections, meters, rates

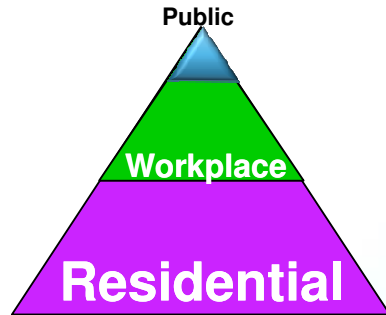




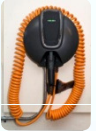
How is GM promoting workplace charging??



GM's Infrastructure Strategy



1.2 kW = grid-friendly; no-cost consumer option

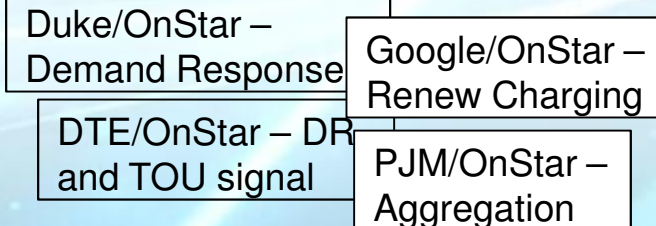


3.3 kW = also reasonably grid-friendly

- Industry Standards
- Battery Learning (e.g. warranty)

Next Gen = DC "fast"

Future
Technology
Development



etc...

2010

2011

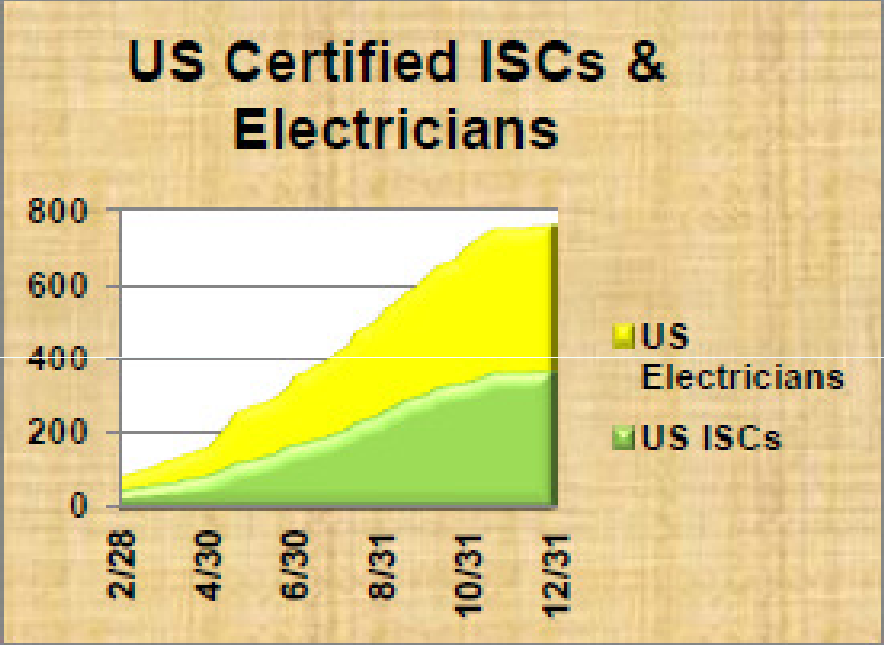
2012

2013

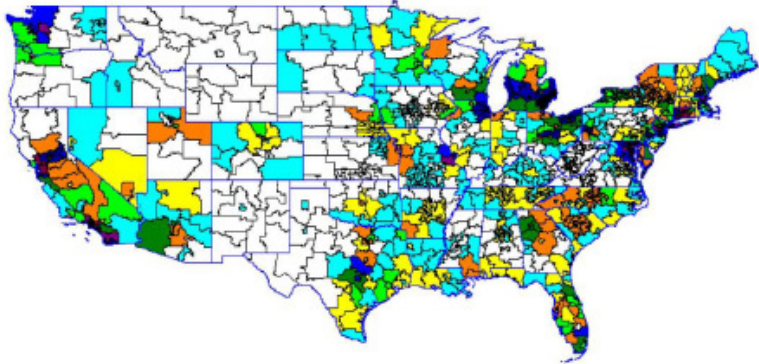
2014

2015

240V Home Charging: SPX's Growing Electrician Network



Certified ISC Service Area Zip Code Coverage (Updated 12/30/2011)



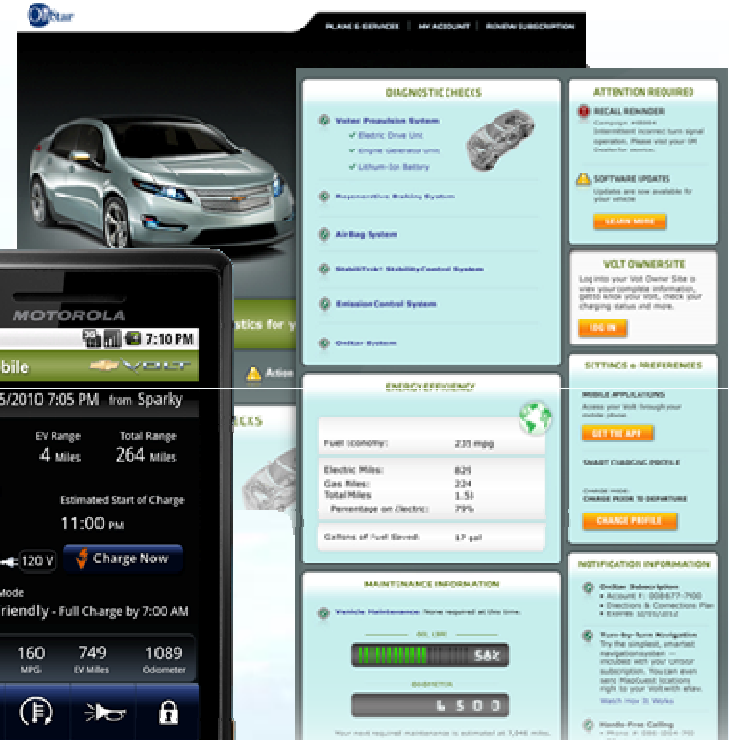
The national rollout of the Volt was accompanied by an expansion of SPX's electrical contractor network, from roughly 100 electricians to almost 800 currently.

Volt Mobile Applications:

Customer-facing applications for Volt Customers delivered via OnStar

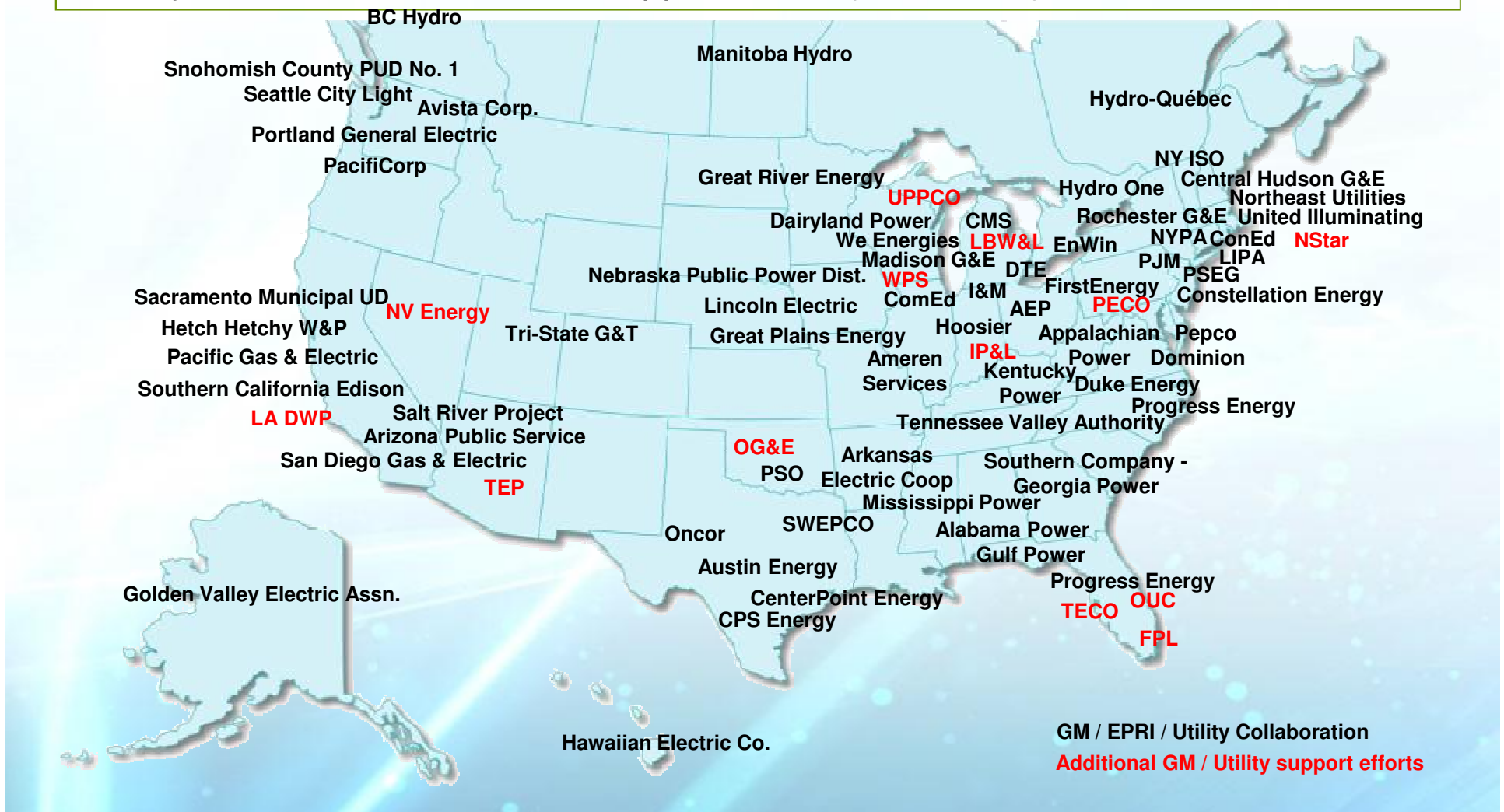


"Excuse me, I got a text from my car."



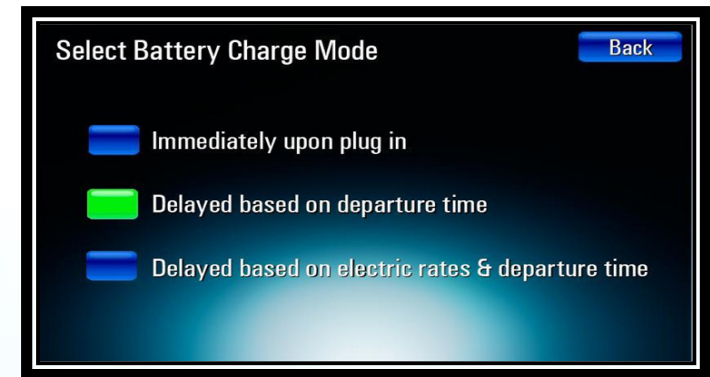
GM / EPRI / Utility Collaboration:

- Largest existing auto-utility collaborative effort -- formed in 2007
- Over 50 utility members and the Electric Power Research Institute (EPRI)
- Focus areas: Vehicle-to-Grid Technical Interfaces, Aligned Messaging, Aligned Policy Priorities, New Business Opportunities (EV-to-Grid)



PEV Opportunities: Smart Vehicles

- **Demand Response** thru Smart Vehicle Charging
 - Teach the right consumer charging behaviors early (e.g., off-peak charging)
 - Opportunity to “plan” more use of renewables (like wind at night)
 - Opportunity to plan charging to match lower TOU rates
- **New Revenue Opportunities** → battery capacity and/or charge rate both play a role
 - Grid Services (e.g. Ancillary Services)
 - Provide “mild” grid services (e.g., frequency regulation via start/stop charging)
 - Requires >500kW (ERCOT >100kW)
 - Vehicle-to-Home (V2H) - some backup power capability
 - Vehicle-to-Grid (V2G)
 - Battery or Consumer impact vs. value proposition?
- **Battery Use in a Secondary Market**
 - Stationary energy storage - cost of Li-Ion vs. other stationary battery technologies?
 - Defers recycling; “shared” cost of batteries by OEMs and Utilities?



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DC Fast-Charging:

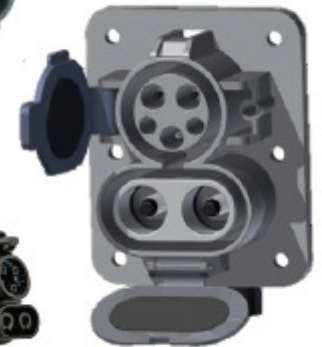
The SAE J1772 Combo (Combined AC/DC) Connector

- Nearly all major automakers are collaborating to develop an industry-standard (SAE J1772) for a DC “Combo” fast-charger
 - Audi, BMW, Chrysler, Daimler, Ford, GM, VW, and Porsche (additional automakers also participating)
 - This DC Combo system adds DC to the already industry-approved AC Level 1 & 2 charging standard adopted in 2010
- The standard is now in the voting cycle at SAE with approval expected July 2012
- UL validation testing has begun and approval is expected December 2012
 - Multiple EVSE suppliers developing hardware in parallel
- SAE-compliant DC Combo fast-charging infrastructure is expected to be deployed starting January 2013
- 3 automakers are rolling out vehicles with DC Combo fast-charge capability in 2013
 - BMW, GM, VW

Current AC Connector



Combined AC/DC Connector



New AC/DC Port (vehicle side)

