EV 101
National Drive Electric Week Webinar Series

- Ron Swanson, North Texas Electric Auto Association
- Ryan Daley, Electrification Coalition
- Kristina Ronneberg, North Central Texas Council of Governments
Ron Swanson
President North Texas Auto Association
A Brief History

- Began in 1837 in Scotland
- First in US in 1890, ended by 1920
- Revived in the 1970's (oil embargo/prices)
- Modern era began in 1989
How Do They Work?

There is a black box that is also involved to handle the “controlling” of the batteries and the motor.
How Far Do They Go?

Current production cars have a range of from 65 to 300 miles on a full charge.

For Example:
- IMev 65 miles
- Soul 93 miles
- Focus 100 miles
- Leaf 109 miles
- Bolt 238 miles
- Tesla S 300 miles
A Word about Charging

There are 3 ways to charge your EV

- Plug in standard charger to any 110 volt outlet
- Use a 240 volt charger (home or commercial)
- Use a 480 Volt commercial charger.

The rate of charging ranges from 4 miles per hour to over 100 miles per hour
What about Gasoline?

Facts and Figures

- 5 Kwh to make a gallon of gasoline (average car 25 mpg)
- Typical EV goes 20 miles on 5 Kwh
- Cost of a gallon of gas $2.50
- Cost of 5 Kwh $0.45 (9 cents a Kwh)

Oh yeah, you have to go to a gas station to get it
Closing Thoughts

- There are 13 production electric vehicles available in 2017 (and 17 plug in hybrids)
- The performance/acceleration of an electric car is superior to most ICE vehicles
- They are virtually silent.
- They are almost maintenance free.

Range Anxiety:
Think of it this way, when was the last time you ran out of gas?
The Electrification Coalition
1. Introduction to the EC
2. Benefits & Economics of Electric Vehicles
3. Applications Best Suited for EVs
4. State of the Market
The Electrification Coalition is a nonpartisan, not-for-profit group of business leaders committed to promoting policies and actions that facilitate the deployment of electric vehicles on a mass scale.
EV accelerator Communities
Northern Colorado, Orlando, Rochester

Workplace charging
Extended ride and drives
Drive Leadership programs
Group buy programs
Increased dealer inventory
Light duty TNC, taxi, or public fleet electrification
Educational workshops
Local policies & incentives
City of Atlanta Partnership

• Formed an MOU with the City of Atlanta in Summer 2016 creating a year long technical advisor position housed at City Hall

• Assisting Atlanta with implementing best policy practices for electric vehicles locally and State-wide

• Goals:
  o Secure strategic partnerships with OEMs and cities to support EV initiatives and fleet transitions
  o Identify barriers cities experience with transitioning to electric vehicles
  o Develop transferrable communication tools that can be shared through networks of cities and OEMs for successful EV deployments
Agenda

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Reduce our National Dependence on Oil

Electrification of transportation system is our best solution for reducing U.S. oil dependence, insulating our economy from oil price volatility.

- Approximately 70 percent of U.S. oil consumption occurs in the transportation sector, with 40 percent in light-duty vehicles
- Transportation is 94 percent reliant on oil-based fuel for energy

U.S. PRIMARY ENERGY DEMAND, 2013

- 37% Oil
- 30% Natural Gas
- 20% Coal
- 8% Nuclear
- 3% Hydro
- 3% Renew.

PETROLEUM FUEL DEMAND BY SECTOR, 2013

- 4% Residential
- 2% Commercial
- 24% Industrial
- 70% Transport
- 1% Electric Power

Source: DOE, EIA
Diversify the Transportation Fuel Supply

Electricity is ubiquitous, reaching every corner of the U.S. The fuel supply is diversified, and almost entirely domestically produced.

- Electricity is generated from a diverse portfolio of domestic fuels
- The power sector has substantial spare capacity
- System Scale: the network of infrastructure already exists
- It’s getting ‘greener’: carbon intensity of the US grid is at the lowest levels since WWII

U.S. ELECTRICITY GENERATION BY FUEL

- 49% COAL
- 22% NUCLEAR
- 17% NATURAL GAS
- 11% RENEWABLES
- 1% PETROLEUM

U.S. ELECTRICITY DEMAND BY SECTOR

- 38% RESIDENTIAL
- 37% COMMERCIAL/OTHER
- 24% INDUSTRIAL
- 1% TRANSPORTATION

Source: EIA, AEO
EVs have significant, but varying, greenhouse gas (GHG) emissions benefits over conventional vehicles.

- **When operating on battery power** – no tailpipe emissions
- **Upstream emissions from electricity generation** vary by region
- **Electricity source aside**, higher efficiency of EVs results in net reduction of GHG emissions
- **The ONLY fuel source** with the potential to get substantially ‘greener’ over time
The price volatility of other transportation fuels threatens U.S. and household economic security. EV operating costs are much lower than ICE.

- Even with greater oil production, the U.S. cannot avoid price volatility driven by global market forces.
- In comparison, electricity prices remain relatively flat and predictable.
- In 2012, the average U.S. household spent a record $2,912 on gasoline.

**Fuel Costs:**
- EV ~ $0.035 /mi
- ICE ~ $0.12 / mi

Source: DOE AFDC

*Electricity prices are reduced by a factor of 3.4 because electric motors are approximately 3.4 times as efficient as internal combustion engines*
Total Cost of Ownership

Compared to your existing vehicles, the TCO/mi may make sense. Compared to a new ICE, the tax credit monetization matters, a lot.

<table>
<thead>
<tr>
<th>Make/Model</th>
<th>Nissan Leaf</th>
<th>Ford Focus</th>
<th>Chevy Volt</th>
<th>Ford Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>BEV</td>
<td>BEV</td>
<td>PHEV</td>
<td>ICE</td>
</tr>
<tr>
<td>Battery Size</td>
<td>30 kWh</td>
<td>23 kWh</td>
<td>18.4 kWh</td>
<td>2.0 L - V4</td>
</tr>
<tr>
<td>MSRP</td>
<td>$34,200</td>
<td>$29,170</td>
<td>$33,170</td>
<td>$23,225</td>
</tr>
<tr>
<td>Incremental Cost</td>
<td>$10,975</td>
<td>$5,945</td>
<td>$9,945</td>
<td>$0</td>
</tr>
<tr>
<td>All-Electric Range</td>
<td>107 miles</td>
<td>76 miles</td>
<td>53 miles</td>
<td>n/a</td>
</tr>
<tr>
<td>EPA MPG Rating</td>
<td>112 MPGe</td>
<td>105 MPGe</td>
<td>106 MPGe</td>
<td>31 MPG</td>
</tr>
<tr>
<td>Charge Time (240v)</td>
<td>8 hours</td>
<td>4 hours</td>
<td>4 hours</td>
<td>n/a</td>
</tr>
<tr>
<td>Est. Annual Fuel Cost</td>
<td>$550</td>
<td>$600</td>
<td>$800</td>
<td>$1,000</td>
</tr>
<tr>
<td>TCO/mi</td>
<td>$0.46</td>
<td>$0.42</td>
<td>$0.46</td>
<td>$0.41</td>
</tr>
<tr>
<td>TCO/mi (w/ TC)</td>
<td>$0.39</td>
<td>$0.35</td>
<td>$0.40</td>
<td>$0.41</td>
</tr>
<tr>
<td>TCO/mi (w/ TC &amp; $3.50 gas)</td>
<td>$0.39</td>
<td>$0.35</td>
<td>$0.41</td>
<td>$0.45</td>
</tr>
<tr>
<td>TCO/mi ($3.5 gas &amp; 15k mi)</td>
<td>$0.36</td>
<td>$0.33</td>
<td>$0.38</td>
<td>$0.36</td>
</tr>
</tbody>
</table>

Estimates are based on an example with the $7,500 federal credit. Fuel costs are estimated at $0.12/kWh and $2.24 / gallon. Use assumes 12k miles per year over 10 years. Estimates will vary significantly when adjusted for specific local circumstances. TC = Tax Credit.
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3. Applications Best Suited for EVs

4. State of the Market
Applications for Light-Duty PHEVs & EVs

Commercially available, non-luxury brand, BEV’s and PHEV have some general, common characteristics to consider prior to deployment

**BEV**
- Subcompact and compact sedans
- Not a lot of cargo space
- Can seat 4 adults comfortably
- Well suited for urban settings with lots of stop-and-go traffic and where speeds generally remain below 45 MPH

**PHEV**
- Compact and midsize sedans
- Medium amounts of cargo space
- Can seat 4-5 adults comfortably
- Well suited for a wide range of activities with the gasoline engine as backup when the battery power is depleted
Medium- & Heavy-Duty EVs

MD/HD EV options are growing, but presently characterized by niche manufacturers establishing scalable supply chains and vehicle availability.

- Transit Busses
- PHEV bucket trucks
- Delivery/Box Trucks
- Yard Trucks
Electric Pickup Trucks?


Workhorse W-15

- Plug-in, range extended pickup
- 80-mile all-electric range, 310 miles on range extender
- 75 MPGe all-electric, 30 MPG on gasoline
- 460 horsepower
- Towing capacity: 5,000 lbs.
- Payload capacity: 2,200 lbs.
- True all-wheel drive (AWD)

The EV market is evolving, expanding!
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State of the Market – July 2017

- Market grew by 6% YOY on 15,175 PHEV & BEV sales
- There were 21 PHEV and 13 BEV models in the U.S. market
- Approximately 661,000 EVs sales overall since 2011
- EVs constitute just 1.1% of all vehicles on the road in the U.S.

Source: SAFE analysis based on data from HybridCars.com
State of the Market – Automaker Sales

- Tesla is the most visible, but other automakers catching up
- Expect more growth from GM (Bolt) & Nissan (2018 Leaf)
- Kia and Daimler (Mercedes-Benz) have newest products
- BMW has made a strong push, but sales have slowed

Change in Automaker PEV Sales, July 2017

<table>
<thead>
<tr>
<th>Automaker</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kia</td>
<td>53.6%</td>
</tr>
<tr>
<td>GM</td>
<td>27.6%</td>
</tr>
<tr>
<td>Nissan</td>
<td>20.7%</td>
</tr>
<tr>
<td>Volvo</td>
<td>-2.2%</td>
</tr>
<tr>
<td>Daimler</td>
<td>97.7%</td>
</tr>
<tr>
<td>Tesla</td>
<td>-24.9%</td>
</tr>
<tr>
<td>Volkswagen</td>
<td>-24.1%</td>
</tr>
<tr>
<td>Ford</td>
<td>-21.3%</td>
</tr>
<tr>
<td>Porsche</td>
<td>-5.3%</td>
</tr>
</tbody>
</table>

Source: SAFE analysis based on data from HybridCars.com.
The Electrification Coalition
Revolutionizing Transportation and Achieving Energy Security

Online:
www.electrificationcoalition.org
www.energysecurecities.org
www.driveelectricnoco.org

Download the Electrification Roadmap: www.electrificationcoalition.org/policy

Contact:
Ben Prochazka (303) 717-3657
BProchazka@electrificationcoalition.org
Regional Electric Vehicle (EV) Efforts

Dallas-Fort Worth Clean Cities
Clean Transportation, Made Easy

Dallas-Fort Worth CLEAN CITIES
Electric Vehicles North Texas

Website: www.dfwcleancities.org/evnt
Regional Data Trends

North Texas Electric Vehicle (EV) Registration Trends

As of September 5, 2017:
Texas Registration: 10,763
DFW Area: 4,267 (40% of TX)

DFW Area #13 Metro Area Nationwide

*Other EV includes the BMW i3, Chevrolet Bolt, Fisker Karma, Ford Focus Electric; Other PHEV includes the BMW i8, Ford C-Max Energi, Ford Fusion Electric, Chevrolet Bolt, Chevrolet Spark EV, Fiat 500e, and Mercedes B250e

*Regional Data Trends

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Regional EV Efforts and Resources

Website: https://www.dfwcleancities.org/evnt
Collaborative Efforts: Alternative Fuel Corridors

Gap Analysis of EV Corridors Designated by the Federal Highway Administration

Qualifying Stations Are:
- DCFC or Level 2
- 5 Miles from Highway
- Public Access

Qualified EVSE must be within 5 miles of the highway, open to the public (no Tesla), and may include DCFC and Level 2 charging stations. No more than 50 miles may be between stations.

North Central Texas Council of Governments
September 2017
Collaborative Efforts: Volkswagen Settlement

$250 Million Being Invested Through 2019 in New Charging Infrastructure

Long Distance Highway Network ~$190 Million
Community Charging ~$40 Million
National Resources

Alternative Fuels Data Center (US Department of Energy)

www.afdc.energy.gov

- Vehicle Search
- Vehicle Cost Calculator
- Alternative Fueling Station Locator
Alternative Fuel and Advanced Vehicle Search

Find and compare alternative fuel vehicles (AFVs), engines, and hybrid systems. Some of the light-duty AFVs in this tool may count toward vehicle-acquisition requirements for federal fleets and state and alternative fuel provider fleets regulated by the Energy Policy Act (EPAct).

Vehicles by Type
- Sedan/Wagon
- Truck
- SUV
- Van
- Step Van
- Vocational/Cab Chassis
- Street Sweeper
- Refuse
- Tractor
- Shuttle Bus
- Transit Bus
- School Bus

Vehicles by Manufacturer

Light-Duty
- All

Medium- and Heavy-Duty
- All

Engines and Hybrid Systems

For medium- and heavy-duty vehicles:
- ENGINE & POWER SOURCES
- HYBRID PROPULSION SYSTEMS

ABOUT THE DATA
Alternative Fuels Data Center Tools: Station Locator & Route Planner

Alternative Fueling Station Locator
Find alternative fueling stations near an address or ZIP code or along a route in the United States. Enter a state to see a station count or see stations data by state.

Find Stations

Electric

more search options

303 Electric stations along the route
Excluding private stations

Download spreadsheet of matching stations

Location details are subject to change. We

http://www.afdc.energy.gov/
Available Incentives

**Qualified Plug-In Electric Drive Motor Vehicle Tax Credit** *(Federal)*
- Ranges from $2,500 - $7,500; IRS Form 8936

**Light-Duty Motor Vehicle Purchase or Lease Incentive Program** *(State)*
- Up to $2,500 Rebate on EV Purchase/Lease; Anticipated Spring 2018

**Alternative Fueling Facilities Program** *(State)*
- Up to 50% Grant for Public-Access Infrastructure; Coming Fall 2017

**AirCheckTexas Drive a Clean Machine Program** *(Regional)*
- $3,500 to Replace a Vehicle that Fails Emissions Inspections or is More than 10 Years Old
EV Benefits

Image source: The noun project
Questions & Discussion
Contact Information

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www.DFWCleanCities.org/EVNT  #texasEV