Disclaimer: The views expressed are those of Paul Gipe and are not necessarily those of the sponsor.

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Paul Gipe, wind-works.org
Are EVs Bad?

Paul Gipe, wind-works.org
What?
What Kind of Question is That?
Are CFLs Bad?
Are LEDs Bad?
Are Vaccines Bad?

Carrizo Plain National Monument

Paul Gipe, wind-works.org
Remember: Oil—Not a Pretty Picture
Remember: We’re Offsetting Oil

Kern County: California’s Oil Capital
1% of World Production

Paul Gipe, wind-works.org
Why Drive Electric?

• Cleaner
• Safer
• More Fun

Paul Gipe, wind-works.org
Why Drive Electric?

- Uses Fewer Resources
- More Efficient
- Zero Tail-Pipe Emissions
- 50%-80% Fewer Total Emissions
- Keeps Oil in the Ground
- Fast & Fun

Paul Gipe, wind-works.org
Why Drive Electric?
So You Can Ditch the SUV

IEA said the dramatic rise in SUVs is fundamentally undercutting gains by EVs in cutting CO₂.

Rise of SUVs 'makes mockery' of electric car push

Paul Gipe, wind-works.org
IEA: SUVs Leading Growth in CO₂

SUVs were the second largest contributor to the increase in global carbon emissions from 2010 to 2018

Change in global emissions by sector (in MtCO₂)

- Power: 1,405
- SUVs: 544
- Heavy industry: 365
- Trucks: 311
- Aviation: 233
- Shipping: 80
- Other cars: -75

Source: IEA

Dump Your SUV

Paul Gipe, wind-works.org
Why Drive Electric?
Fewer Overall Emissions

- Trend is Increasing
  As Generating Mix is Greening
- Trend for Gassers is static
No \( \text{NO}_x \) Tail-Pipe Emissions

Dieselgate Has Cost Auto Cos. USD 35 Billion

Paul Gipe, wind-works.org
Lowest Total CO$_{2e}$ Emissions

- Most Emissions from Fuel
  Batteries Add Few Relative Emissions
  Even with 1-2 Battery Replacements!

Source: UCS, Cleaner Cars from Cradle to Grave 2019
Lifetime CO₂ Emissions

Average carbon dioxide emissions per mile

Traditional gas-powered cars span a range of prices and emissions.

Hybrid and plug-in hybrid vehicles are about the same price as traditional cars but cut emissions roughly in half.

Electric cars have the lowest cost and emissions over time.

Paul Gipe, wind-works.org  carboncounter.com by the MIT Trancik Lab
EV CO₂ Emissions with California Generating Mix

80% Reduction in CO₂ Emissions

Chevy Bolt
Tesla Model 3
Gas

kg/20,000 km (Thousands)

0 1 2 3 4 5

Paul Gipe, wind-works.org

https://evtool.ucsusa.org
Chevy Bolt Annual CO₂ Emissions by Province

<table>
<thead>
<tr>
<th>Province</th>
<th>CO₂ Emissions (kg/20,000 km)</th>
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</thead>
<tbody>
<tr>
<td>Quebec</td>
<td>0.05</td>
</tr>
<tr>
<td>Manitoba</td>
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<tr>
<td>British Columbia</td>
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<td>Alberta</td>
<td>3.17</td>
</tr>
<tr>
<td>Gas</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Ontario = 97% Reduction in CO₂ Emissions

Paul Gipe, wind-works.org
Why Drive Electric?
EVs More Efficient

Paul Gipe, wind-works.org
Saddleback Butte State Park, California
EV Efficiency with California Generating Mix

- Chevy Bolt: 1.7 liters/100 km
- Tesla Model 3: 1.6 liters/100 km

Paul Gipe, wind-works.org
EV Efficiency by Energy Source Relative to GHG Emissions

Paul Gipe, wind-works.org

UCS: Wheel-to-Wheel Efficiency
Why Drive Electric?
EVs Better Value
EVs are Much Like Solar
Higher Up-Front Costs
= Long-Term Savings

Paul Gipe, wind-works.org
EVs: Lower Operating Costs

• No Engine
  No Oil Changes
  No Spark Plugs
  No Air Filter

• EVs—Rotate the Tires

• EVs—Lower Fuel Costs
Annual Fuel Costs (2019)

Paul Gipe, wind-works.org

Fuel for Bolt 1/3 That of Camry

Compare the Chevrolet Bolt EV to a similar gas vehicle, the Toyota Camry XLE/XSE

The Chevrolet Bolt EV is $60 cheaper to fill up monthly

Your EV Selection
Chevrolet Bolt EV

Similar Gas Vehicle
Toyota Camry XLE/XSE

https://ev.pge.com/
Paul Gipe, wind-works.org
Chevy Bolt Maintenance ~1/2 That of Camry in California

Paul Gipe, wind-works.org

USD over 3 Years

- Chevy Bolt: $950
- Toyota Camry: $1,700
Why Now?

- Better Cars
- Better Batteries
- Longer Range (3X)
- More Fast Charge Stations
- Hefty Subsidies in Some Places

BC & Quebec

Paul Gipe, wind-works.org
Better Cars

• Vehicles for Different Purposes
  Trucks, SUVs, Sedans
• No One Vehicle Does it All!
• EVs No Different
  CUVs, Sedans, “Hot Hatch”

Paul Gipe, wind-works.org
EV Range = kWh Traction Battery

- Tesla Model 3: 62 kWh
- Hyundai Kona: 64 kWh
- Bolt EV: 66 kWh
- Nissan Leaf +: 62 kWh
- 2015 Leaf: 22 kWh

kWh = Size of the Gas Tank

Paul Gipe, wind-works.org
EV Market Now Equals Hybrid Market

Paul Gipe, wind-works.org
What to Buy or Lease

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What Every EV Should Have

• DC Fast Charge Capability
  For Road Trips
• Heated Steering Wheel
• Heated Seats

Paul Gipe, wind-works.org
Are EVs Different?

• Yes, of Course
  You “Fill Up” (Charge) at Home

• **Vive La Différence!**

• **No Need to be Afraid**
  They Really Do Work ;)
  Ask any EV Driver

Paul Gipe, wind-works.org
EV & Electricity Consumption

15,000 km/yr

- Nies-Gipe: 3,600 kWh/year
- Nies-Gipe & EV: 4,000 kWh/year (4,000km EV + 2,500 kWh home)
- Avg CA Home: 6,500 kWh/year

Paul Gipe, wind-works.org
How to Use (Drive) EVs

- Normal Driving—Charge at Home
- Road Trips—Charge at DCFC Stations
“Filling the Tank”
.
.
.
Charging the Battery
in the “Old” Days

Paul Gipe, wind-works.org
EV Home Charge Station

- J1772 EV Plug
- EVSE 240 V, 40 A
- kWh Meter
- Switch
- NEMA 14-50 Receptacle

Paul Gipe, wind-works.org
Non-Tesla Level 2 Plug

- J1772 (in the US & Canada)
  240 V, <50 A

Paul Gipe, wind-works.org
EV Fast Charging Standards

• Tesla
• Everyone Else
  CHAdeMO: Nissan, Mitsubishi
  CCS: American & German mfgs.

40 kW: 30 mins

Paul Gipe, wind-works.org

Pacific View Mall North, Ventura, California
Tesla Charging

• 90% at Home
• <10% on the Road
• Supercharger Network—Most Extensive in North America—Bar None!
Non-Tesla EV Charging

- 90% at Home
  Level 2: 240 V, 40 A, ~7 kW
- <10% on the Road
- DCFC Rapidly Growing

Paul Gipe, wind-works.org
DCFC Stations & Kiosks

- Station = Group of Kiosks
- Kiosks = Dispenser (1-2 Cables)
- Tesla
- CCS + CHAdeMO
- CCS Only
- CHAdeMO Only

Paul Gipe, wind-works.org
Regional DCFC Networks
Ontario & Quebec

Paul Gipe, wind-works.org
Regional DCFC Networks
Western Provinces

Paul Gipe, wind-works.org
DCFC Charge Station: 1 Kiosk

- EV Connect
- Santa Clarita
- Rare

Paul Gipe, wind-works.org
DCFC Charge Station: 3 Kiosks

- ChargePoint
- Coalinga (I-5)

Paul Gipe, wind-works.org © PlugShare
DCFC Charge Station: 4 Kiosks

- Electrify America
- Coso Junction

Paul Gipe, wind-works.org
DCFC Charge Station: 6 Kiosks

- Recargo
- Prunedale (101)
- Rare

Paul Gipe, wind-works.org © PlugShare
Why Drive Electric?

• It’s the Right Thing to Do
• Practice What We Preach
• Time to Ditch the Prius—or SUV
Must Increase Deployment Rate

- Growth—Good but not Enough
- Must Accelerate Growth
- What Can be Done
  - Continue Federal Subsidies
  - Expand Provincial Subsidies
  - Early Adopters—Move Now

Paul Gipe, wind-works.org
Wind Wolves Preserve
Ontario 100% EV Mandate

Comparing Vehicle Pollution Scenarios in the GTHA

SOLUTION & HOW WE GET THERE

Cars and SUVs: 100% electric
ZEV Sales Mandate @ 100%: supported by incentives and standards

<table>
<thead>
<tr>
<th>Health impact: Mortalities prevented/yr</th>
<th>Cost impact: Social benefits/yr</th>
<th>GHG Impact: Tons reduced/yr</th>
<th>Health Rank</th>
<th>GHG Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>313</td>
<td>2.4 billion</td>
<td>7.6</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Environmental Defence, Ontario Public Health Assoc.

Paul Gipe, wind-works.org
Ontario 100% EV Mandate
Clearing the Air

- 2/3 Cut in CO$_2$
- Reduces Air Pollution along Travel Corridors
- Often Inner City

Paul Gipe, wind-works.org
Time for Canadians to Take the Road to the Future

Freiburg, Germany

Paul Gipe, wind-works.org
No Time to Waffle

No Time for Half-Measures

No Time to Lose

Paul Gipe, wind-works.org
No Plug--No Deal

Paul Scott, *Who Killed the Electric Car*
Driving Electric

What’s Stopping You?

Paul Gipe, wind-works.org
EV CHARGING ONLY