Electrifying the Transportation Sector

Matt Frommer
Southwest Energy Efficiency Project (SWEEP)
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Emissions from the transportation sector

America's New Pollution King
Transportation emissions have surpassed electricity emissions for the first time since 1978

- Electricity emissions (metric tons of CO2)
- Transportation emissions

U.S. Energy Information Administration
Bloomberg
How clean are EVs?

In Xcel Energy service territory, EV to be 90 mpg-equivalent by 2025.
Getting Competitive
Battery prices seen reaching key level of $100 per kilowatt hour by 2026

- Actual lithium-ion prices
- BNEF projections

Source: Bloomberg New Energy Finance

Tesla to achieve leading $100/kWh battery cell cost this year, says investor after Gigafactory 1 tour

Fred Lambert - Sep. 11th 2018 4:27 pm ET  @FredericLambert
EV Economics

Modeled for La Plata Electric Association
EV 101

Two types of EVs:

1. **Battery Electric Vehicles (BEV)**: electric motor
2. **Plug-in Hybrid Electric Vehicles (PHEV)**: electric motor + gasoline engine

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2018 Nissan LEAF (BEV)
- 151 miles electric range
- $29,990 MSRP

2018 Toyota Prius Prime (PHEV)
- 25 miles electric range, 54 mpg gasoline
- $27,300 MSRP
43 EV models on the market. Top 6:

1. Tesla Model 3 (BEV)
   $35,000 $26,250

2. Toyota Prius Prime (PHEV)
   $27,350 $14,850

3. Honda Clarity (PHEV)
   $33,400 $20,900

4. Chevy Bolt (BEV)
   $36,620 $24,120

5. Nissan LEAF (BEV)
   $29,990 $17,490

6. BMW i3 (BEV)
   $44,450 $31,950
SUVs / Crossovers:
22 electric models by 2022

Mitsubishi Outlander (PHEV)
$35,795 $23,295

Hyundai Kona EV (BEV)
$36,450 $23,950

Subaru Crosstrek (PHEV)
$34,995 $22,495

Rivian R1S (BEV)
2019

Rivian R1T (BEV)
2019

Ford F-150 (BEV)
2020
Electric buses

● 1 in 10 children in the US have asthma - NOx is a known trigger

● Electric school buses with 120-mile range can replace 80% of routes today

● BNEF predicts that 84% of buses (transit and school) will be electric in 2030

● “Each electric transit bus saves the city $25,000 in fuel costs every year” (Chicago Transit Authority)
Where are we with EV sales?

Colorado EV Market-share (2018)
Where are we with EV sales?

2017 vs 2018 = 82% market growth
The size of the challenge:

Figure 3: Cumulative global passenger EV sales, current and forecast

Source: Bloomberg NEF
Part 2: Progress through Policy
## List of countries banning fossil fuel vehicles:

<table>
<thead>
<tr>
<th>Country</th>
<th>Ban announced</th>
<th>Ban commences</th>
<th>Scope</th>
<th>Selectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>2017</td>
<td>&quot;in the near future&quot;[^5]</td>
<td>Gasoline and diesel</td>
<td>Production</td>
</tr>
<tr>
<td>Germany</td>
<td>-</td>
<td>&quot;2030&quot;[^8]</td>
<td>Combustion engine</td>
<td>New vehicle sales</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2017</td>
<td>2030[^12]</td>
<td>All vehicles not emission free</td>
<td>New vehicle sales</td>
</tr>
<tr>
<td>Taiwan</td>
<td>2018</td>
<td>2040[^13]</td>
<td>Non-electric</td>
<td>New vehicle sales</td>
</tr>
</tbody>
</table>

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**Climate Changed**

**California Bill Seeks Ban on Fossil-Fueled Vehicles by 2040**
Automakers are responding

<table>
<thead>
<tr>
<th>Automaker</th>
<th>Goal/Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audi</td>
<td>20 new EV models by 2025</td>
</tr>
<tr>
<td>BMW</td>
<td>12 EVs by 2025</td>
</tr>
<tr>
<td>Volvo</td>
<td>50% of sales are electric by 2025 (5 new BEVs by 2021)</td>
</tr>
<tr>
<td>GM / Cadillac</td>
<td>20 electric cars by 2023</td>
</tr>
<tr>
<td>Jeep</td>
<td>10 PHEVs and 4 BEVs by 2022</td>
</tr>
<tr>
<td>Renault-Nissan-Mitsubishi</td>
<td>Sell 1 million EVs per year by 2022 (12 new BEVs)</td>
</tr>
<tr>
<td>Ford</td>
<td>40 EVs by 2022: 16 BEVs, 24 PHEVs</td>
</tr>
<tr>
<td>Honda</td>
<td>2/3 of all sales to be electric by 2030</td>
</tr>
<tr>
<td>Hyundai-Kia</td>
<td>8 new EVs by 2022</td>
</tr>
<tr>
<td>Jaguar - Land Rover</td>
<td>Pledge to manufacturer only EVs and hybrids after 2020</td>
</tr>
<tr>
<td>Toyota</td>
<td>10 BEVs by early 2020s</td>
</tr>
</tbody>
</table>
US climate policy and governance

2016 → 2019

federal

state

local

federal

state

local
State Level EV Policy

1. Vehicle purchasing incentives - State EV tax credit
2. EV charging infrastructure: VW settlement & utility investment
3. Adopting zero-emission vehicle (ZEV) standard

Colorado State goal: 940,000 EVs on our roads by 2030 (17% of all vehicles)
EV charging infrastructure: VW settlement

- $68.7 million to Colorado, 15% ($10M) to EV charging stations
Getting EVs on the road benefits all utility customers

La Plata Electric Association Time-of-use (TOU) rates
Takeaways

- We can’t solve climate change without electrifying transportation

- Market is headed the right direction, but moving way too slow

- Government policy support is essential to speed the transition
Final price after tax credits: $13,990
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