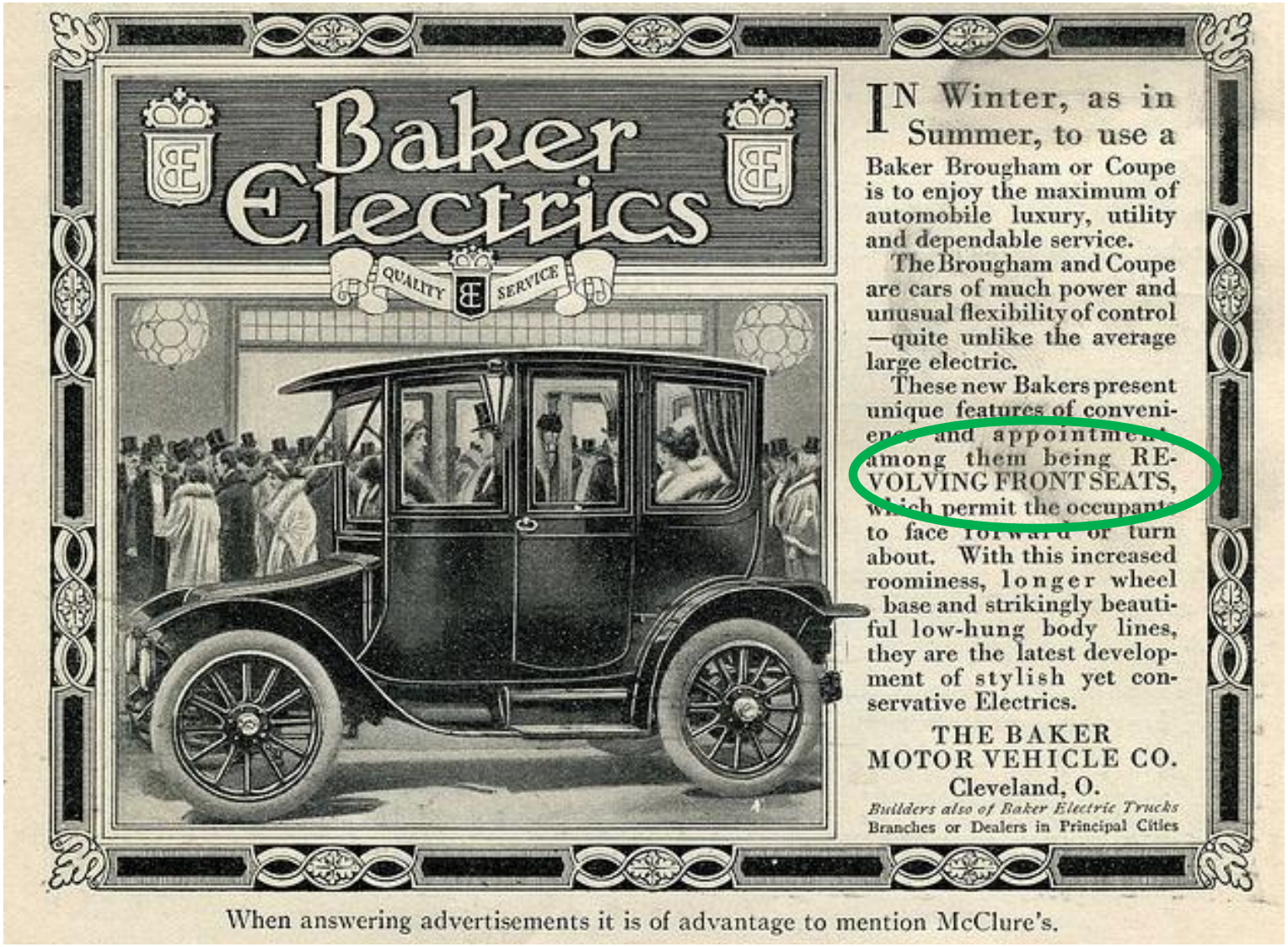
The Joys of Driving an Electric Car



Baker Electrics

QUALITY SERVICE

IN Winter, as in Summer, to use a Baker Brougham or Coupe is to enjoy the maximum of automobile luxury, utility and dependable service.

The Brougham and Coupe are cars of much power and unusual flexibility of control—quite unlike the average large electric.

These new Bakers present unique features of convenience and appointment among them being REVOLVING FRONT SEATS, which permit the occupants to face forward or turn about. With this increased roominess, longer wheel base and strikingly beautiful low-hung body lines, they are the latest development of stylish yet conservative Electrics.

THE BAKER MOTOR VEHICLE CO.
Cleveland, O.

Builders also of Baker Electric Trucks
Branches or Dealers in Principal Cities

When answering advertisements it is of advantage to mention McClure's.

Doug McKenzie • renewabledoug@gmail.com • EcoGreen Group • April 10, 2014

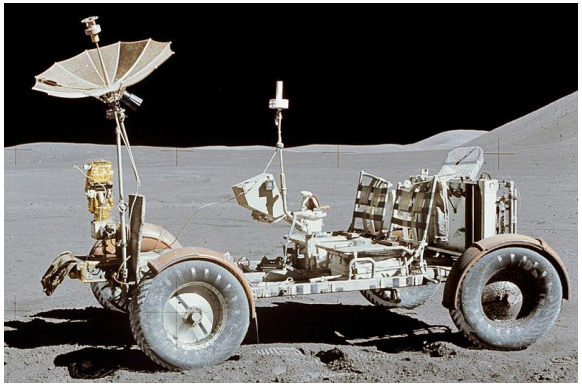
Electric cars have come (and gone) a long way

- Elwell-Parker Company
  "First practical electric car," 1882 ->
- Baker-Electric: 1899-1915
  Range: 50 miles / 14 MPH
- Detroit Electric: 13,000 electric cars built between 1907 & 1939
- Woods Motor Vehicle "Dual Power"
  First Gas-Electric Hybrid, 1911-1918
- By 1912, electric cars were double the price of gas cars
- Henney-Kilowatt: 1959-1960
  60 miles / 60 MPH
  100 built, 47 total sold

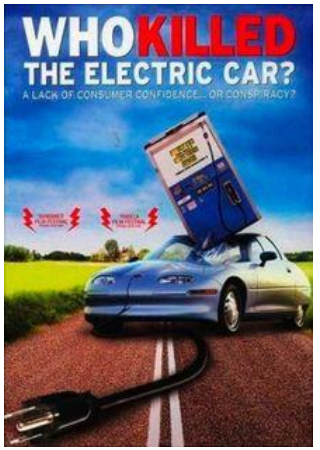
Electric cars have come (and gone) a long way

- The “Big 3” & Rambler produced electric concept cars in the late 1960s

- Lunar rover, 1971



- 1990s: renewed interest in EVs, driven by CA’s CARB



- 1996 – 2003 GM’s EV1 (“Who Killed the Electric Car?) Also Toyota RAV4, Honda EV Plus, Ford Ranger. Fossils vs. electric (fossils won) Like today (except electric will win)
- Tesla Roadster – 2008 – the modern age of electric vehicles begins!

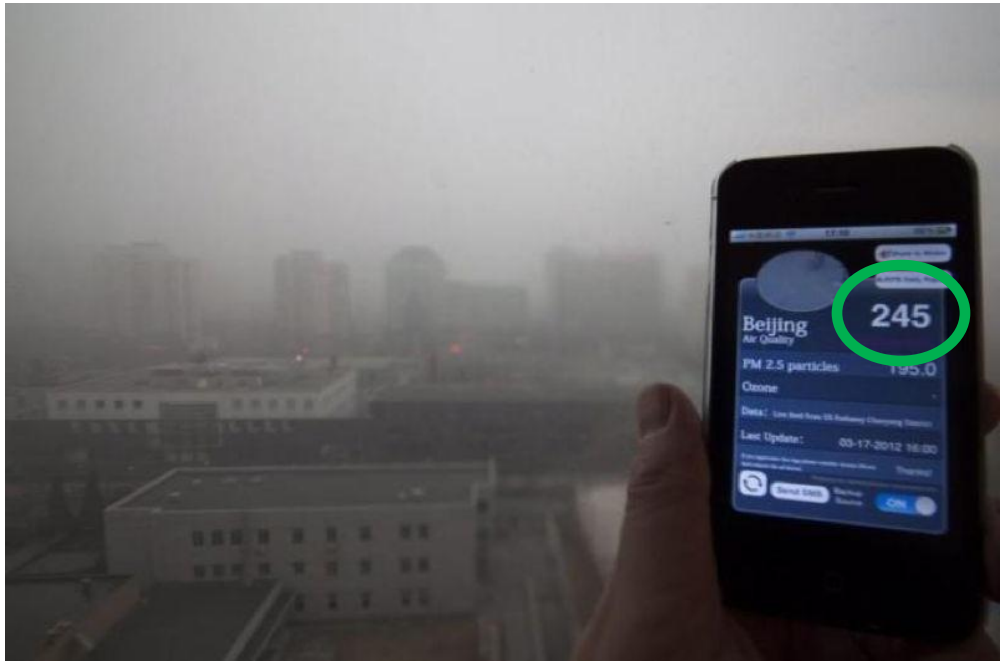

D.A.R.E.


CHEVY VOLT vs NISSAN LEAF
the electric car smackdown

Environmental Benefits of EVs

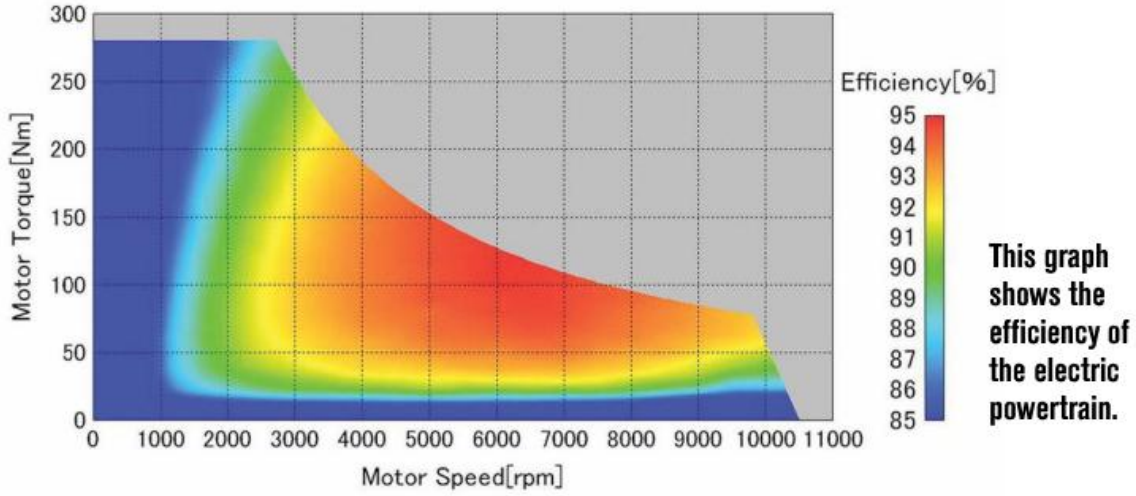
- No tailpipe emissions: Nitrogen Oxides (NOx), Carbon Dioxide (CO2), unburned hydrocarbons, Carbon Monoxide (CO), …

- Less smog: 245 $PM_{2.5}$ ($\mu g/m^3$ of 2.5 micron particulate matter) is 7 times the EPA short-term maximum



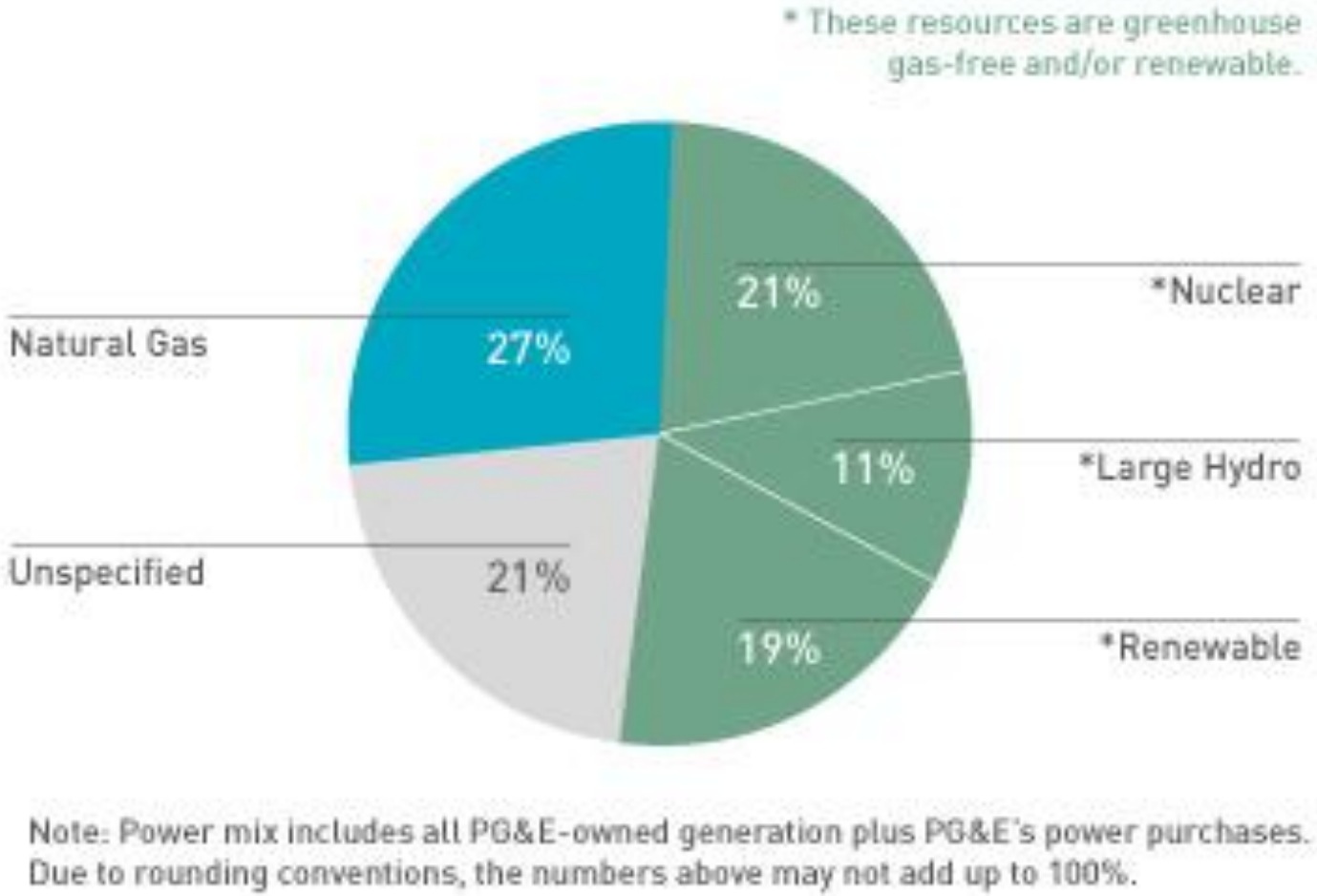
Environmental Benefits of EVs

- No toxic refueling stations needed; no trucking of fuel needed; no spills
- Reuse/recycle EV batteries
- Less wasted energy
  ICE ≈ 30% efficient
  EV ≈ 90% efficient



Environmental Benefits of EVs

- EV total pollution depends on the power source



Economic Benefits of EVs

- Fuel cost per mile
  - ICE: cents per gallon / miles per gallon = cents per mile
    - 400¢ per gallon / 20 miles per gallon = **20¢ per mile**
  - EV: cents per kWh / miles per kWh = cents per mile
    - Cents per kWh: PG&E EV-A off-peak ≈ 10.2¢/kWh *
    - Miles per kWh: 3.3 (industry average)
    - 10.2¢ per kWh / 3.3 miles per kWh = **3.1¢ per mile**
  - At 1000 miles/month, that's $31 vs. $200/month, or a **yearly savings of over $2000**

* PG&E rates/tiers/time-of-use/choices are complicated – your mileage may vary. EV-A is a good choice for EVs. No tiers (i.e., no penalty for heavy consumption) & very cheap nighttime charging rates (10.2¢ vs. 13.6¢ E-1 Tier 1)

Economic Benefits of EVs

- Rooftop solar is a perfect EV complement: Achieve 100% clean transportation by producing cheaper electricity
- Federal tax credit: up to $7500 (for >= 17kWh battery)
- California rebate: $2500 for purchase or lease of a new EV
- Lower cost maintenance

  EV engines and transmissions are much simpler: No oil changes, no pistons or valves or cylinder heads, no fuel pump or injectors or gas lines or gas tank, no timing chain, no spark plugs, no 100 explosions per second, no exhaust systems or mufflers, no catalytic converters, no smog inspections.

Economic Benefits of EVs

- Externalities of petroleum fuels
  - Health
    - Coal-related health externalities cost Americans at least $200 billion/year (and at least 13,000 premature deaths). That's an additional 18¢/kWh for coal-based electricity-generation costs
  - Military
    - Difficult to estimate accurately. At least $200 billion/year for petro-wars, transportation protection, military use of fuel
  - Environment
    - CO2 emissions are the primary driver of industrial-age climate change; IPCC AR5 says 2°C rise will cost between 0.2 and 2.0% of global income ($160 billion to $1.6 trillion/yr). Costs increase exponentially with higher temps
    - The average US car emits ~1 lb. of CO2/mile => 6 tons/yr. Greenhouse gases methane & nitrous oxide are also emitted

Experiential Benefits of Driving an EV

- The “tank” is full every morning. Never go to the gas station. Fill up at your home or work or almost anywhere
- EV engines are very quiet at all speeds. CBS’ 60 minutes dubbed in loud ICE noise for their 3/30/14 Tesla piece!
- Smooth, immediate acceleration with no lag, no shifting. Full torque at zero rpm
- Regenerative braking slows the car down by recharging the battery. Up to 32 kW of regen-deceleration (40% of maximum acceleration). Ideal for urban and mountain-road driving!

The Leaf's motor generates maximum torque of 280 N·m and maximum power of 80 kW.

Experiential Benefits of Driving an EV

- No idling: No wasted fuel in traffic, stop signs or lights
- Use the heater or A/C with the engine off
- Turn the heater or A/C on before getting to the car
- No starter motor noise
- No engine warm up needed
- Use carpool/HOV lanes and express/HOT lanes
- Precise monitoring of real-time and cumulative energy use
- Low center of gravity (below-floor batteries) helps turning performance
- Proselytizing , clean-conscience, and bragging rights
- Cleaner wheels (much less grime from braking)

Disadvantages(?) of EVs

- Range anxiety limits EVs to urban-only driving
- Price(?)

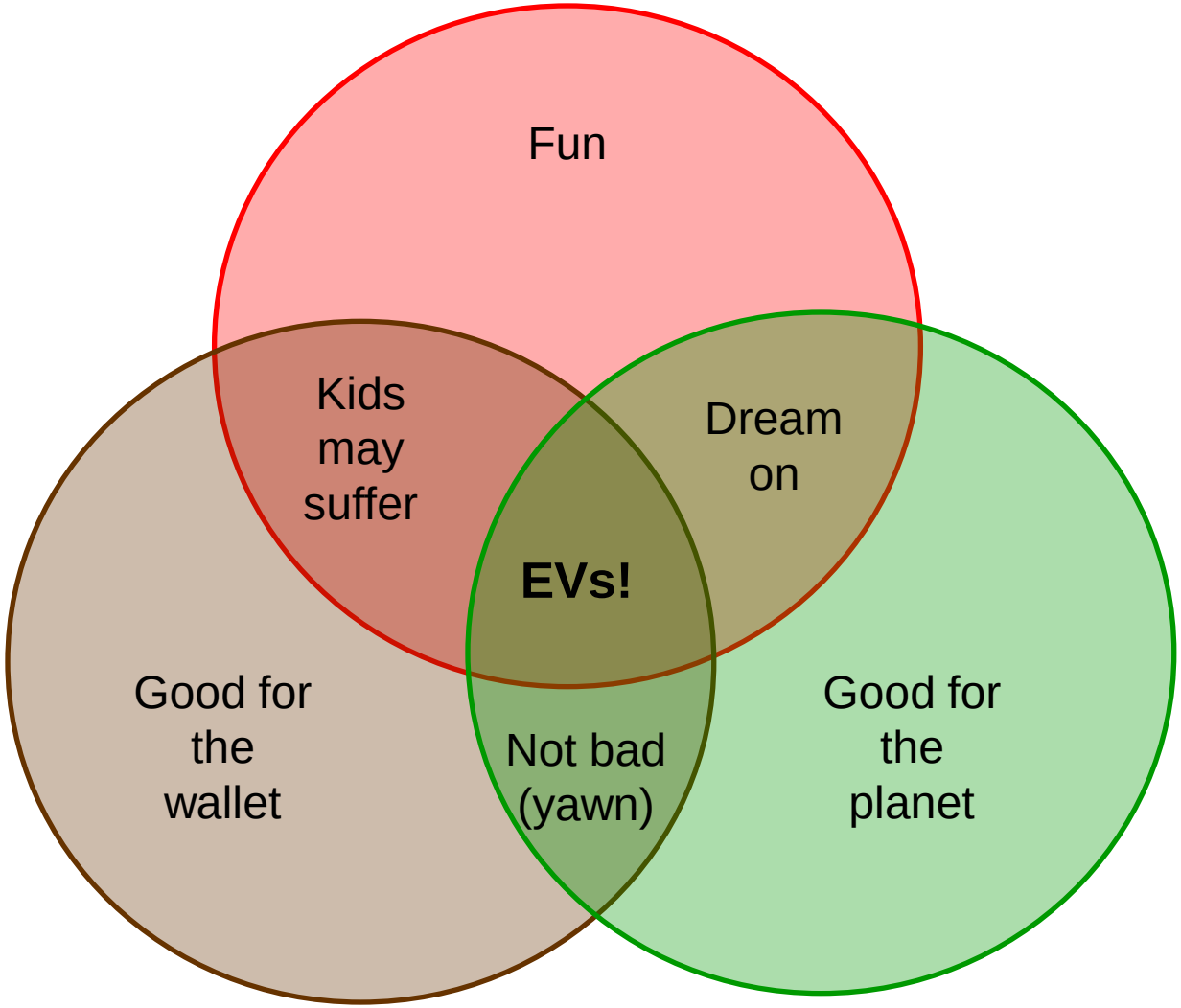
  http://cleantechnica.com/2013/12/06/11-electric-cars-prices-lower-average-new-car

  Prices are after the Federal Tax Credit is subtracted
  - Nissan Leaf – $21,300
    2013 Leaf lease: $2000 initial pmt + $200/mo (save $200/mo on gas)
  - Chevy Volt – $26,685
  - Toyota Prius Plug-in Hybrid – $27,490
  - Ford C-Max Energi – $28,943
  - Smart Electric Drive – $12,490
  - Ford Focus Electric – $27,700
  - Chevy Spark EV – $19,995
  - Mitsubishi I – $15,495
  - Fiat 500e – $24,300
- Replacing battery packs(?)
  - Tesla may lower battery cost from $260/kWh to under $200 by 2017

The Future

- Range anxiety goes away with plentiful charging stations and much longer driving ranges
- EV price drops as battery price drops (maybe dramatically)
- EV price drops even more relative to ICE as CO2 is taxed
- Spent EV batteries are are used for stationary storage, eventually making solar PV the dominant source of energy
- The future is bright!

Thanks!


Fun
Kids may suffer
Dream on
EVs!
Good for the wallet
Not bad (yawn)
Good for the planet