



Plug In Electric Vehicles

Kansas State Energy Conference

Oct 12-13, 2010





Plug In Vehicles Arriving from all Major Manufacturers



25% of passenger vehicles sales expected to be electric by 2020

Work Trucks are already available





Electric Vehicle Pros and Cons

Pros

- Low operating cost – 3 to 4 cents per mile
- Less maintenance, fewer parts to fail
- Less green house gas and pollution overall. Zero from the tailpipe
- Great for around town commuter car or short range work vehicles

Cons

- Limited range, no long road trips
- Battery technology expensive
- Higher initial cost



Passenger Vehicles



Chevy Volt



Ford Focus



Nissan Leaf



Think!



Coda



BYD



Small Vehicles

NEVs travel under 25mph for local use



Gem



Miles



Zap Xebra

Off Road Vehicles for Farm, Utility, and Hunting



Polaris



Hunt Ve





Work Trucks



Phoenix



Ford Transit Connect



Vantage



Large Vehicles



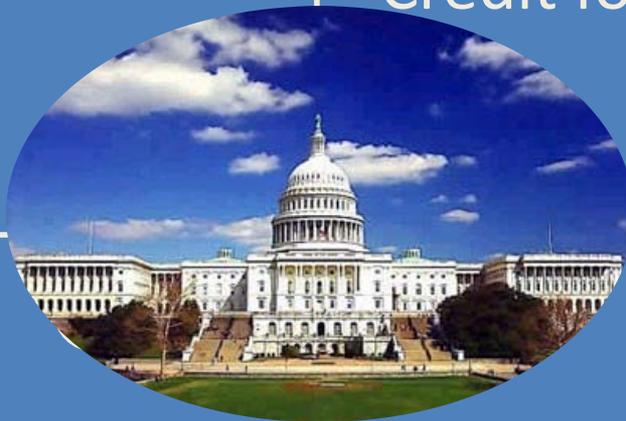


Significant Federal Support

Transportation Electrification Act of 2010 under consideration

50% Fed tax credit for charging stations thru end of 2010

Up to \$7500 Fed Tax Credit for plug in vehicles



Goal: 1M on road by 2015

Grants: ARRA, EECBG, etc



Benefits

Reduced CO₂, GHG, and particulates, NO_x, SO₂.

Cleaner Air

Transportation efficiency increases 50%

Energy Efficiency

Supports Smart Grid

Smart Grid

New Revenue
Attract Businesses
Community Image

Economic Growth

Local Jobs
Electricians
Auto Techs
Sales/Marketing

Jobs

Energy Security

Reduced oil consumption
flexibility to use multiple domestic sources including renewables

Acceleration
Torque
Quiet

Fun





The Cars

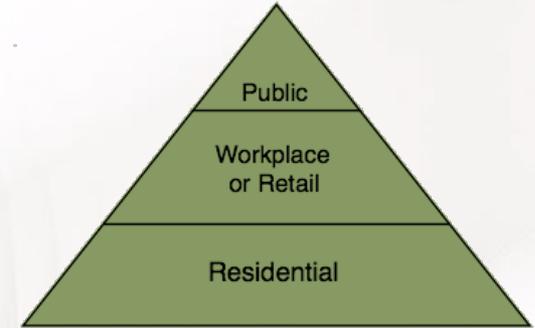
| Type | Example | Electric Range | Charging |
|---|---|--|--|
| <p>BEV Battery Electric Vehicle \$32,500 minus \$7500 Tax Credit</p> | <p>Nissan Leaf</p>  | <p>100 miles all electric</p> | <p>6 hours at 240V about \$4 at home</p> |
| <p>PHEV Plug In Hybrid Electric Vehicle \$41,000 minus \$7500 Tax Credit</p> | <p>Chevy Volt</p>  | <p>40 miles electric then gasoline backup</p> | <p>2.5 hours at 240V about \$1.50 at home</p> |



Charging Infrastructure Overview



- Most Plug In Vehicles will charge overnight.
- Charging Stations required when away from home.

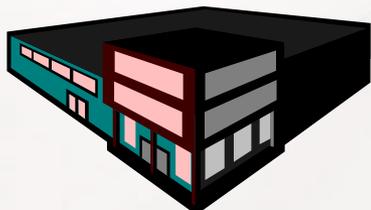


Source: Electric Power Research Institute

- Increases consumer adoption of plug-ins. Confidence in charging station availability reduces range anxiety.
- Stations will be hosted (owned) by utility companies, governmental entities, and private enterprise.
- Billing models flexible for use in all scenarios. Provides revenue stream for owners of charging stations.



Install Charging Stations where people live, work, play, and shop





Charging Stations



Owners of Charging Stations

- Hourly Revenue from use of charging station
- Green Publicity
- Attract customers, employees, students, or residents
- Can give away as a free amenity or attraction
- Asset management – cost, revenue, usage, GHG reduction reports, etc



Coulomb
Technologies
Authorized Distributor



Drivers of Electric Vehicles

- Pay with credit card or ChargePoint network account card
- Find charging stations via smartphone app or Google
- Receive text msg /email when charging is complete or interrupted



We All Benefit

Environment

- Cleaner Air
- Less Green House Gas

Business

- New Revenue
- Green Publicity

Regional

- New Jobs
- New Businesses

Drivers

- Lower Operating cost



Coming Improvements

Batteries

- Expect lower pricing
- Expect longer range
- Expect fast charging along highway corridors

Vehicle Cost

- Expect lower pricing as battery price decreases reduce the initial cost over conventional vehicles



Distributed Electricity Storage

Vehicle to Grid (V2G)

- Potential exists to supplement peak generation with surplus electricity stored in vehicle batteries
- No standards yet. Not sufficient battery capacity yet , leaving drivers uncomfortable giving electricity back to the utility company.

2nd Use of batteries

- After batteries have reached end of useful life in vehicles, still plenty of capacity left for other uses
- Potential use for storage of intermittent generation from wind/solar
- Potential for use as buffer to grid. Slow charge bank of batteries all the time from the grid, quick discharge from batteries for fast charging of vehicles.



Electric Utility Companies

- Utility companies understand electric vehicles are coming
- They are less concerned about overall load to the grid, than peak load exacerbation, and localized loads
- Will have time to increase generation capacity or decrease other usage as electric vehicle usage ramps up
- Many utility projects underway to gain experience
- Some embrace enthusiastically, some are more cautious, others oppose. All understand it is coming.
- Time of Day Pricing of electricity is likely at some point, even with out electric vehicles. This, along with Smart Grid, will help people manage their usage and help shift peak load to non peak hours.



Plug-In Readiness Activities

★ Including Greater Kansas City, Central Kansas, and St. Louis Area Plug in Readiness Task Forces
Most activities are happening on the coasts, vehicles and benefits arriving there sooner





Working Together, Getting Ready



- Plug-in Vehicles are coming fast
- Broad Benefits
- Kansas is getting ready
- Opportunities for many sectors
- How do you want to participate?