Electric Autos and West Virginia Energy

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Governor Tomblin's
ENERGY Summit
West Virginia: A National Energy Resource

Electric Autos are not a New Concept

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Electric Autos are not a New Concept

1909 Baker Electric

That's over <u>ONE HUNDRED</u> Years Ago

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Even in the Modern Era…

GM EV-1

1996-1999

Toyota RAV4 EV

1997-2003

They've been around for
<u>OVER TWENTY YEARS</u>

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Now they are becoming among the BEST CARS on the Road

Elon Musk and Bob Lutz

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Elon Musk – Tesla Creator

Tesla Model S

Best selling US plug in car 2015 - BEV

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Bob Lutz – Father of the Chevrolet Volt

Chevy Volt

First Delivery December 2010 - PHEV

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Best Selling Plug-In in USA

Nissan Leaf

Best selling US plug-in car 2010-2015 - BEV

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Europeans coming in a BIG WAY

BMW i3 - BEV or PHEV

BMW i8 - PHEV

Volvo xc90 - PHEV

Even Trucks are coming soon…

VIA Motors VTRUX

PHEV

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So, Why is Electric Making a Comeback?

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- Advances in Electrical Drive Systems and Batteries

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- Advances in Electrical Drive Systems and Batteries
- Electric is very Convenient – especially for Urban Commuters

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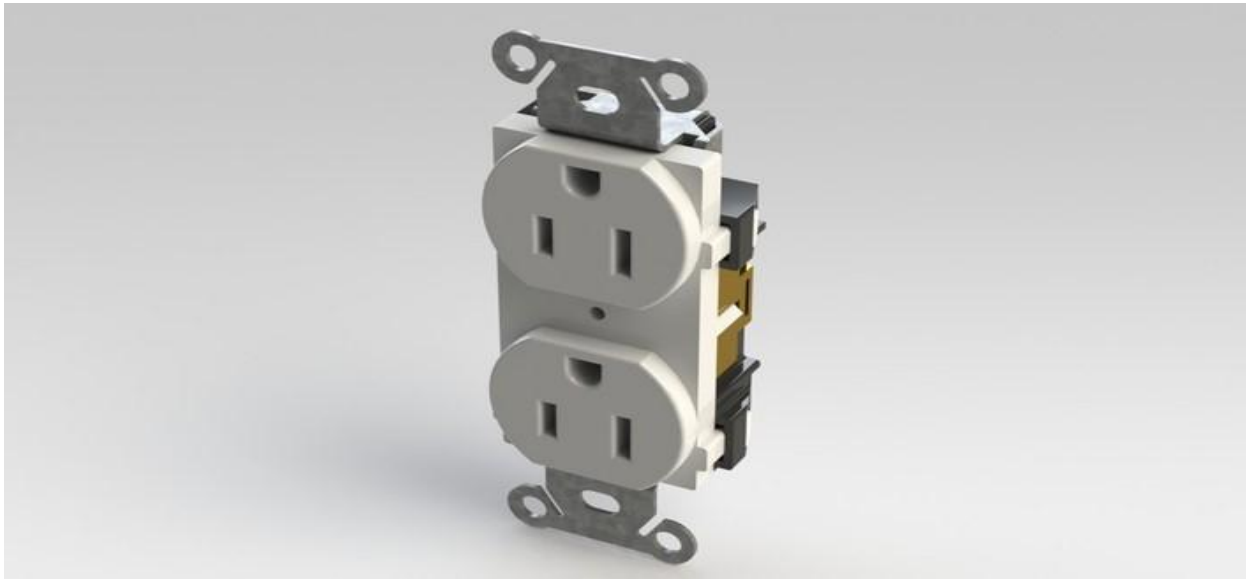
Most EVs are Charged at Home
Level 1 (L1) (110 v AC)



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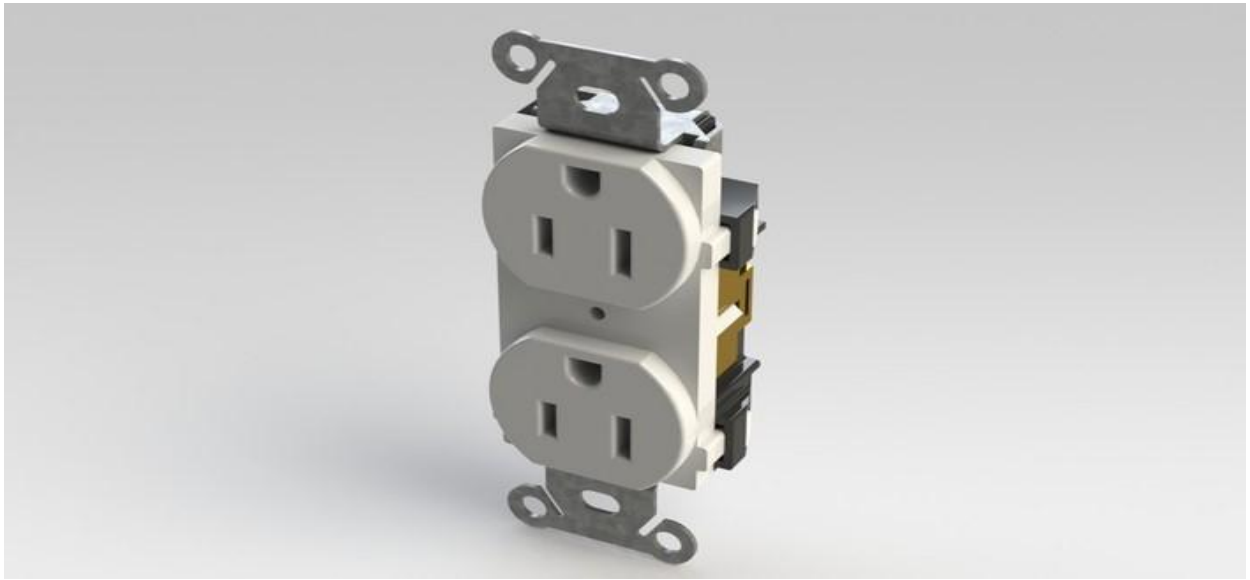

Charges at 4 Miles of Range/Hour (mrph)

Typical Volt charges overnight for about $1.30

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Most EVs are Charged at Home

Volt Level 2 (L2) Charging Station

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Most EVs are Charged at Home

240v/13a
8 mrph

Volt charges in Four Hours

Volt Level 2 (L2) Charging Station

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Most EVs are Charged at Home

Tesla L2 Charging Station

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Most EVs are Charged at Home

Tesla L2 Charging Station – 240v/80a & 60 mrph

Tesla full charge in 4 Hours at about $10.00

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So, Why is Electric Making a Comeback?

- Advances in Electrical Drive Systems and Batteries
- Electric is very Convenient – especially for Urban Commuters
- Very Affordable on a Day-to-Day Basis

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So, What's It Cost to Operate?

Running Costs per 1,000 miles

Chevy Volt:

Power: $15 - $30

Gasoline: $10 - $30

Tesla or Nissan Leaf:

Power: $40 - $50

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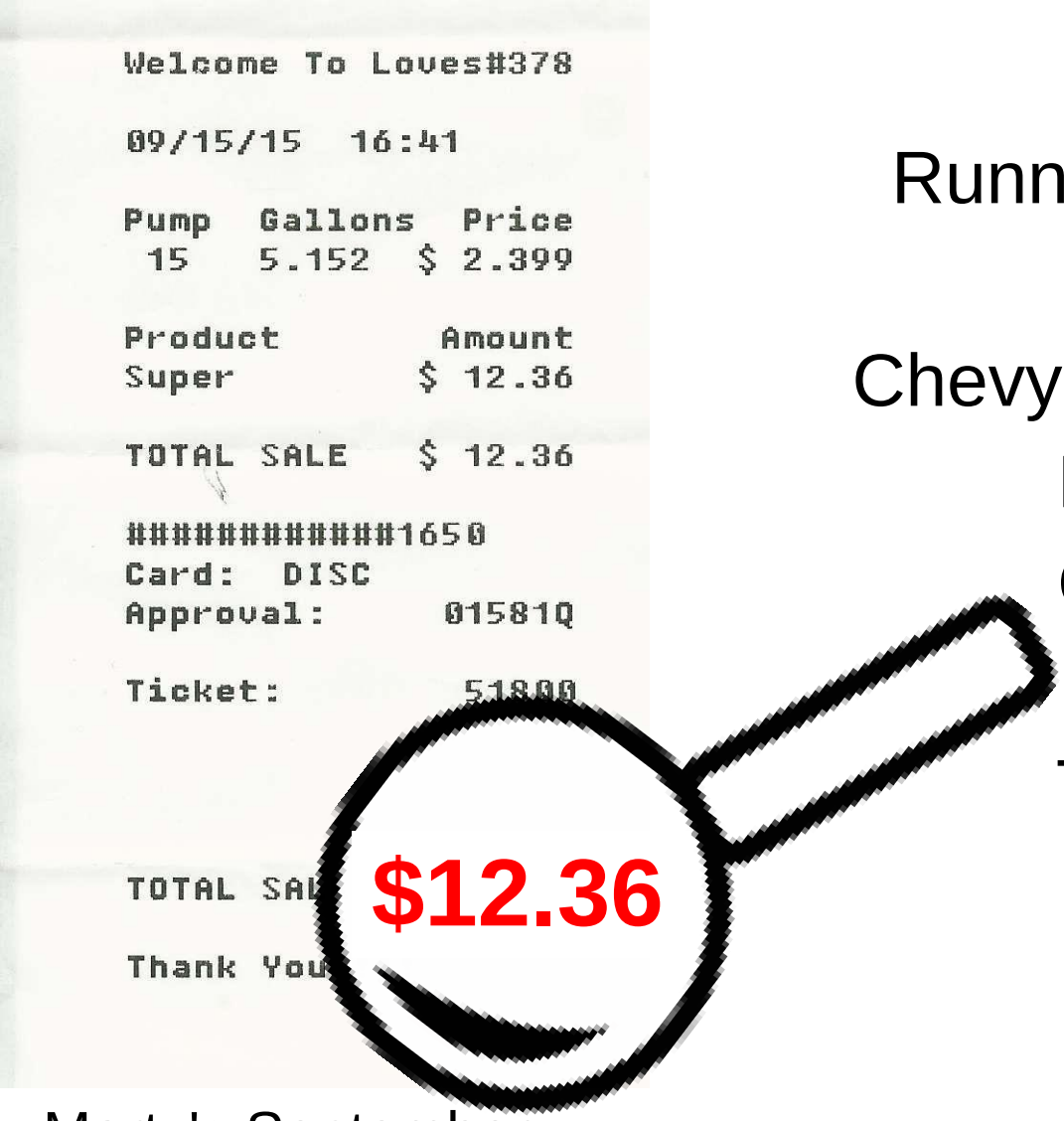

Marty's September Gasoline Bill

Running Costs per 1,000 miles

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Power: $15 - $30

Gasoline: $10 - $30

Tesla or Nissan Leaf:

Power: $40 - $50

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So, Why is Electric Making a Comeback?

Nearly all current Super Cars deploy
Electric Drive Capabilities

The 1500 hp Koenigsegg Regera is a hybrid with an 18 mile all-electric range

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Why should We care about electric cars?

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Why should We care about electric cars?

- Positive for US & W.Va. Economics
  - Reduce Imported Oil

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EVs typically avoid burning One Gallon (or more) of gasoline a day

That’s about 500 gallons of gasoline per year.

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That is *imported oil* which has been *eliminated*!

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Why should We care about electric cars?

- Positive for US & W.Va. Economics
  - Reduce Imported Oil – Eliminate 500 gals gas per EV/yr
  - Powered by COAL

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Electric cars use power from the electrical grid

In W.Va. they are Powered by COAL!

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An EV in W.Va. consumes <u>8 to 11</u> pounds of coal per day

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100,000 EVs in W.Va. would consume 150K – 200K tons/year of coal

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Say What? **100K EVs in our Region?**

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Say What? **100K EVs in our Region?**

- There are **375,000** plug-in cars **NOW** in USA
- 24 models across 15 brands – <u>Today</u>
- More than 50 new models in pipeline
  - From GM, Ford, Nissan, BMW, Audi, VW, Mitsubishi, Volvo, Apple and others

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One Million EVs will consume 1.5MM – 2MM tons/year of Coal and save 500MM gals of gas

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Why should We care about electric cars?

- Positive for US & W.Va. Economics
  - Reduce Imported Oil – Eliminate 500 gals gas per EV/yr
  - Powered by COAL – Soon 1.5MM-2MM tons per year
- Limited Effect on Existing Power Grid

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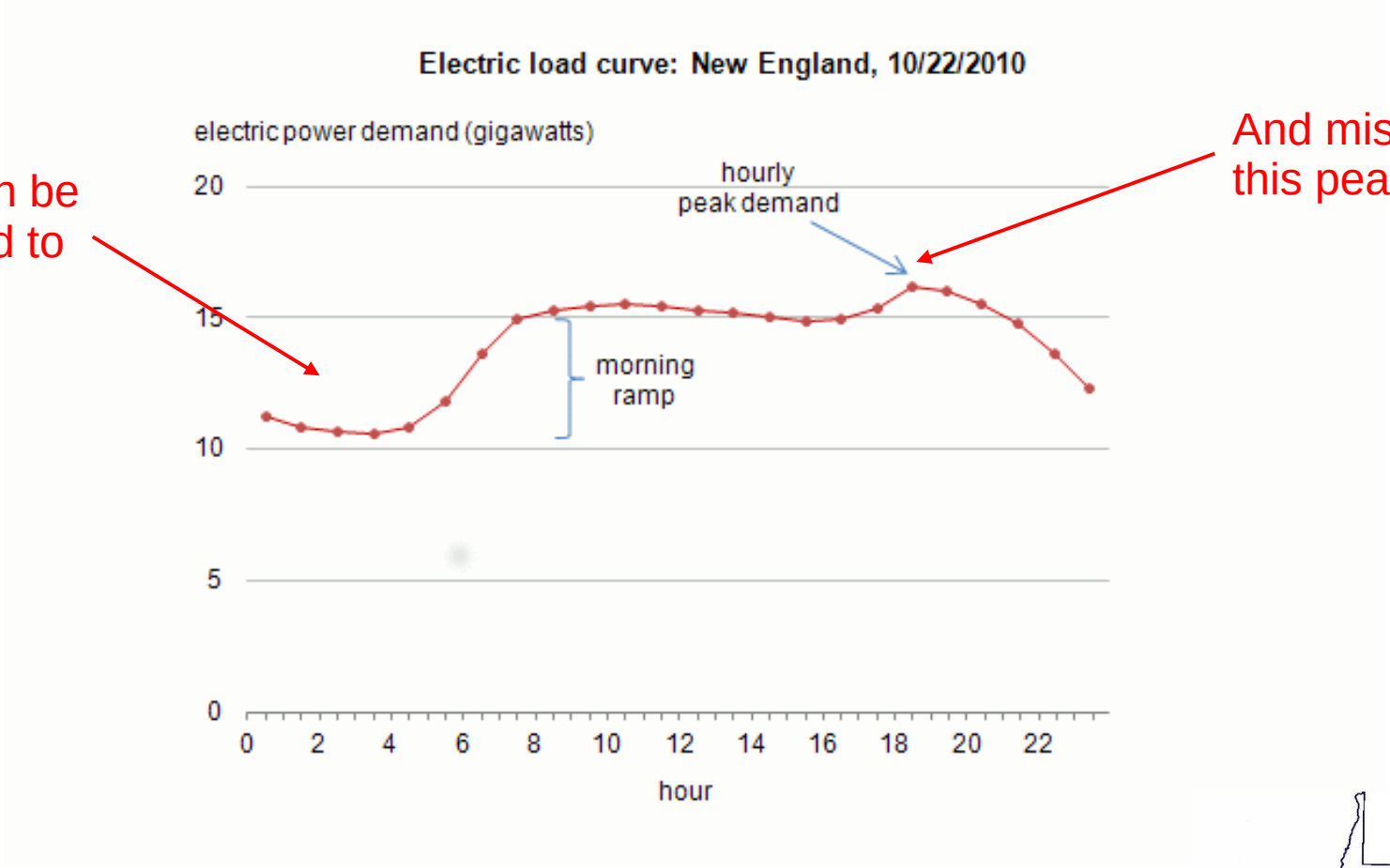
Most EVs are Charged at Home

At NIGHT!

Electric car charging can be programmed to fill this dip



And miss this peak

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  - Reduce Imported Oil – Eliminate 500 gals gas per EV/yr
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- Limited Effect on Power Grid – Most Charging at Night
- Market Drivers are Appealing

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  - EVs are a Boost for Retail Sales

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Why should We care about electric cars?

A study showed an Average Shopper spent
12 Minutes in a Retail Store

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Why should We care about electric cars?

A study showed an Average Shopper spent
12 Minutes in a Retail Store

Add a Charge Station and the Study showed the
Average EV Shopper spent **45** Minutes in the same
Retail Store

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Why should We care about electric cars?

- Positive for US & W.Va. Economics
  - Reduce Imported Oil – Eliminate 500 gals gas per EV/yr
  - Powered by COAL – Soon 1.5MM-2MM tons per year
- Limited Effect on Power Grid – Most Charging at Night
- Market Drivers are Appealing
  - EVs are a Boost for Retail Sales – Shoppers stay longer
  - W.Va. Tourism needs to “Be Prepared”

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Why should We care about electric cars?

Tourism is a Driver in West Virginia

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Why should We care about electric cars?

Tourism is a Driver in West Virginia

Public Charging Stations will bring Drivers to W.Va.’s Tourism Destinations

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Public EV Charging

L2

Most Common Public Station

240 volts

13 to 70 amps

ChargePoint Public Station

Charges at 8 to 55 mrph

Charging fees vary (zero and up)

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Public EV Charging

L3 Stations – Faster Charge at 480v DC

Charging fees vary (zero and up)

Charges at 25 to 150+ mrph

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Why should We care about electric cars?

- Positive for US & W.Va. Economics
  - Reduce Imported Oil – Eliminate 500 gals gas per EV/yr
  - Powered by COAL – Soon 1.5MM-2MM tons per year
- Limited Effect on Power Grid – Most Charging at Night
- Market Drivers are Appealing
  - EVs are a Boost for Retail Sales – Shoppers stay longer
  - W.Va. Tourism – Boosted by Public Charging

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IN SUMMARY

EVs are Here & More are On the Way

- Advances in Electrical Drive Systems and Batteries
- Electric is very Convenient – especially for Job Commuting
- Very Affordable on a Day-to-Day Basis
- Much Reduced Vehicle Maintenance
- REALLY, REALLY FUN to DRIVE!

West Virginia stands to benefit:

- Increased Coal Usage
- Reduced Oil Imports
- Grid Friendly Electrical Consumption
- Market Boosts Available for Tourism and Retail Sales

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IN CLOSING

The West Virginia Electric Auto Association is a ready resource for Information and Policy Development

Contact us via the Internet at

www.WVEAA.org

or directly at

Marty Weirick: Marty.Weirick@gmail.com
Larry Harris: lharris1@comcast.net

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West Virginia: A National Energy Resource

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Electric Autos and West Virginia Energy

Questions or Comments?

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West Virginia: A National Energy Resource

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Background Slides

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So, Why is Electric Making a Comeback?

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Analysis

Engineering assumptions:

Coal heating value – 13,000 BTU/lb (S. WV Steam)

Power plant heating value – 0.67 lb coal / kwh

Electric car mileage – 3 miles / kwh

US car average miles driven – 37 miles/day

Coal Market Share – 70.2% - (from Midwest ISO)

Coal Market Share – 95% - (West Virginia only)

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Analysis

Question: Why should West Virginia care about electric cars?

Answer: Imported Oil Electric cars use electricity from the US grid. Based on average assumptions, electric cars avoid burning more than 1 gallon of gasoline a day, or about 500 gallons a year. Because the US is a net oil importer, this avoided fuel is imported oil.

What if we replaced oil imported from our enemies with West Virginia coal?

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Analysis

Question: Why should West Virginia care about electric cars?

Answer: US Economics One million electric cars will defer burning 500,000,000 gallons of gasoline per year. Based on $40 / barrel oil, that reduction in oil imports will reduce the US balance of payments more than $0.5 billion per year.

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Grid Analysis

Question: Won't electric cars overwhelm the electric grid, requiring huge new investments?

Answer: Not necessarily. Think of an EV as a computer with wheels. Every EV can be programmed for at least charging in 3 modes:

1) Set charge start time.

2) Set charge completion time.

3) Set time of day charge cost table, and the car software optimizes charging times.

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Market Analysis

Electric Car Market Share Barriers

- Cost of Cars
  - Declining – think computers & flat screen TVs
- Availability of public car charging stations
  - Most charging is at home but public charging is needed for long trips
- Political opposition
  - Electric cars have a “green” tint
- Most gas cars work well

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Retail Charging Analysis

What benefits can go to retail business for public charging?

- At a California department store chain the average shopper stays 12 minutes.
- At the same chain the average EV owner stays 45 minutes.
- EV owners are loyal retail customers, and will drive out of their way to find merchants that provide public charging.
- EV owners are willing pay for the power, as long as they don't feel gouged.

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Public Charging

- Although EV's are mostly charged at home, most owners (especially battery only owners) want the assurance they can charge away from home if they need to charge to get home.
- Home charging is unlikely to meet all EV owner needs.
- West Virginia and the region have experienced very slow rollout of public charging stations compared other parts of the US.

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West Virginia Electric Auto Association SUMMARY

Policy Analysis

WVEAA has policy recommendations to help the electric car market.

- Build-out of networked charging stations
- Time-of-use electric power pricing
- Auto Dealers need to sell electric vehicles