

# Electric Transportation Infrastructure





### Business Case EV's are coming; but where will they charge?



- Regulatory pressure, generous incentives and consumer demand combine to create EV market in the US. (2% of light fleet by 2020!)
- President Obama has a stated goal of 1 million EV on the road by 2015, but how much EVSE will that require? 1:1? 2:1?
- Yet, no infrastructure exists to recharge all electric vehicles with limited useful range. What use cases and business models will that spawn?
- Recharging these vehicles will be a significant source of load growth for utilities and a compelling first managed node for the rapidly evolving Smart Grid. How will these assets be managed?



### **Industry Adoption**

- What are the early adopting regional or target market centers?
- How to aid adoption?
- How to streamline installation and permitting process?
- How to educate consumers?



# In Tokyo Quick Charger was seen as key to EV market adoption ... instructive for US?



Pre-Level 3 shows modest vehicle use

State of Charge of Battery shows users depleted the battery <u>more</u> knowing a Level 3 existed

Post-Level 3 shows ICE-like vehicle use

- Tokyo Electric Power Company (TEPCO) ran a multi-year test on EV to assess the feasibility of electrifying their fleet of 8000 vehicles and simultaneously prepare for the adoption of EV in their service territory
- To facilitate the test, TEPCO hypothesized that EV market adoption had been delayed due to length of time to charge and also identified range anxiety of operators afraid to fully deplete the fully charged battery
- TEPCO developed a rapid charging technology and supported the development of charger designs and implemented them throughout Tokyo.
- Early stage testing proved conclusively the impact of rapid charger on captive fleet users by inducing operators to use vehicle more often and to deplete the battery further.
- To date, TEPCO has deployed 300 rapid chargers throughout Tokyo and plan to deploy 1000 by 2012

### **Quick Charging Infrastructure Critical for Adoption**



## **EVSE Ownership Considerations**

- Infrastructure Impact
- Cost / Payback
- Ancillary Benefits
- Maintenance
- Grid Impact
- Management



## **EVSE Infrastructure Impact**

EVSE – an extension of the distribution system

- Enabling a premise for EV charging is more than just installing an EVSE
- NEC 625 delineates that an EVSE be installed on a **dedicated circuit** with 125% over-current protection
- Installation scenarios will vary significantly from customer to customer
- For some customers it may be **simple** 
  - Install a new two-pole circuit breaker, wiring, and the EVSE
- For other customers it can get **complex** 
  - Upgrade of service, install a new load center, getting up to code, long wiring distances, conduit through walls, etc.







# Business Case for DC Quick Charger in Convenience Store application

#### • Financial Overview

•	DC Quick Charger cost	\$64,000
•	Installation & Ancillary	\$25,000
•	Estimated Total*	\$89,000

•	Federal Tax Credit (50%)**	\$45,000
•	Avoided Annual Environmental fees***	??
•	Incremental In-Store revenue (30% GM contributor)	??

#### Benefits:

- Increased traffic, captive at c-store for 15 30 minutes for recharge
- Opportunity to market self as Green, eco-friendly business
- Can be integrated into existing loyalty programs and other co-marketing opportunities
  - \* Installation scenarios vary significantly. This is a rough indicative estimate for illustration only.
  - \*\* IRS Federal Form 8911 provides a 50% credit for alternative fuel refueling stations installed by year end 2010. It is anticipated that this credit will be extended to year end 2011.
  - \*\*\* Environmental assessment fees for petroleum pumping equipment can be significant and are assessed for the life of the equipment. These costs should be intelligently captured and factored into a total cost of ownership cost/benefit analysis when comparing an installation of an all electric versus petroleum based pumping equipment.



### Eaton's Full Suite of Electric Vehicle Management Solutions



- Driving savings from improved energy management
- Turnkey solutions for target segments
- Numerous authentication partners



### Launched October 2010

### Eaton EVSE Family Pow-R-Station<sup>™</sup>

#### **Networked or Not**

- Open Architecture
- Host provisioned

#### **Flexible Authentication**

- POS or RFID
- Custom

#### **Flexible Metering**

- Digital (2011)
- Integrated AMI (2012)

#### **Flexible Control**

- Local or External
- Over-ride Capability

#### **Flexible Communication**

• Ethernet, Serial



LEVEL 2 DC QUICK **CHARGE** -240 VAC 500 VDC **40A Upstream Protection 150A Upstream Protection** Garage RESI C- Store Retail Curbside Highway **Rest Stop** Retail 3-6 hours 15-30 minutes

### **Coming December 2010**

### Eaton EVSE Family Pow-R-Station™ Network Manager

Web Portals for:

- Fleet, EVSE & Load Management
- Network Provisioning
- Real Time Reporting & Monitoring

Deploy your network to:

- Increase System Uptime
- Reduce energy costs
- Maximize charger reliability









Easily **monitor and manage** your multi-site deployment

Powering Business Worldwide



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