Electric Vehicles:
The Silver Bullet for Emissions?

Phil Jones - UoA 18/2/2019
About SBN
(Sustainable Business Network)
This afternoon...

- The Big Picture
- EVs and the zero emissions challenge
- The arguments: for and against
- Conclusion
1. Transport in NZ: The Big Picture
How we travel...

- Car – 86% (as a passenger – 8%)
- Cycle or walk – 7%
- Public transport – 7%
What we own...

Car ownership rate highest in OECD... and rising...

https://www.transport.govt.nz/mot-resources/vehicle-fleet-statistics/#annual
The impacts...

- **40 mins to 53 mins**
  (average Auckland commute 2015-2016)

- **$ 1.3 billion p.a.**
  (estimated cost of congestion in Auckland)

- **$ 7.7 billion p.a.**
  (cost of imported oil in 2018 – NZ)

- **~400 premature deaths**
  (estimated effects of pollution from vehicles – 2002)
… and emissions...

18% of New Zealand’s domestic greenhouse gas emissions are from transport

90% of New Zealand’s domestic transport emissions come from road transport

68% increase in New Zealand’s domestic transport emissions since 1990

Major growth area - from all road vehicle types
2. EVs and the Zero Emissions Challenge
Transport sector is the prime opportunity
WHERE WE NEED TO GET TO...

CARBON FROM ENERGY FOR ROAD TRANSPORT

~100% to 0% (2019-2050)
Technology adoption curve

Focus on light vehicle fleet

End-2018 11,748 (0.3%)
An adoption pathway to 100%...

EV registrations per year to achieve 100% by 2035 (2040)

- 2018: End 2% (2019: 2.5%)
- 2021: 16% (2027: 50%)
- 2029: 84% (2032: 50%)
- 2037: 84% (2035: 100%)

Innovators: 2.5%
Early Adopters: 13.5%
Early Majority: 34%
Late Majority: 34%
Laggards: 16%

Market share %
Are EVs and NZ up to the challenge?
3. The Arguments: For and Against
Zero emissions by 2050: The case for...
1. The NZ Pioneers...
... and the individuals buying Nissan LEAFs

~ 50% of all EVs registered to date

https://www.transport.govt.nz/mot-resources/vehicle-fleet-statistics
2. The Visionaries...

Tony Seba: by 2030...

- All new vehicles electric and autonomous
- Car ownership obsolete
- All new energy solar or wind
New, cost competitive technology + Business model innovation = “Impossible for incumbent products to compete”
3. Battery costs coming down...

Now: US $155-$360/kWh

2022-2027 Projection: US $120/kWh = ICE-eqivalent (TCO basis)

4. State superstars leading the way...

Percentage of new car sales that are electric, first half 2017

<table>
<thead>
<tr>
<th>Country</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
<td>20</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>15</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Iceland</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Sweden</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Ukraine</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Belgium</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Switzerland</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Finland</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>China</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Austria</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Netherlands</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>France</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>UK</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Plug-in Sales and % Growth

<table>
<thead>
<tr>
<th>Region</th>
<th>2018 H1</th>
<th>2017 H1</th>
<th>% Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>394</td>
<td>192</td>
<td>+105%</td>
</tr>
<tr>
<td>Japan</td>
<td>27</td>
<td>29</td>
<td>-7%</td>
</tr>
<tr>
<td>Europe</td>
<td>195</td>
<td>137</td>
<td>+42%</td>
</tr>
<tr>
<td>USA</td>
<td>122</td>
<td>89</td>
<td>+37%</td>
</tr>
<tr>
<td>Other</td>
<td>45</td>
<td>24</td>
<td>+86%</td>
</tr>
</tbody>
</table>

Norway leads way on electric cars: 'it’s part of a green taxation shift'

Nearly a third of all new cars sold in the country this year will be plug-in models and experts expect that share to skyrocket.

The zero emissions incentives include:

- No purchase/import taxes (1990)
- Exemption from 25% VAT on purchase (2001)
- Low annual road tax (1996)
- No charges on toll roads or ferries (1997 and 2009)
- Free municipal parking (1999)
- Access to bus lanes (2005)
- 50% reduced company car tax (2000)
- Exemption from 25% VAT on leasing (2015)
5. Our natural advantage...

2017 - 80% renewable production (Down from 85% in 2016)

6. And... the promise of autonomy...

“... (autonomous vehicles) will mean for the first time in history, mobility freedom will be available for everyone, everywhere.”

Zero emissions by 2050:  
The case against...
1. Another curve...

Early Majority

➢ “Want a hassle-free solution that performs as promised.”

➢ “Are not willing to tolerate anxiety or doubt.”

➢ “Are willing to purchase only when all elements of the requisite infrastructure are in place.”

2. Another year older...

Our vehicle fleet is old – 40% are over 15 years old

https://www.transport.govt.nz/mot-resources/vehicle-fleet-statistics
3. Our unnatural dis-advantage...

Information labels and no RUC for EVs - the only measures in NZ to purchase more fuel efficient vehicles...

Most OECD countries have regulation &/or financial incentives for efficient models...
...contributing to flat-lining CO₂ emissions - 180 g/km

http://www.transport.govt.nz/research/newzealandvehiclefleetstatistics/#annual

...compared to 120 g/km (EU) and 143 g/km (Japan)


STOP PRESS! New incentives imminent? Feebate?
~70% of all new vehicles are bought by organisations.

NZ major corporates commit to electric vehicle fleet expansion

Major challenges...

<table>
<thead>
<tr>
<th>A/C charging equipment</th>
<th>Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site capacity / load management</td>
<td>Network capacity</td>
</tr>
</tbody>
</table>
5. The auto-industry – waiting for FCEVs?

Fuel cell electric vehicles (FCEVs) will be the real break-through for electric mobility.

- Agree: 79%
- Undecided: 12%
- Disagree: 9%

Battery electric vehicles (BEVs) will fail due to infrastructure challenges while fuel cell electric vehicles (FCEVs) are seen as the real breakthrough for electric mobility.

https://automotive-institute.kpmg.de/product-value/electric-readiness
6. There’s (more) money to be made...

Value $6 trillion (as at 2013)

“Between **60-80% of coal, oil and gas reserves** of publicly listed companies are ‘**unburnable**’ if the world is to have a chance of not exceeding global warming of 2°C.”

4. The Verdict... Zero by 2050?
Summary of arguments...

1. NZ pioneers
2. Visionaries
3. Global leaders
4. Battery costs reducing
5. Renewables grid
6. Promise of AVs

1. Crossing the chasm
2. Age of fleet
3. Lack of incentives
4. Company uptake
5. Commitment by auto-industry
6. Oil reserves
Conclusion: 1. Need to tick all the boxes...

<table>
<thead>
<tr>
<th>✔ Policy &amp; Incentives</th>
<th>✔ Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔ Infrastructure</td>
<td>✔ Consumer demand</td>
</tr>
</tbody>
</table>
Conclusion: 2. To create the momentum...

EV market share of 16+ % by 2021 (latest 2025)

1. Affordable vehicles – financial incentives
2. Consumer demand – targeted marketing
3. Product availability – committed auto-industry
4. Visible charging network – good progress
Conclusion: 3. To achieve mass uptake...

Moving to 50% market share by 2025-2030

1. Continuing fall in battery costs (cost equivalence well before 2030)
2. Comprehensive product availability (e.g. SUVs)
3. Global acceptance of the end of the fossil fuel era

And...continuing shift to an ultra low carbon electricity supply
Final words...

Success isn’t only electrifying our fleet... it’s offering an integrated mix of healthy, efficient, zero-carbon transport options.
You want to have a future where you’re expecting things to be BETTER, not one where you’re expecting things to be WORSE.

Elon Musk Quotes via Gecko&Fly
Any questions?
Thank you

phil@sustainable.org.nz