

# Why we need to Flip the Fleet: electric vehicles for a net carbon zero future

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*Monday 18<sup>th</sup> October, 2021*



# Today's Korero

- Why we need EVs
- How are EVs performing in NZ?
- Prospects for transformation of NZ transport
- What does this tell us about sustainability transitions?

# Why we need EVs

... something needs to change!

# Intergovernmental Panel on Climate Change

- United Nations Environment Programme
- World Meteorological Organization (WMO)
- 6-yearly Global Assessments
- AR1 1990
- AR6 in progress



WORKING GROUP REPORT

## AR5 Climate Change 2014: Mitigation of Climate Change

April 2014

[EXPLORE](#)



WORKING GROUP REPORT

## AR5 Climate Change 2014: Impacts, Adaptation, and Vulnerability

March 2014

[EXPLORE](#)



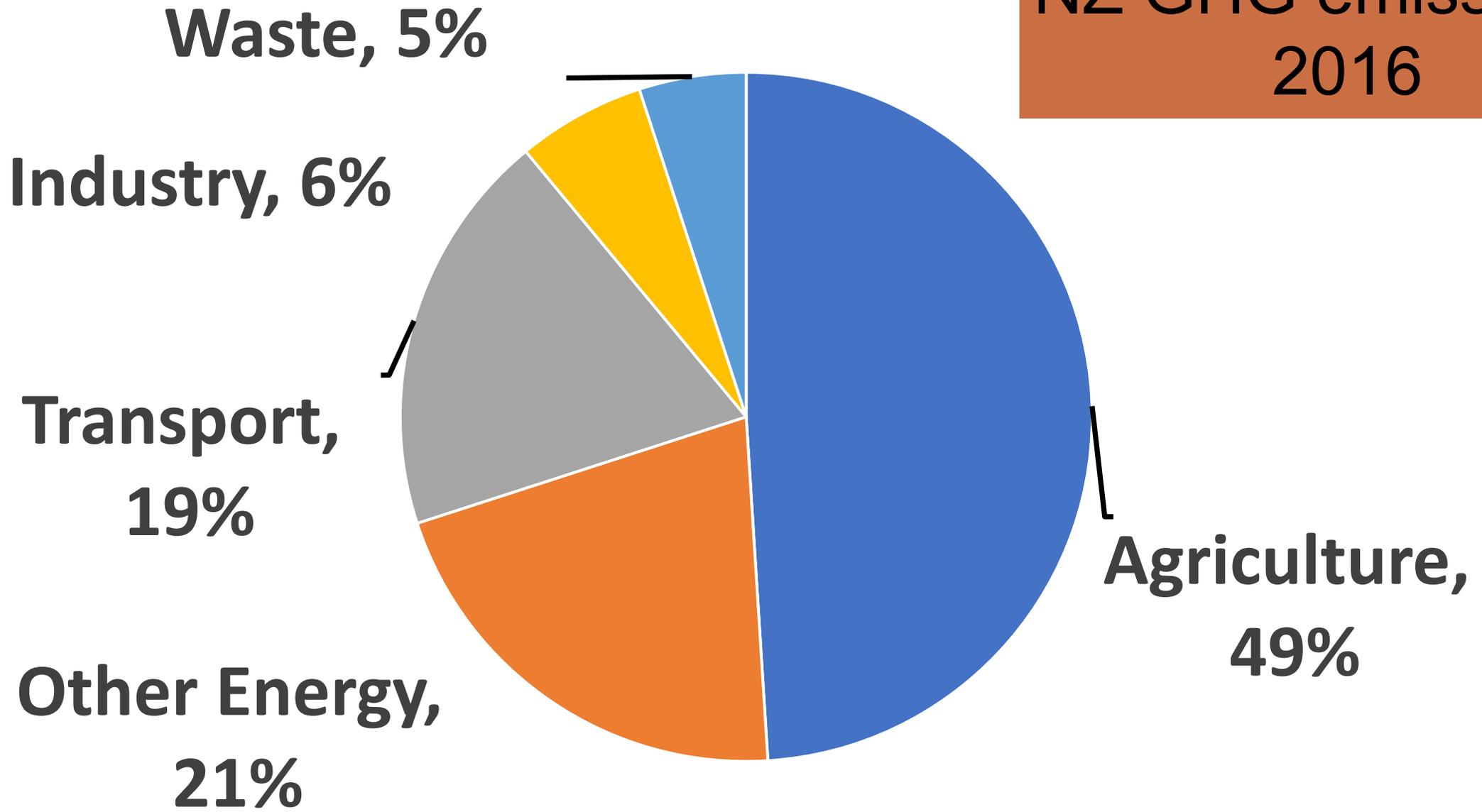
WORKING GROUP REPORT

## AR5 Climate Change 2013: The Physical Science Basis

September 2013

[EXPLORE](#)

**NZ GHG emissions,  
2016**



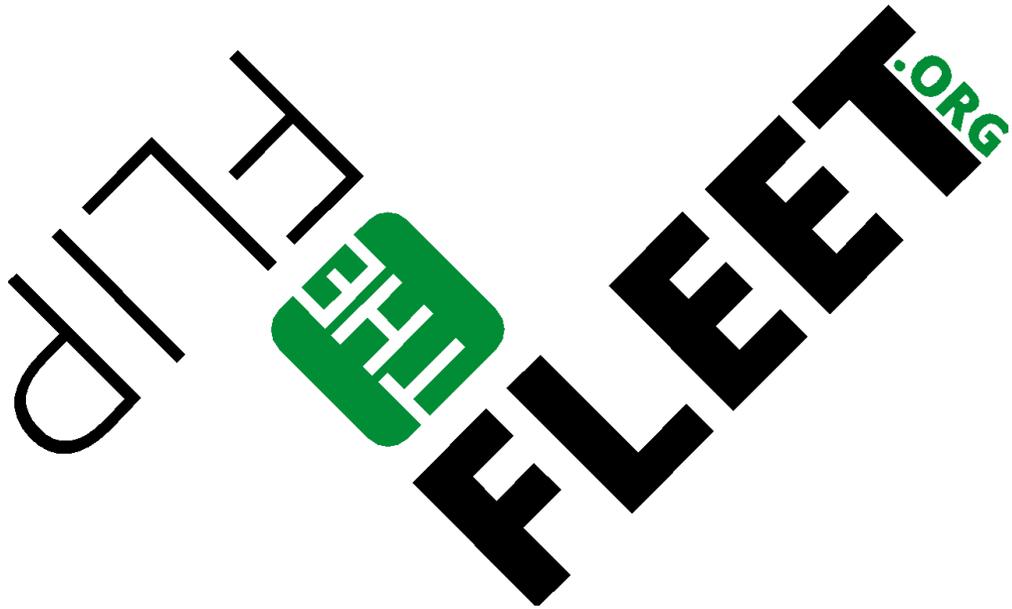


“The biggest thing we could do as a household to knock back our collective carbon emissions”

Eat less meat  
Fly less  
Plant a tree  
Solar water heater  
Solar panels  
Home battery  
Buy an Electric Vehicle  
Use public transport

# How are EVs performing in NZ?

Are they practical? Are they all they are cracked up to be for our environment, economy and society?



## Citizen science “by *EV owners, for future EV owners*”

- Public launch June 2017
- 1620 owners
- 20 ‘fleets’
- 31,834 monthly records
- 8-20 KPIs per monthly upload
- > 300,000 data points
- Monthly “1-click surveys”

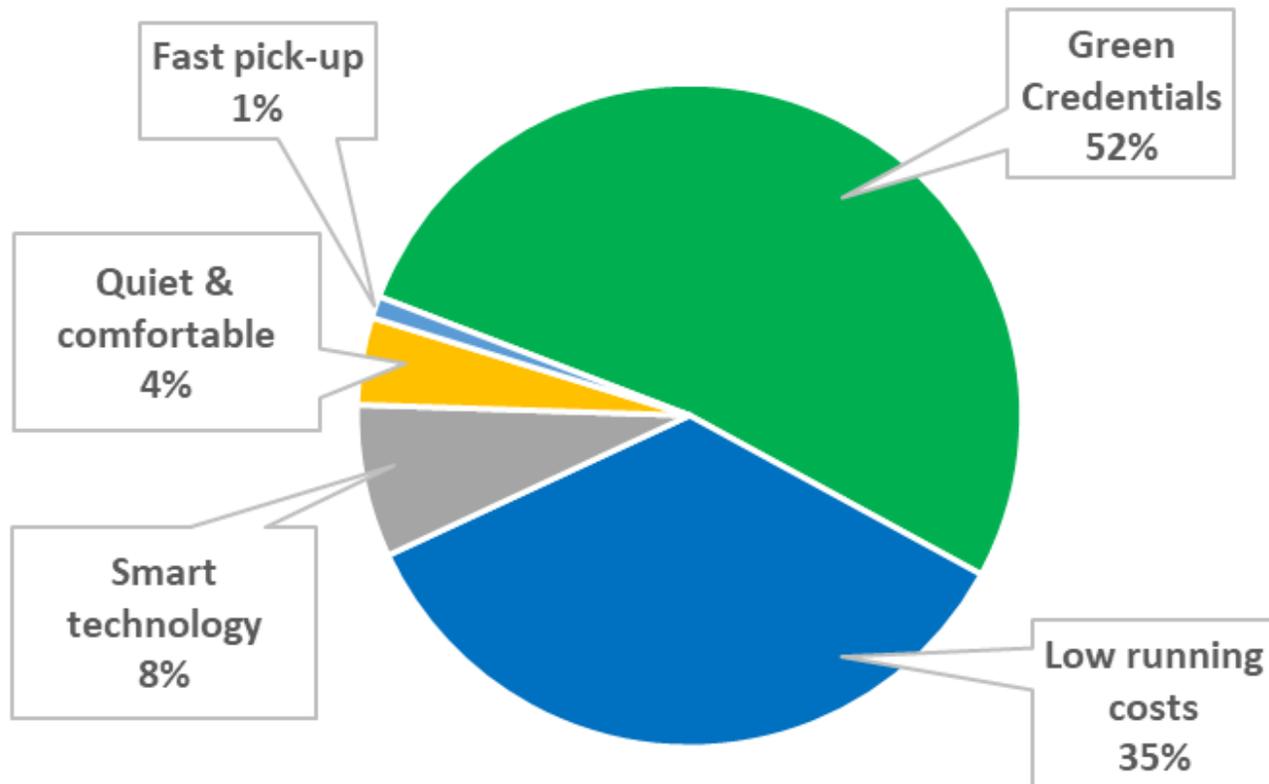


96% of current EV owners will “definitely” or “probably” make their next car another EV

- *Flip the Fleet* survey, Nov 2016

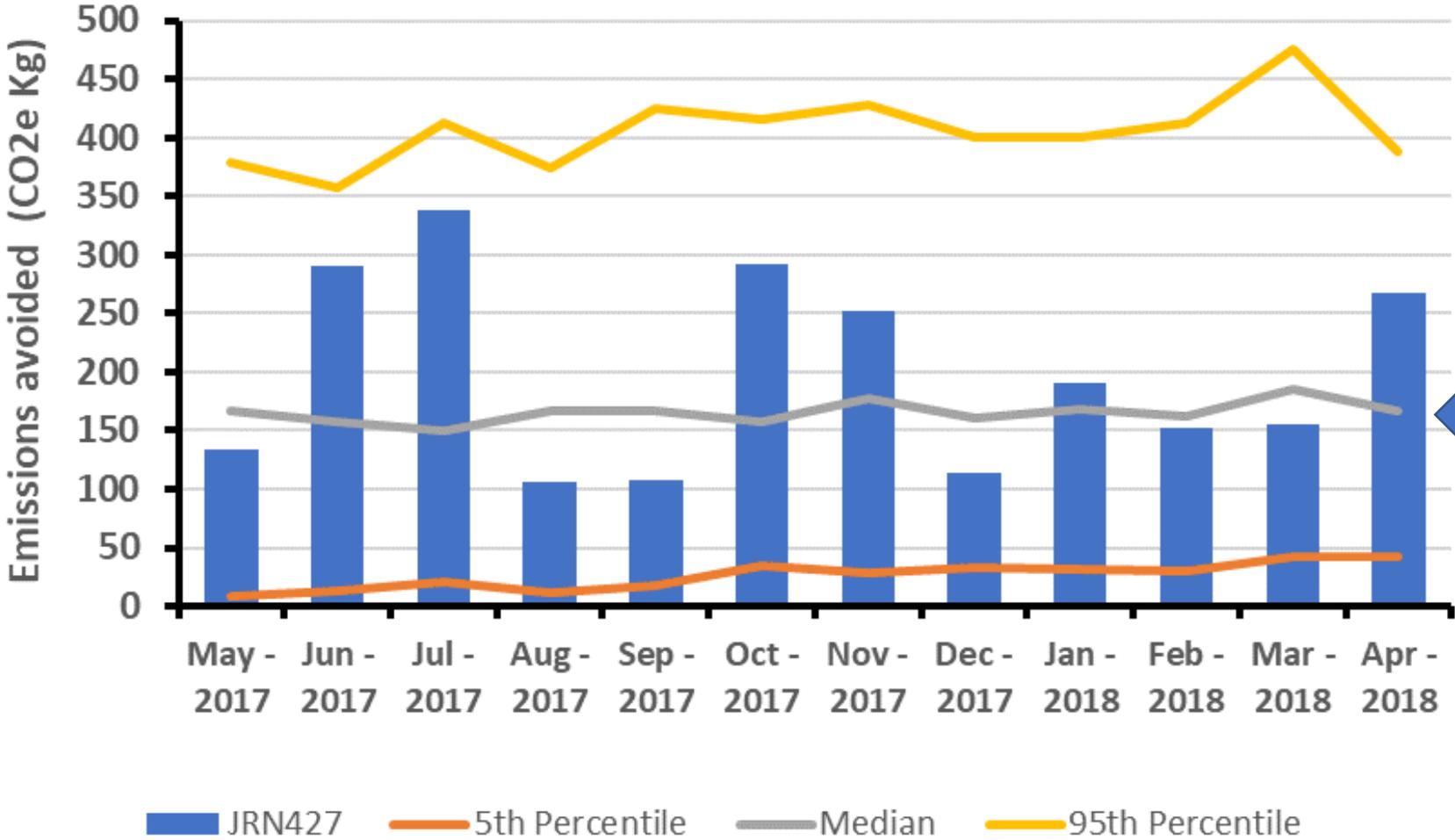
**“To go back to a petrol only car would be inconceivable”**

# My most important reason for buying a Battery Electric Vehicle was its ...



Flip the Fleet  
"1-Click survey"  
April 2018, n=391

# Emission reductions JRN427 Nissan Leaf



Sequestration by 24 pine trees

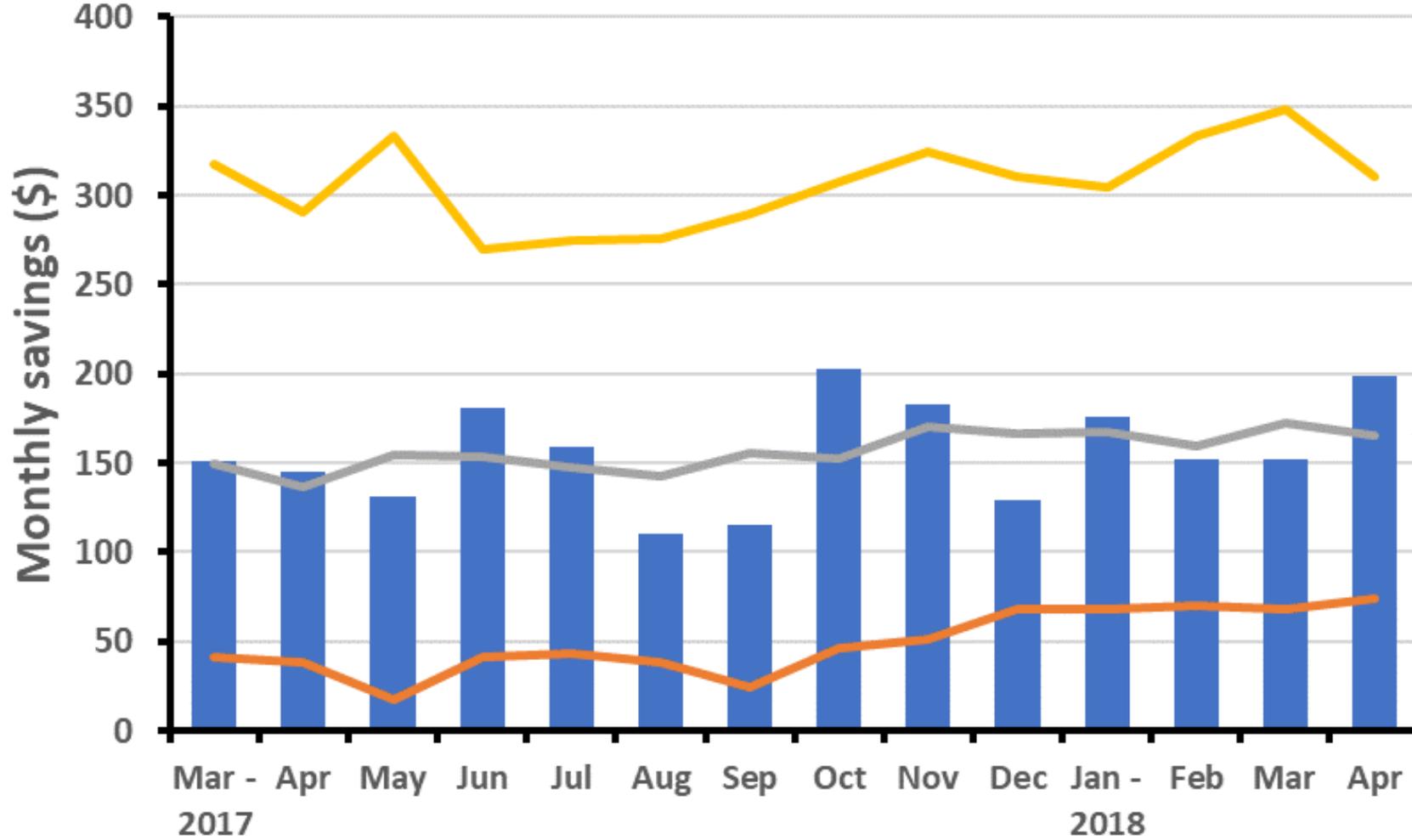
2007 kg CO<sub>2</sub>e per year

9.7 return flights AKL-WLG per year

**“I got tired of forking out large sums for even just routine services, and there always seemed to be something that needed renewing”**



# \$\$ savings e.g. JRN427 Nissan Leaf



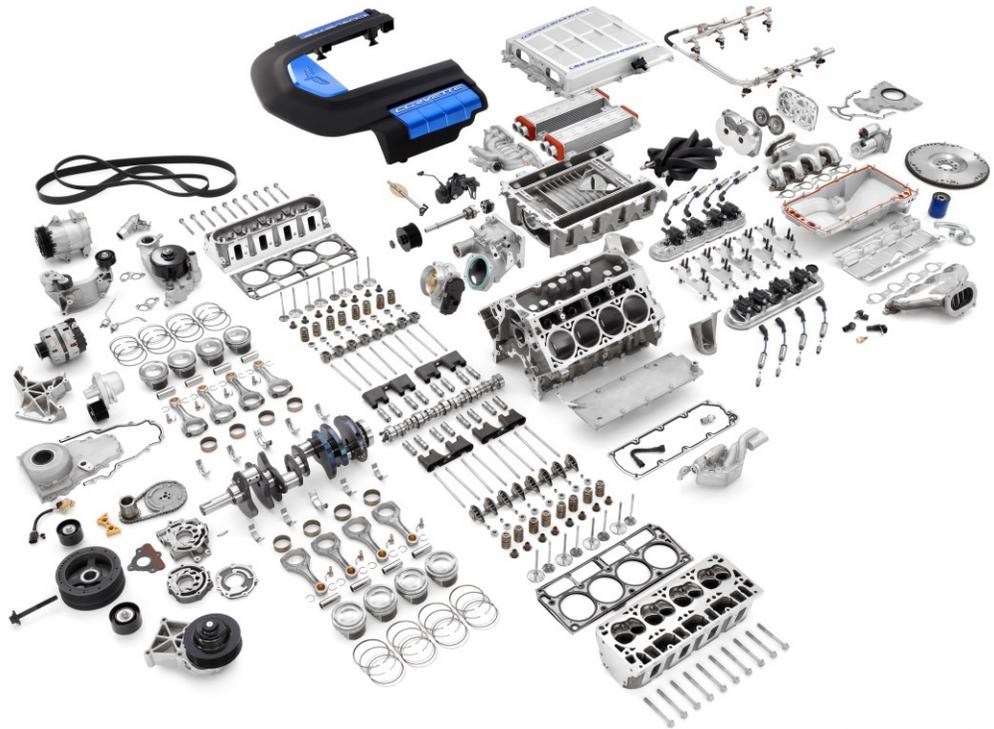
\$1,983 per year

Every dollar saved avoids 1 kg of CO<sub>2</sub>

JRN427 5th Percentile Median 95th Percentile

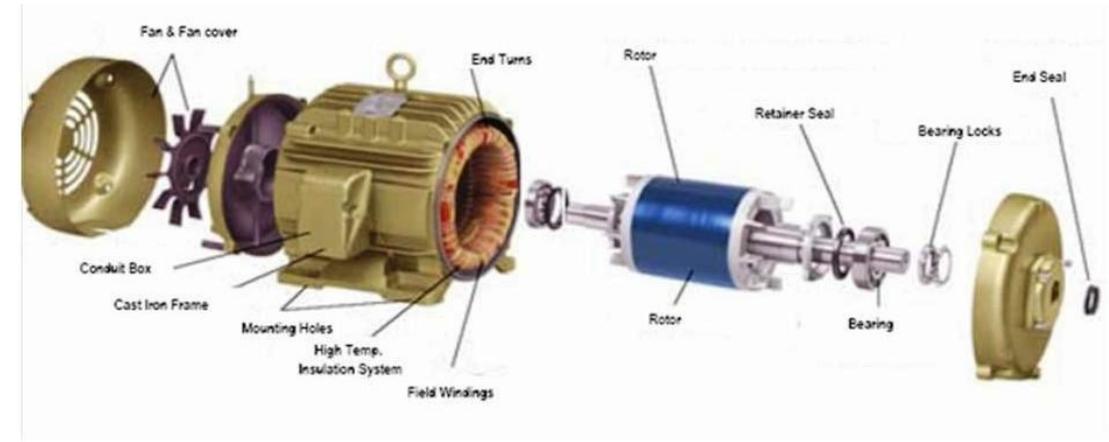
**~2,000  
moving parts**

**~20  
moving parts**

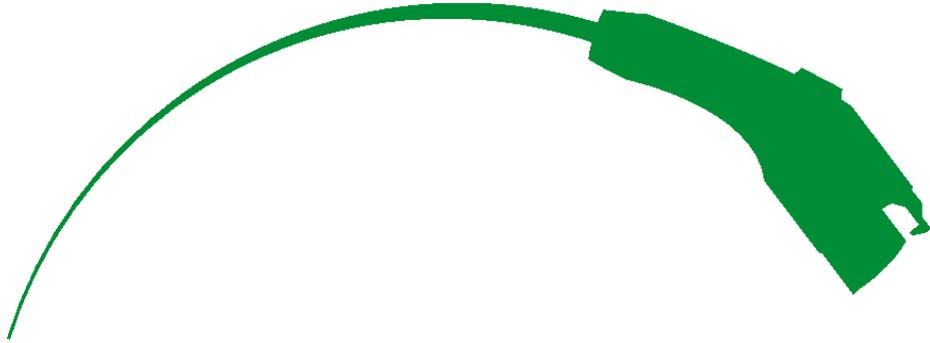


Chevrolet Corvette ZR1

2009 LS9 6.2L V-8 SC (LS9)  
Component Exploded View



**\$0.30/L equivalent**



**FLIP THE FLEET.ORG**



**\$2/L of petrol**

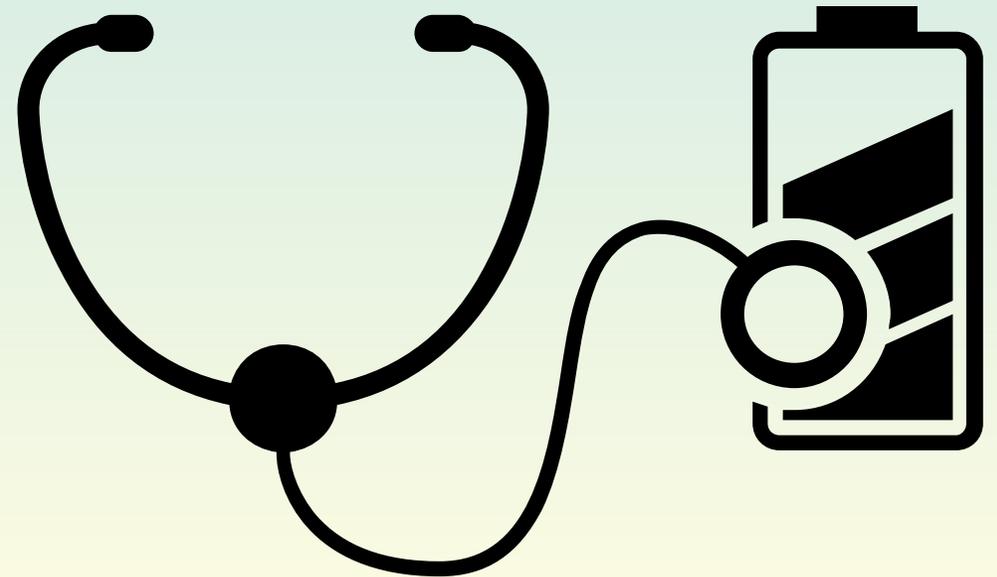
**BEV:** 1 c/km for repairs, maintenance and tyres + 3.6 c/km for electricity = 4.6 c/ km

**Middle-sized ICV:** 6 c/km for repairs, maintenance and tyres + 13 c/km for petrol = 19.6 c/km

BEVs cost ca. 23% as much to run, excluding depreciation and taxes

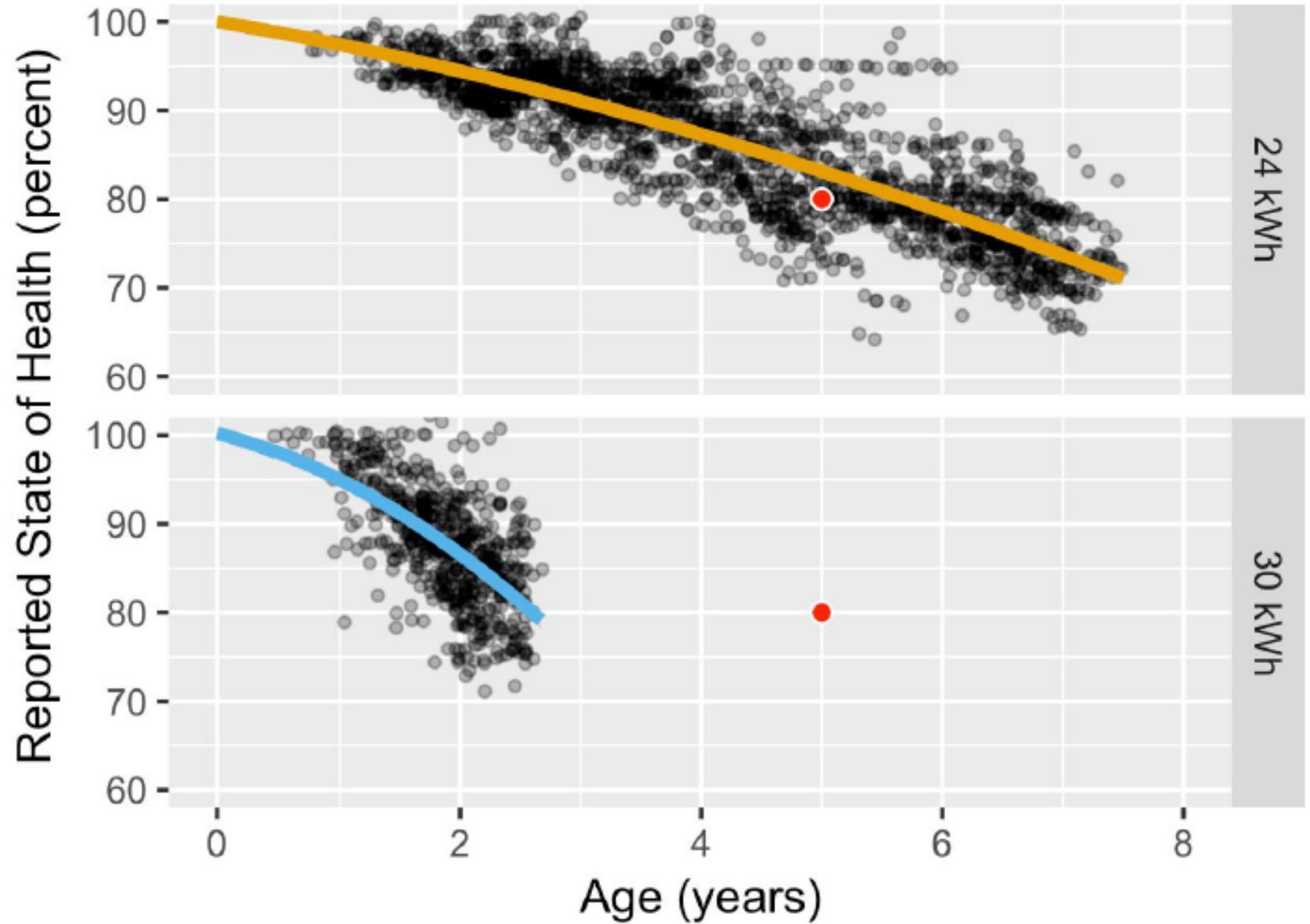
# Battery capacity loss (24 kWh Leaf)

- 2.4% – 3.5% p.a. decay rate
- 6.31 km/kWh in winter
- ‘Minimum practical range’ = 80 km
- 12 – 18 years before battery refurbishment needed



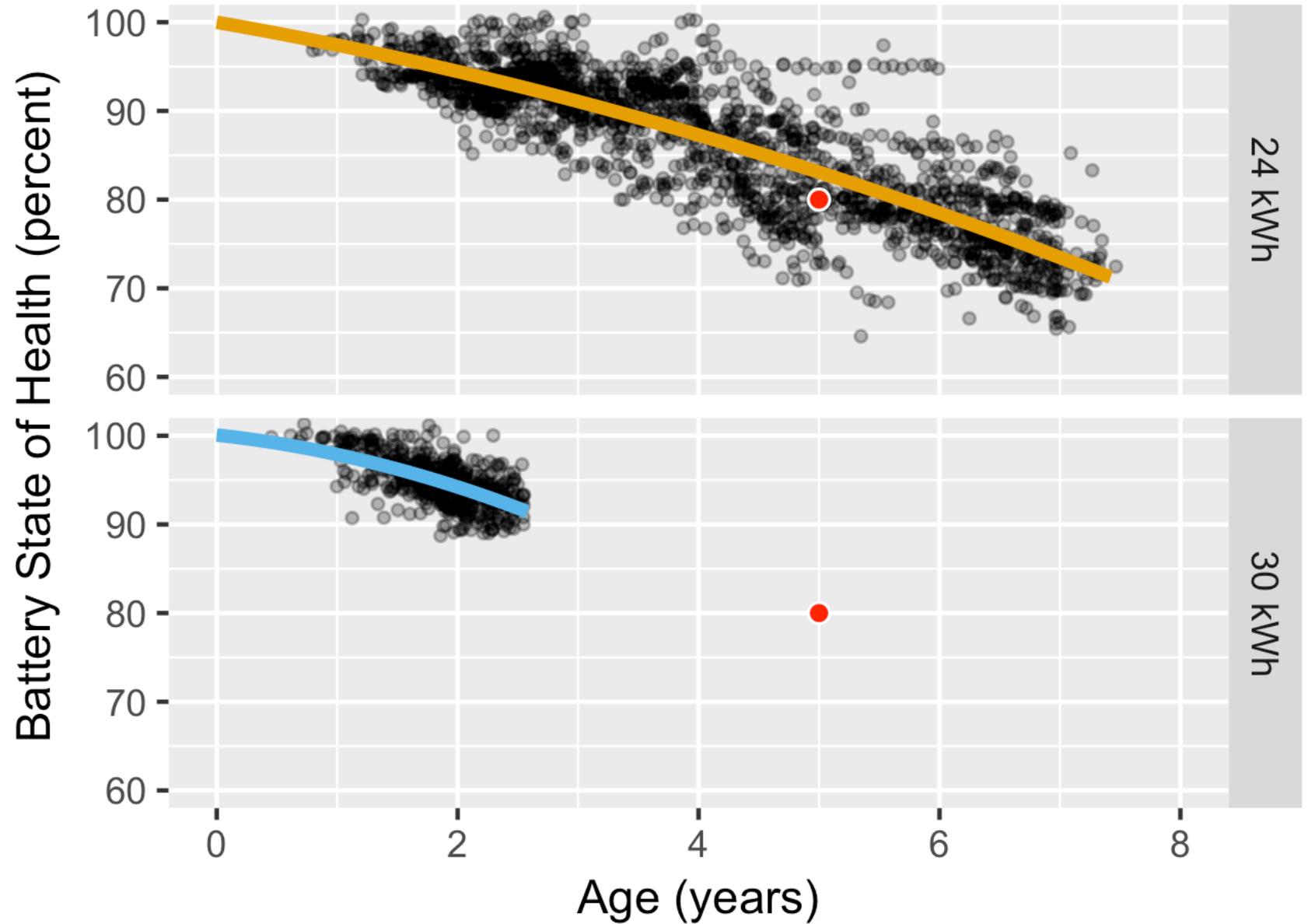
# Battery capacity fade

- key uncertainty
- new technology, uncharted territory
- one half of the “Range anxiety” challenge



**3% battery  
capacity fade  
per year**

Retrospective  
“correction” applied  
to historical *Flip the  
Fleet* data for 30  
kWh Leafs



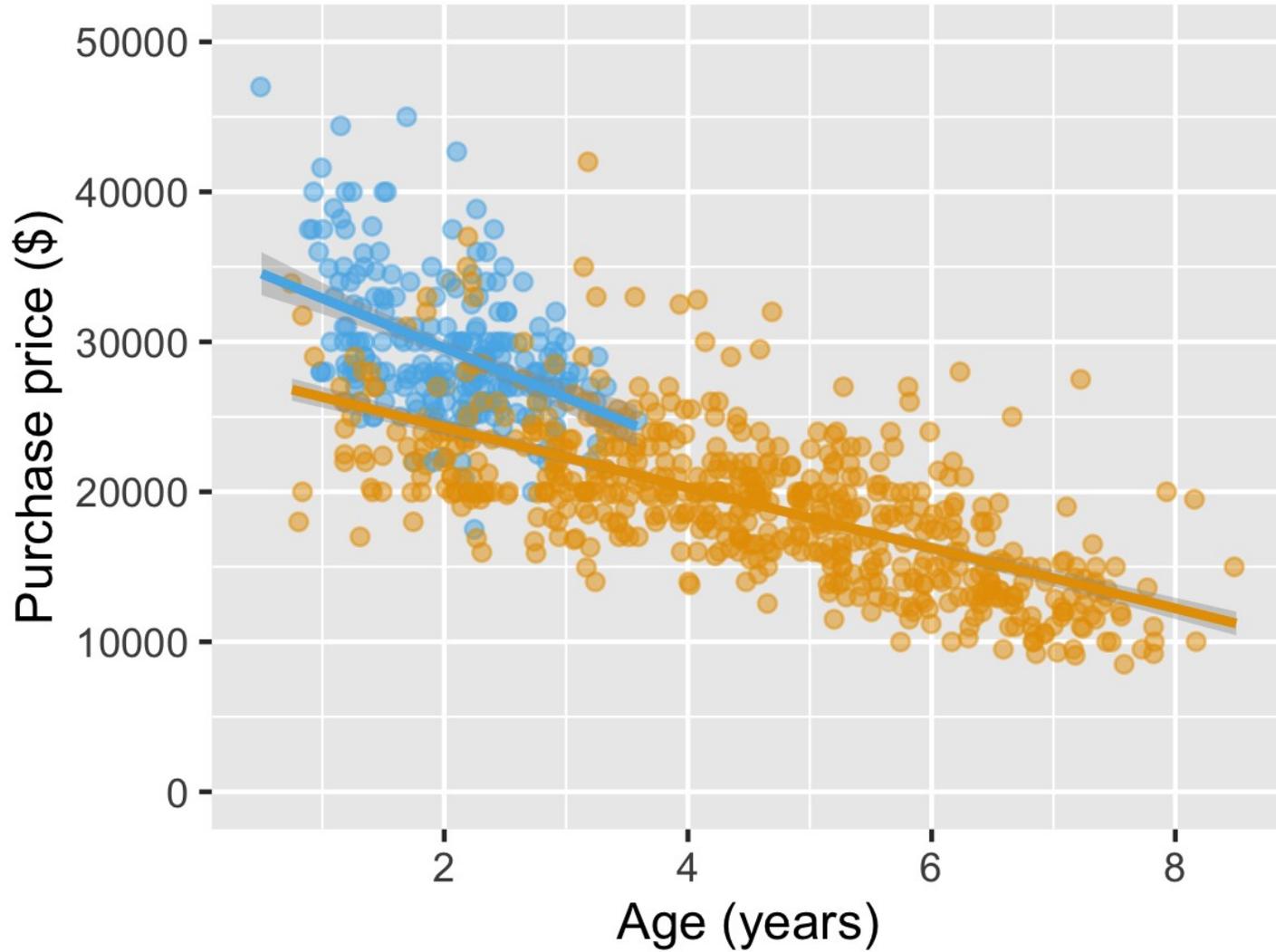
# Battery costs erode EV financial gains

Based on *Flip the Fleet*, June 2018 - Repairs and Maintenance Study

If battery refurbishment or replacement is not included, BEVs cost 13% of cost to repair and maintain compared to ICVs.

Table shows % of repairs and maintenance costs of EV compared to ICV when battery refurbishment or replacement costs are included

	Number of battery replacements				
Cost	1	2	3	4	5
\$4k	31%	49%	66%	84%	102%
\$6k	40%	66%	93%	119%	146%
\$8k	49%	84%	119%	155%	190%
\$10k	57%	102%	146%	190%	234%
\$12k	66%	119%	172%	225%	279%



Model

- 24 kWh
- 30 kWh

Flip The Fleet  
July 2019

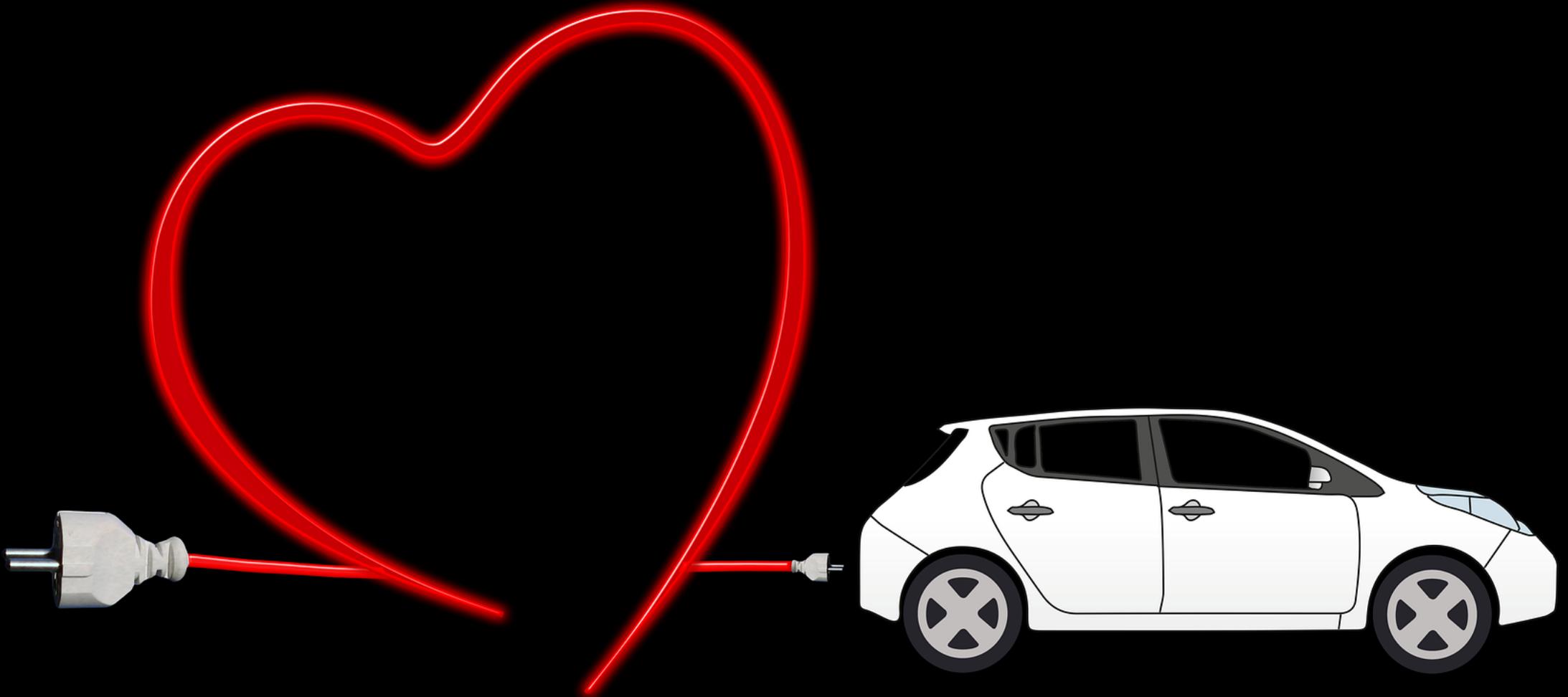
Nissan Leaf  
Purchase cost  
All years combined

**\$2,050 per year**  
(95% uncertainty interval.  
\$1,860 - \$2,240)

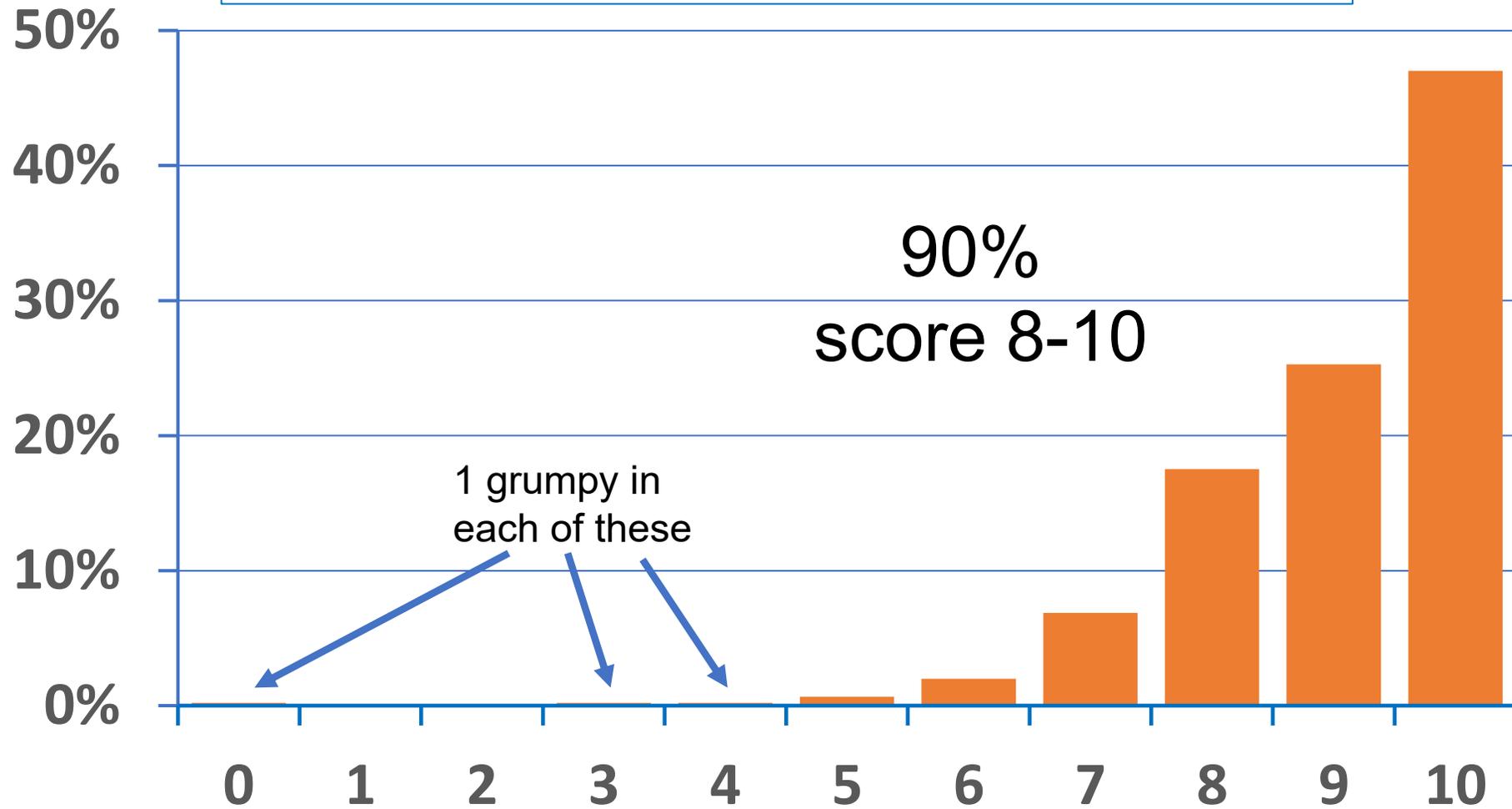
30 kWh \$6,000 dearer

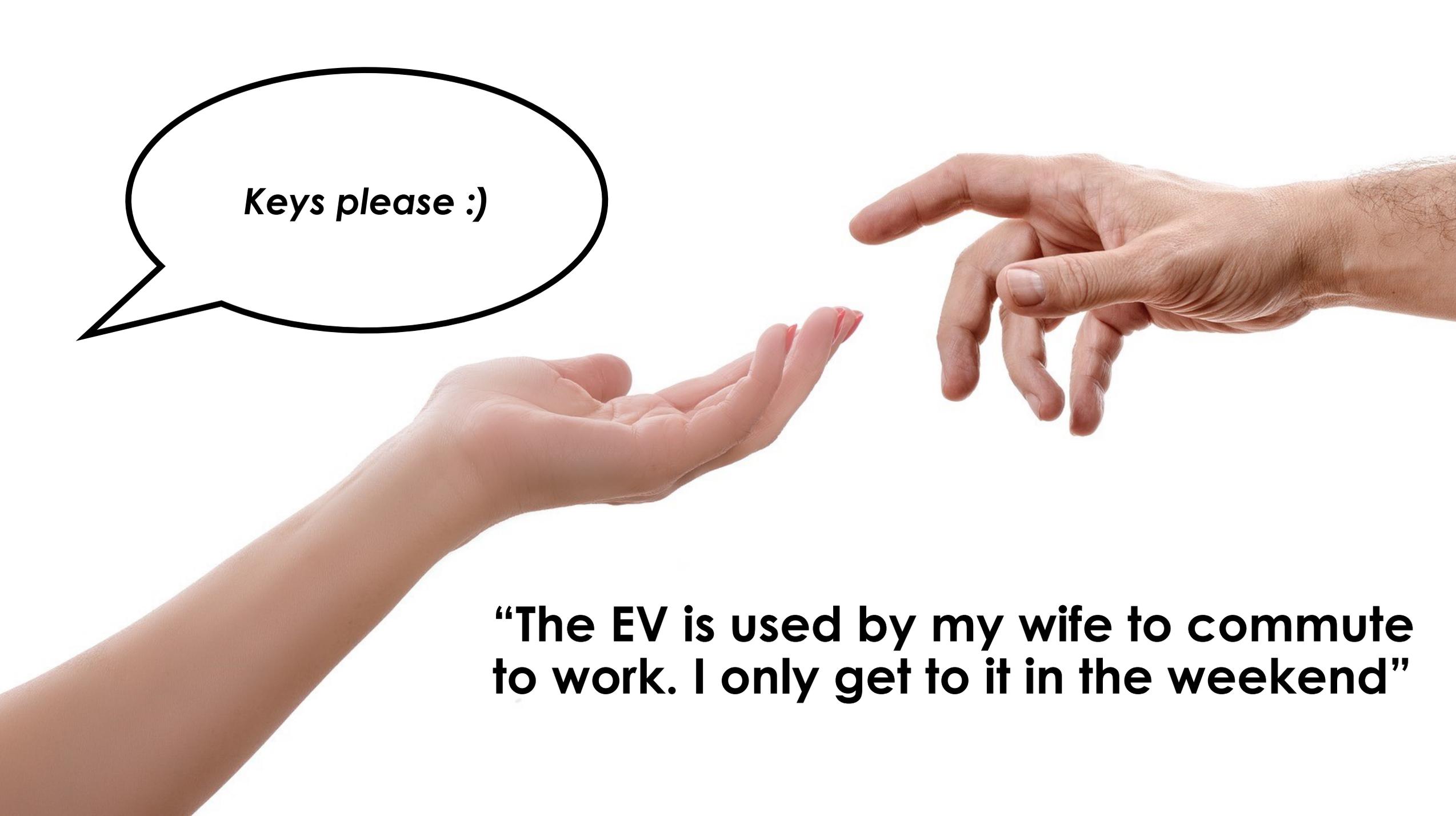
No evidence of  
different depreciation  
rates between variants

***“The longer I use it, the more I love it!”***



EV Satisfaction rating, Sep 2021, n=451



A photograph showing a woman's hand on the left and a man's hand on the right, both reaching towards each other. A speech bubble is positioned above the woman's hand, containing the text "Keys please :)".

*Keys please :)*

**“The EV is used by my wife to commute to work. I only get to it in the weekend”**

**“As I and my wife are both hearing-  
impaired, conversation is possible,  
especially when we drive on hot  
seal roads”  
- 85 year old**

**“I can now afford to visit my grand  
children more often”**



**“Queues, smelly,  
interrupts the  
journey, hurts the  
wallet, tempts the  
tummy”**

A close-up photograph of a blue fuel nozzle. The nozzle has a white circular label in the center with the text "Super 95 E10" printed in blue. The nozzle is positioned next to a grey, textured surface, likely a fuel tank or nozzle holder. The background is a clear blue sky.

**Super  
95<sup>E10</sup>**



# Never Allow Children to Use Pump

Only persons 15 years or older permitted to use pump.  
Keep children away from pump area.

# Do Not Leave Pump Unattended When Refueling



## Health Warnings:

Harmful or fatal if swallowed. Long-term exposure to vapours has caused cancer in laboratory animals.

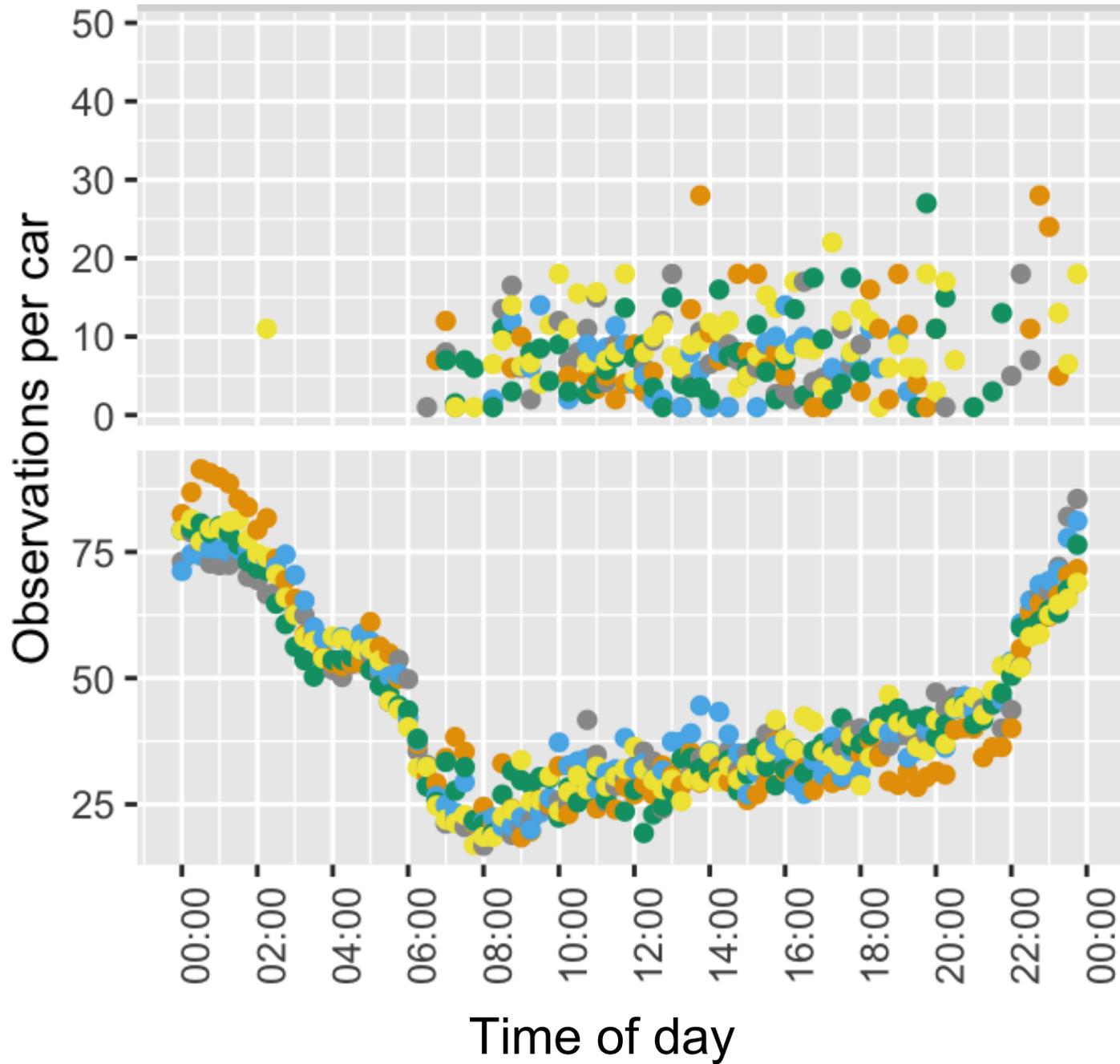
Avoid prolonged breathing of vapours

Keep face away from nozzle and fuel tank

Keep away from eyes and skin

Never siphon by mouth

Failure to use caution may cause serious injury or illness.



# Charging times

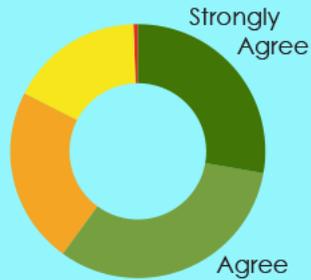
*Rafferty Parker and Ben  
Anderson + Flip the Fleet*

- 42 Leafs & eNV200s
- 572,854 obs.
- Weekdays
- Oct – Dec 2018

Many EVs avoid  
charging in peak  
electricity demand  
periods



## Men miss the Vroom-Vroom



**Over 60%** of respondents agreed that the sexes were equally likely to switch, but they varied widely on why.

Mum gets it: she wants a car that is safe, practical and saves money.

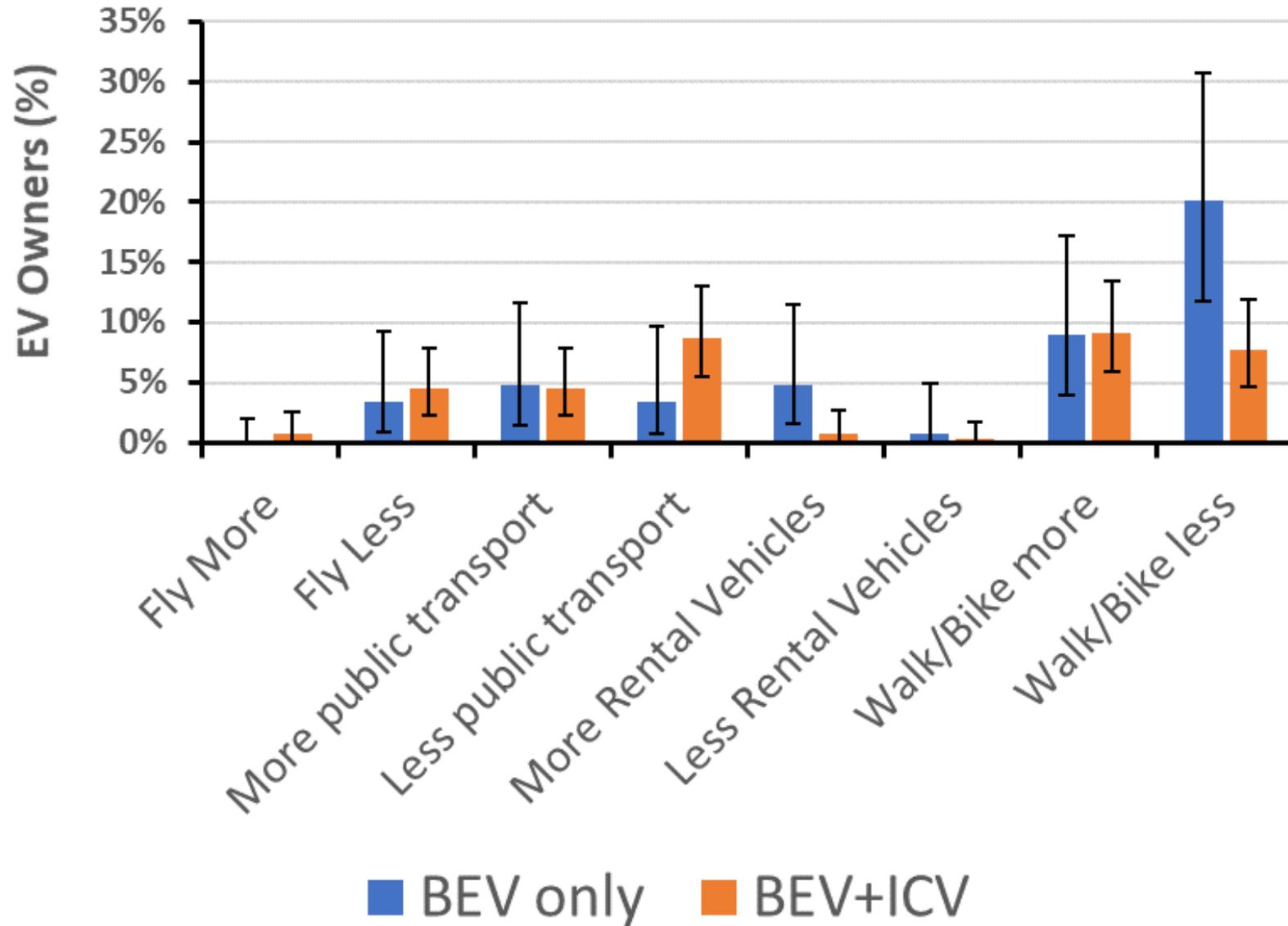
The kids get it... they plug in their phone, computer, headphones so why would you not plug in your car?

The dad is 97.5% likely to be the dinosaur. No noise, no smell, no oil, no mess – how can this be good?

A majority felt that generally men are more comfortable with charging the EV and monitoring its battery condition and range. This may be reflected in women being more prone to "range anxiety".

“I go to the farmer’s market almost every weekend and promote EVs. Typically, you will have Mum, Dad and the kids visit our booth. The kids get it... they plug in their phone, computer, headphones so why would you not plug in your car? Mum gets it: she wants a car that is safe, practical and saves money. Dad rarely, if ever, gets it. No noise, no smell, no oil, no mess – how can this be good? The dad is 97.5% likely to be the dinosaur.”

# Do transport modes change after buying an EV?



Flip The Fleet  
June 2018

483  
respondents

# Prospects for transforming NZ transport

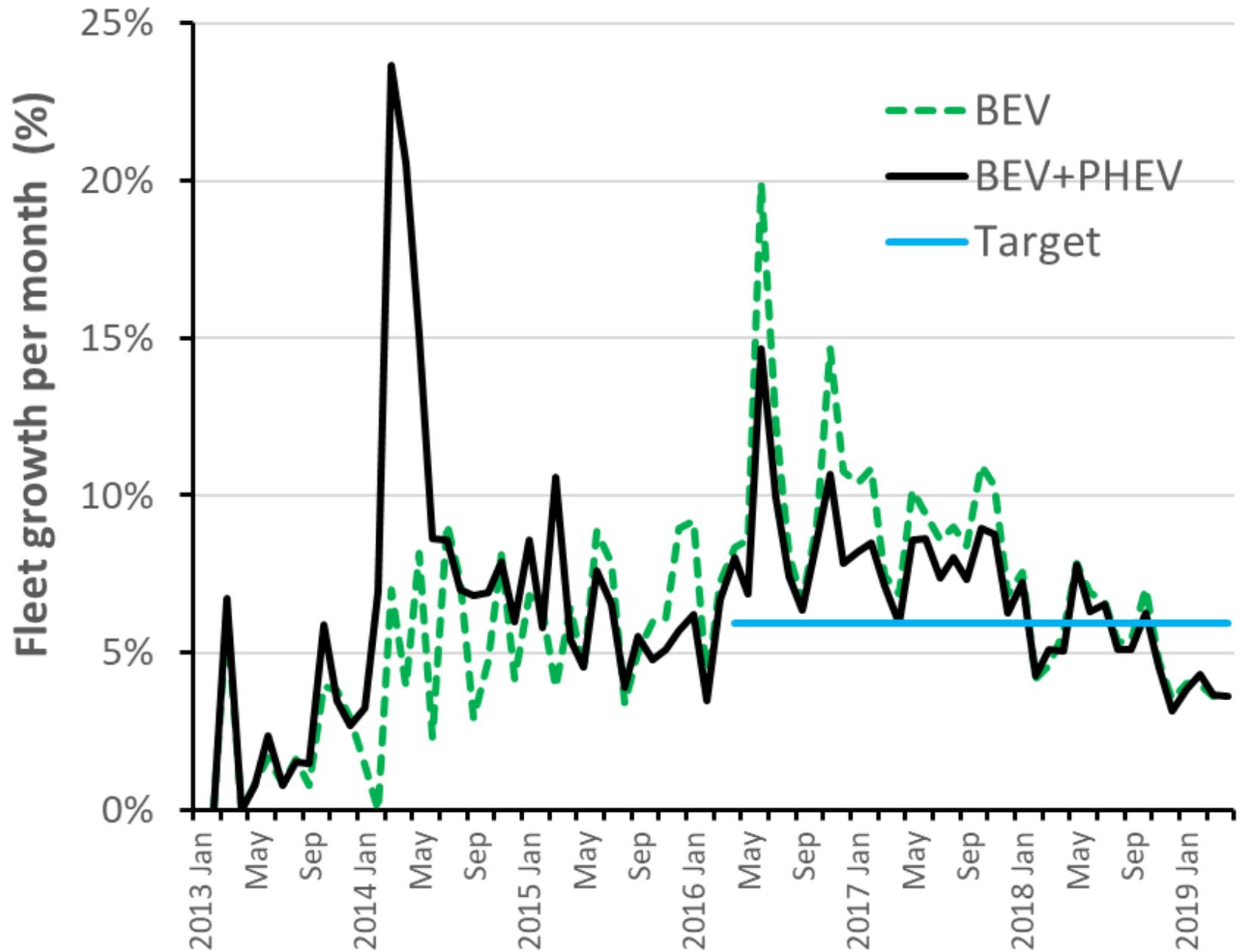
Uptake so far? Barriers and enablers for accelerating uptake?

June 2021

6.45% new registrations

0.85% light vehicle fleet

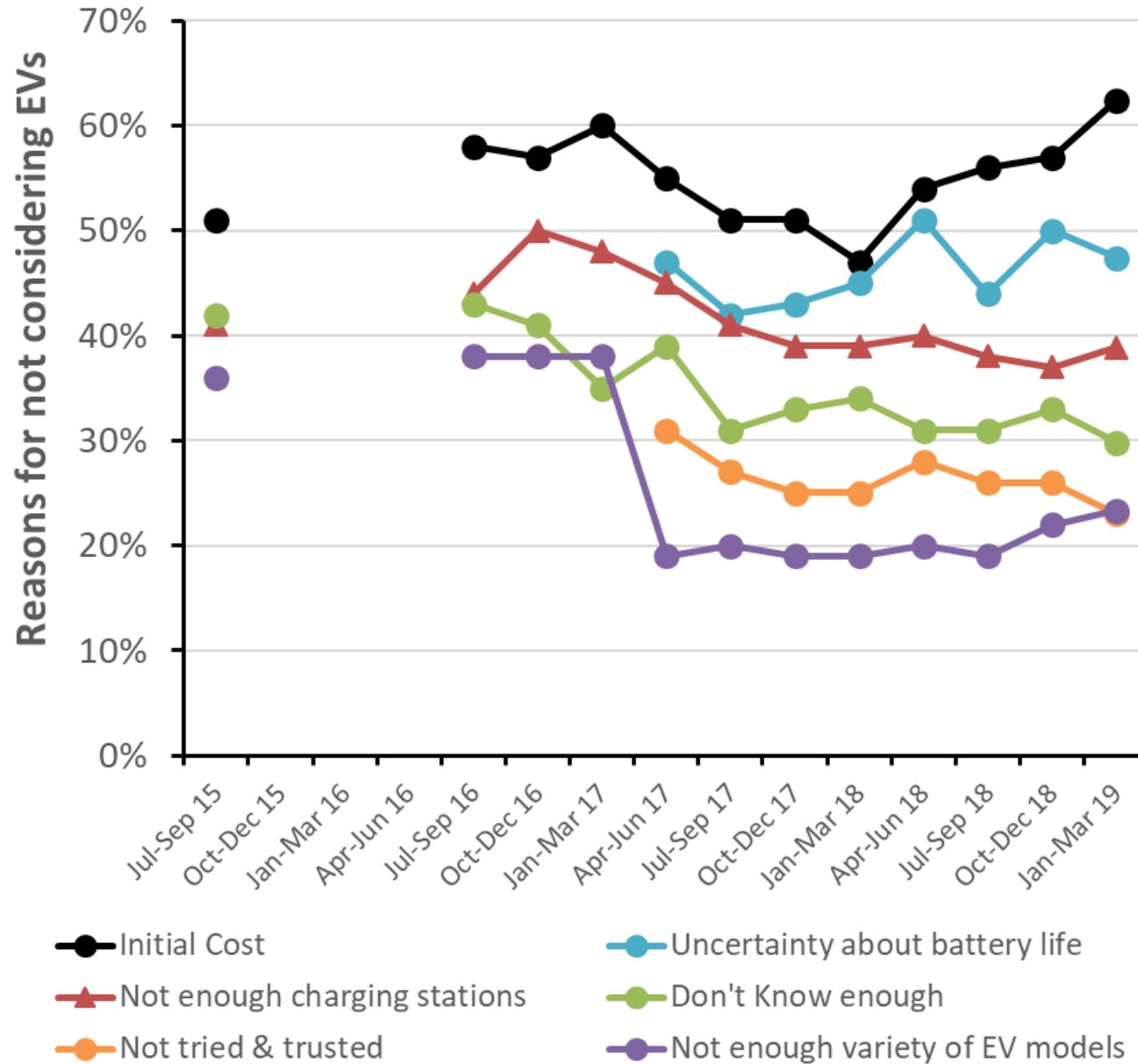
Most are used imports



# Current barriers

- Purchase cost
- Range anxiety
- Sparse charging infrastructure
- Time to charge
- Towing other stuff
- Limited heavy transport options
- Still relatively few low cost models available



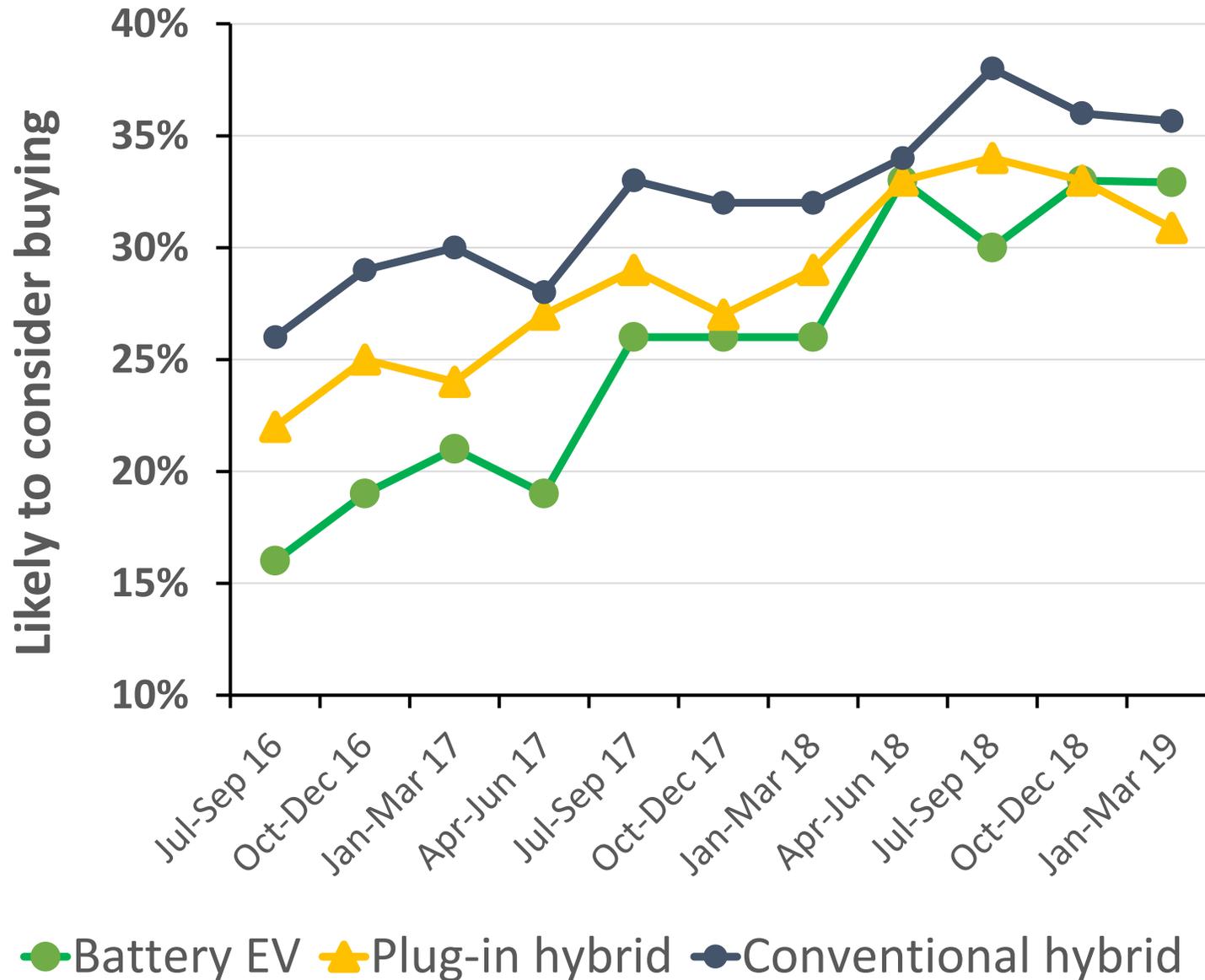


## Trade Me July 2019

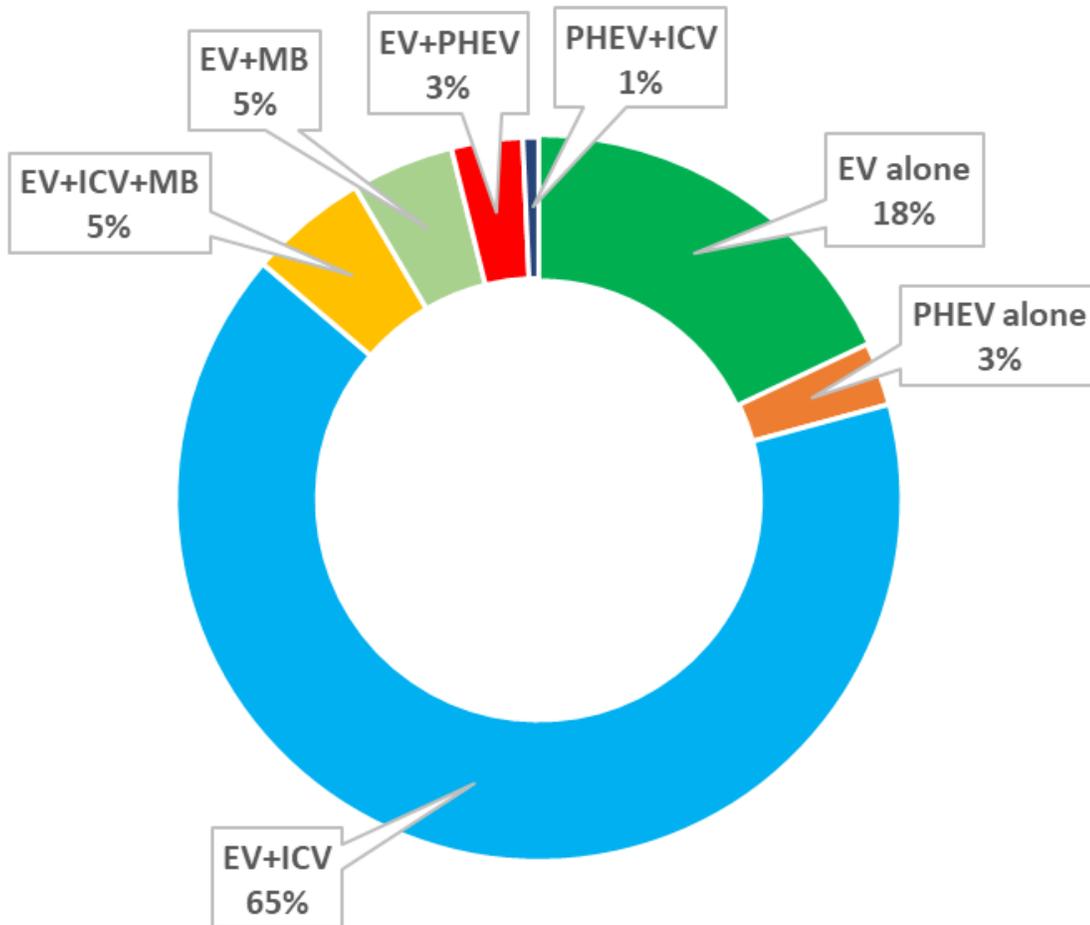
Cost	69%
Range	54%
Battery life	46%

## Trade Me July 2019

74% would consider buying an EV for their next purchase - up from only half of respondents to the same question a year ago



# The “Family Hybrid” pathway to adoption?



Retain an ICV as second vehicle for towing and long trips, transfer most of local travel to the EV

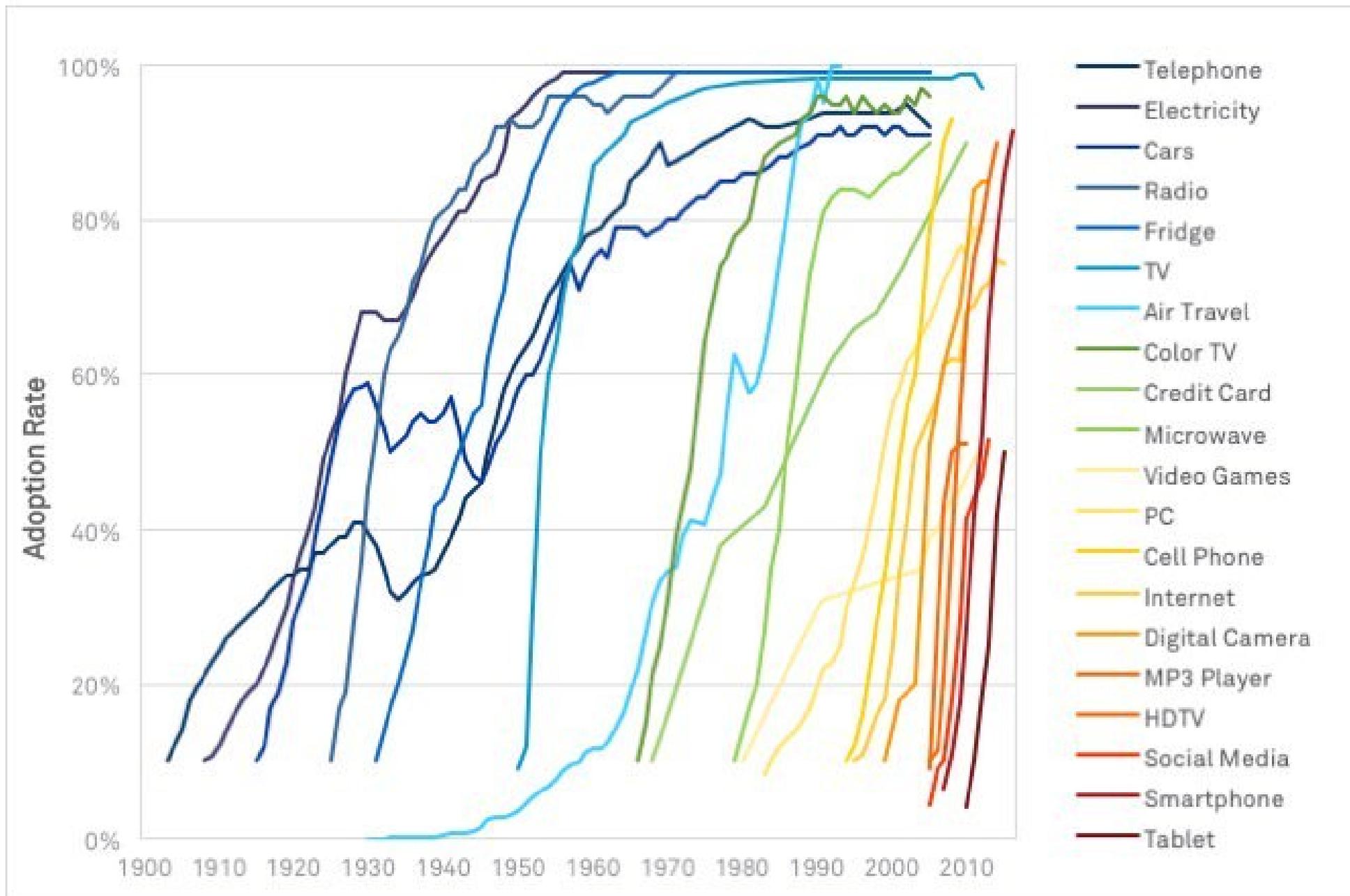
ca. 4 million registered motor vehicles for 4.6 million people

Household vehicles, 2013 census:

- None 8%
- One 38%
- Two 38%
- Three+ 16%

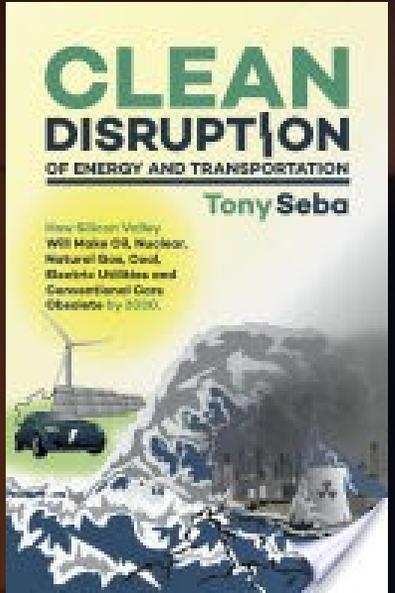
What does EV uptake tell us  
about sustainability transitions?

Resilience. Crisis. Regulation. Equity. Social change.



Source: Asymco

**BLACKROCK**



Why do smart people  
 at smart organizations  
 consistently fail  
 to anticipate or lead  
 Market Disruptions?

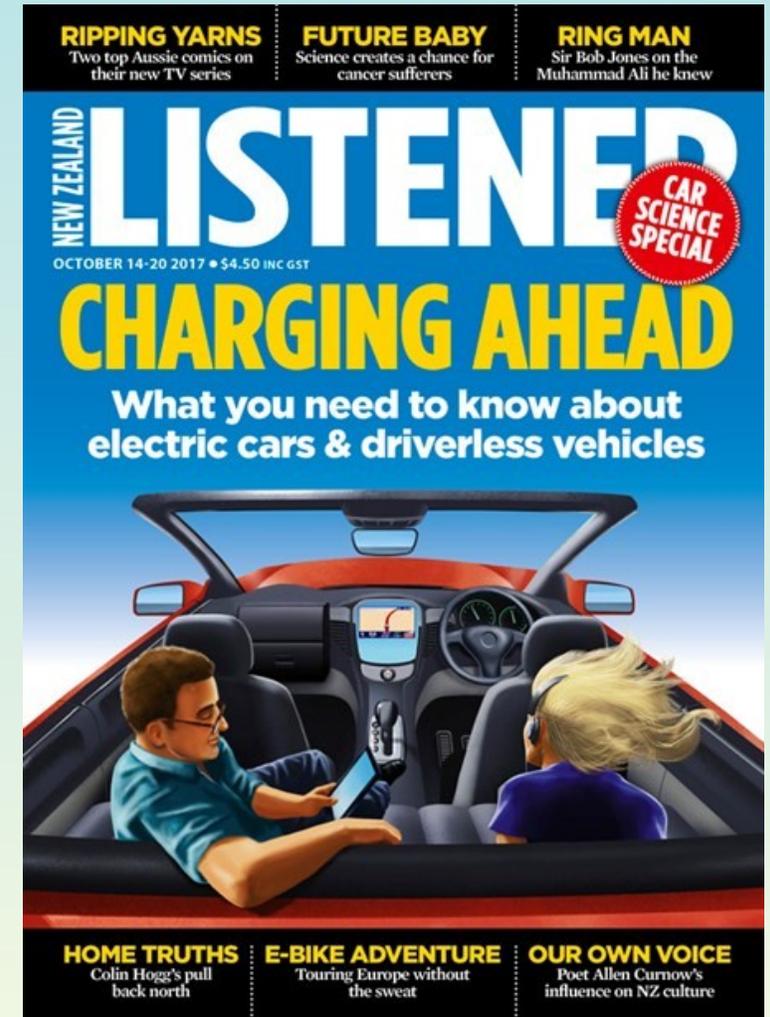


Copyright © 2014 Tony Seba

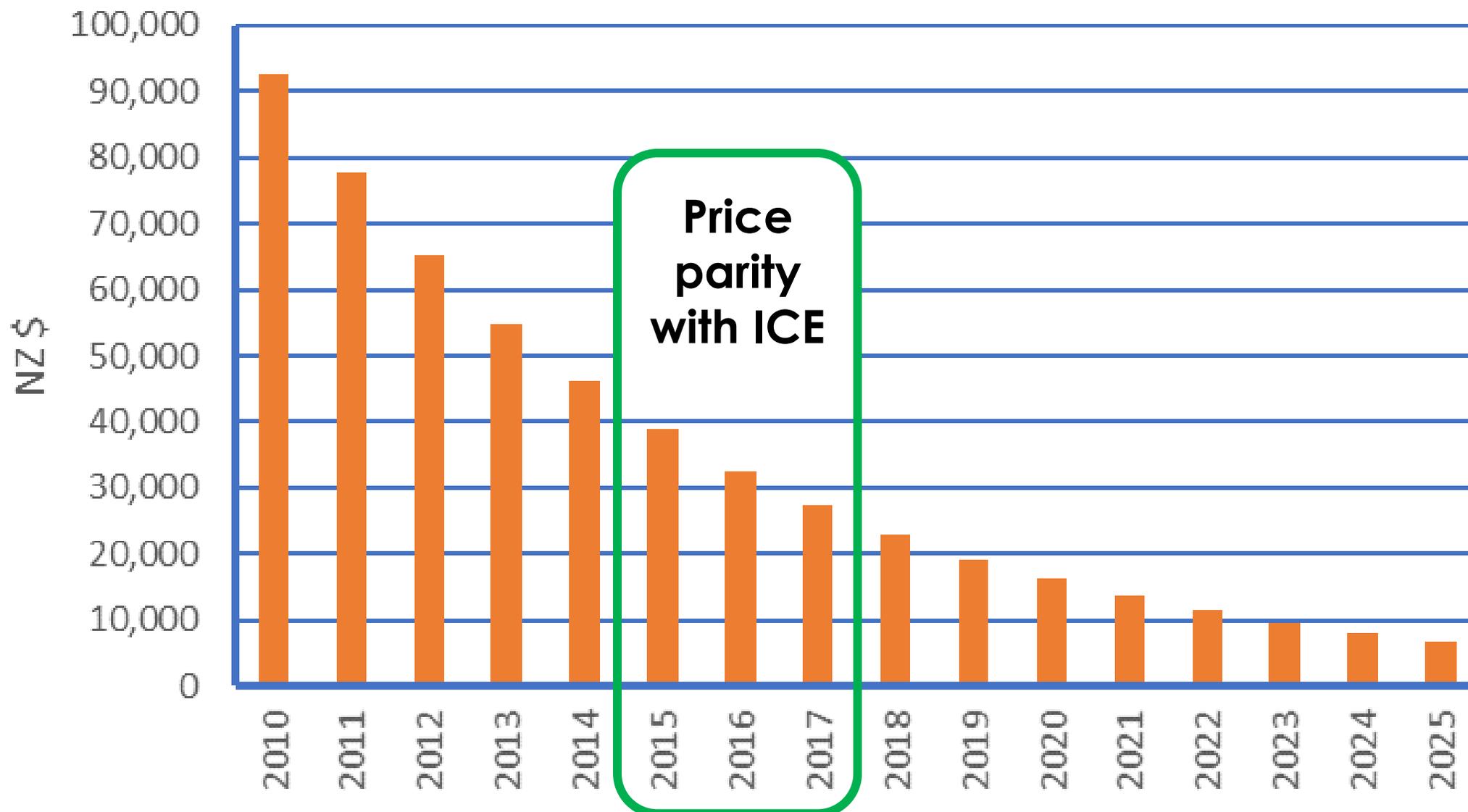


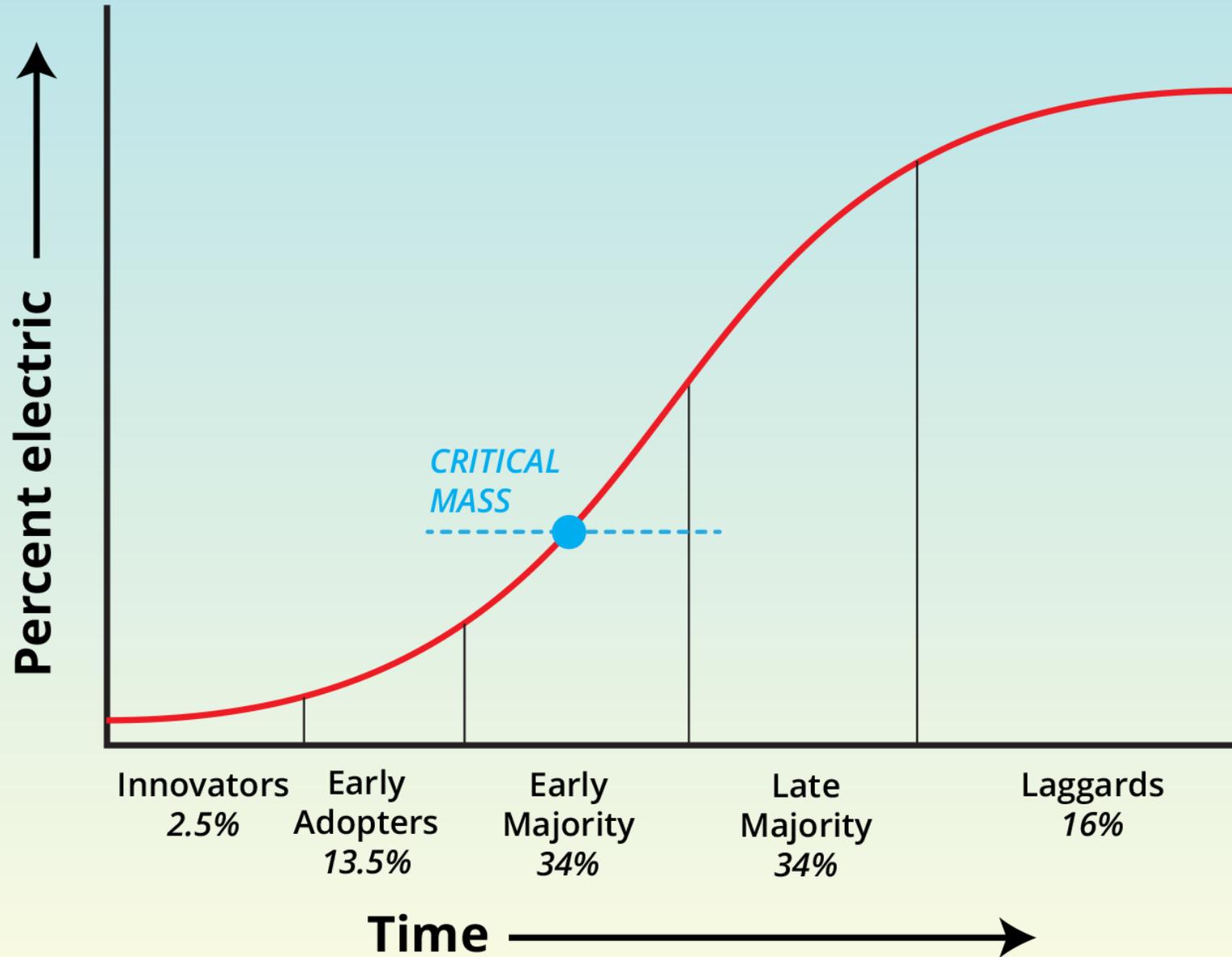
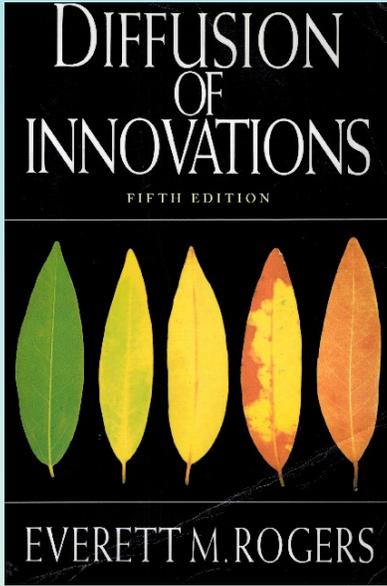
# Driving disruption: technology convergence

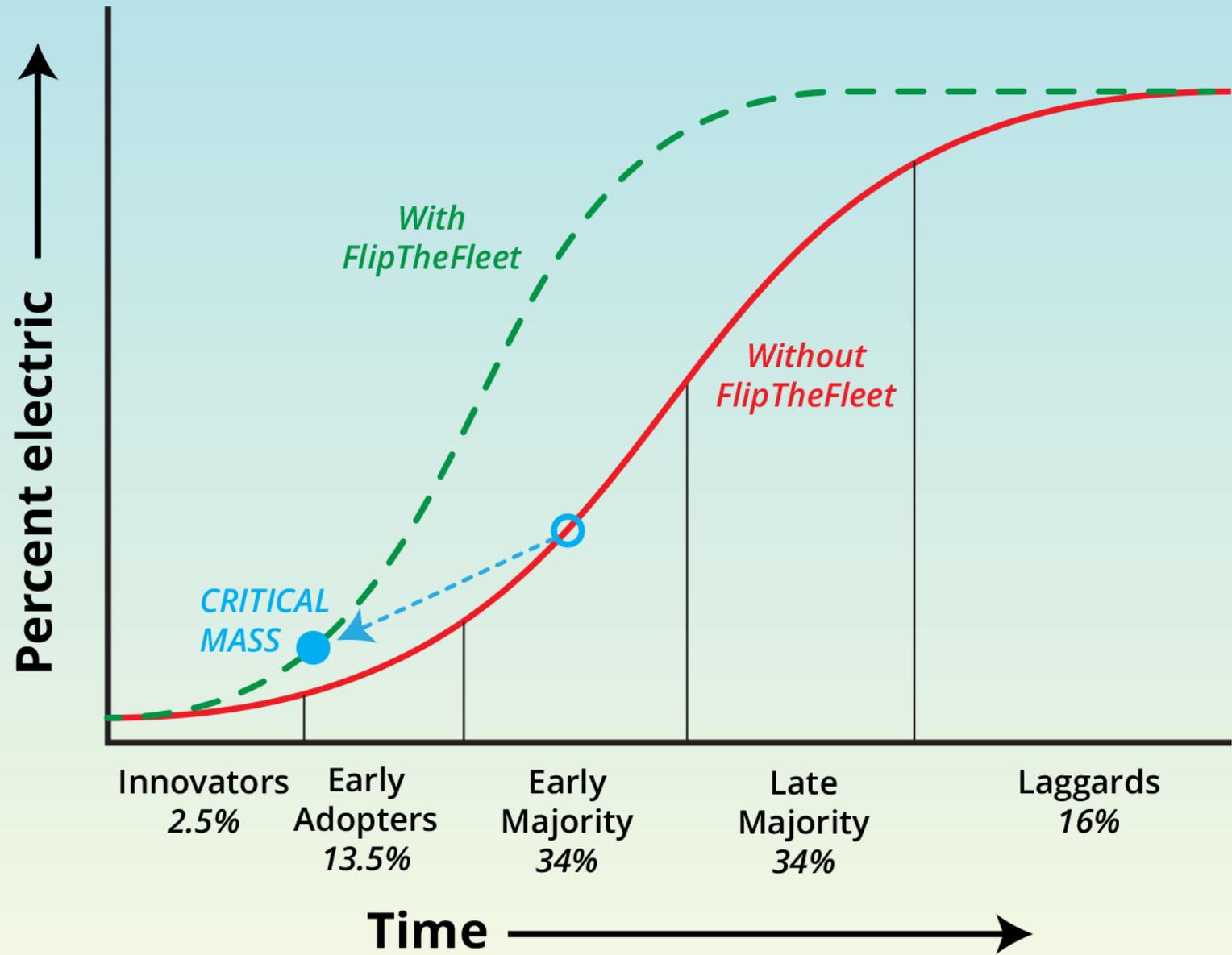
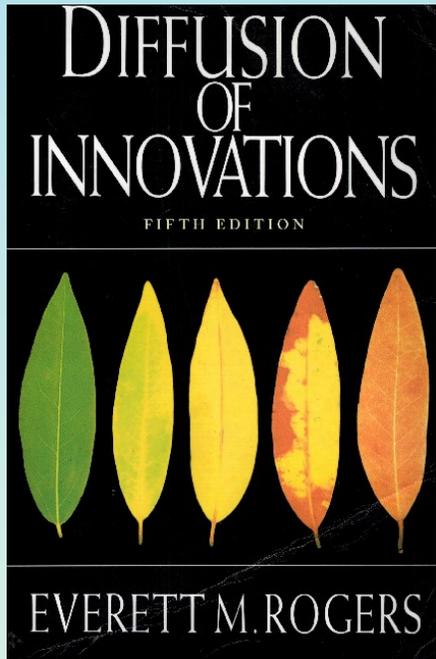
- Battery
- Electric Vehicles
- Solar
- Internet, connectedness  
... ride hailing
- Computing power + Lidar  
... Autonomous cars



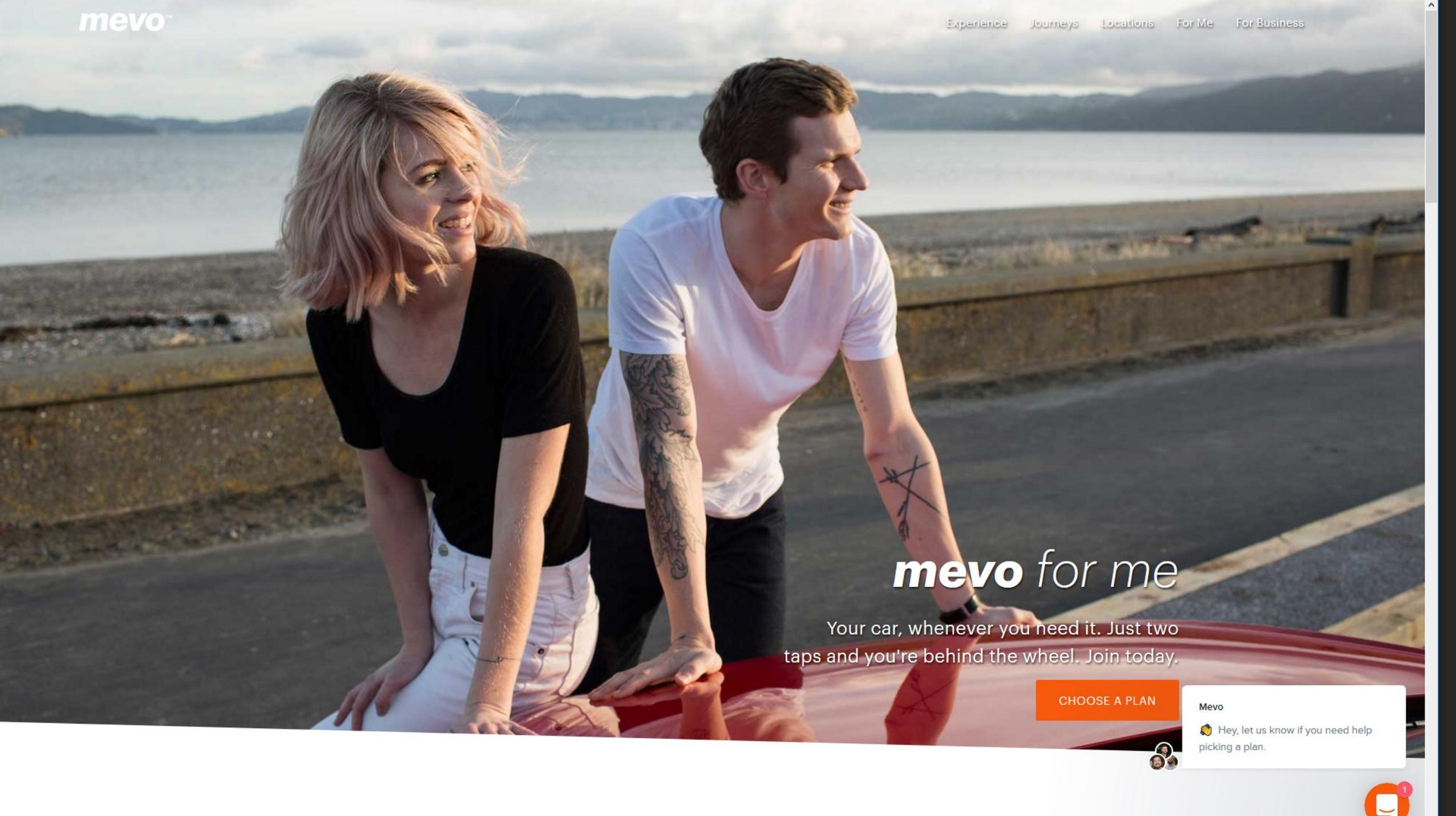
Cost of a 64 kWh battery (needed to drive 400km)











# mevo *for me*

Your car, whenever you need it. Just two taps and you're behind the wheel. Join today.

CHOOSE A PLAN

Mevo

 Hey, let us know if you need help picking a plan.



# Private ownership

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*5% utilisation*

*High initial costs*

*Lots of risk and hassle*



# Leasing

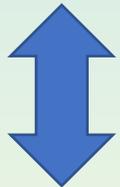
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*>5% utilisation*

*Economy of scale*

*Predictable cost*

*Less hassle*



# Transport As A Service (TAAS)

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*~ 40% utilisation*

*~ 20% of fleet needed*

*Even better economy of scale*

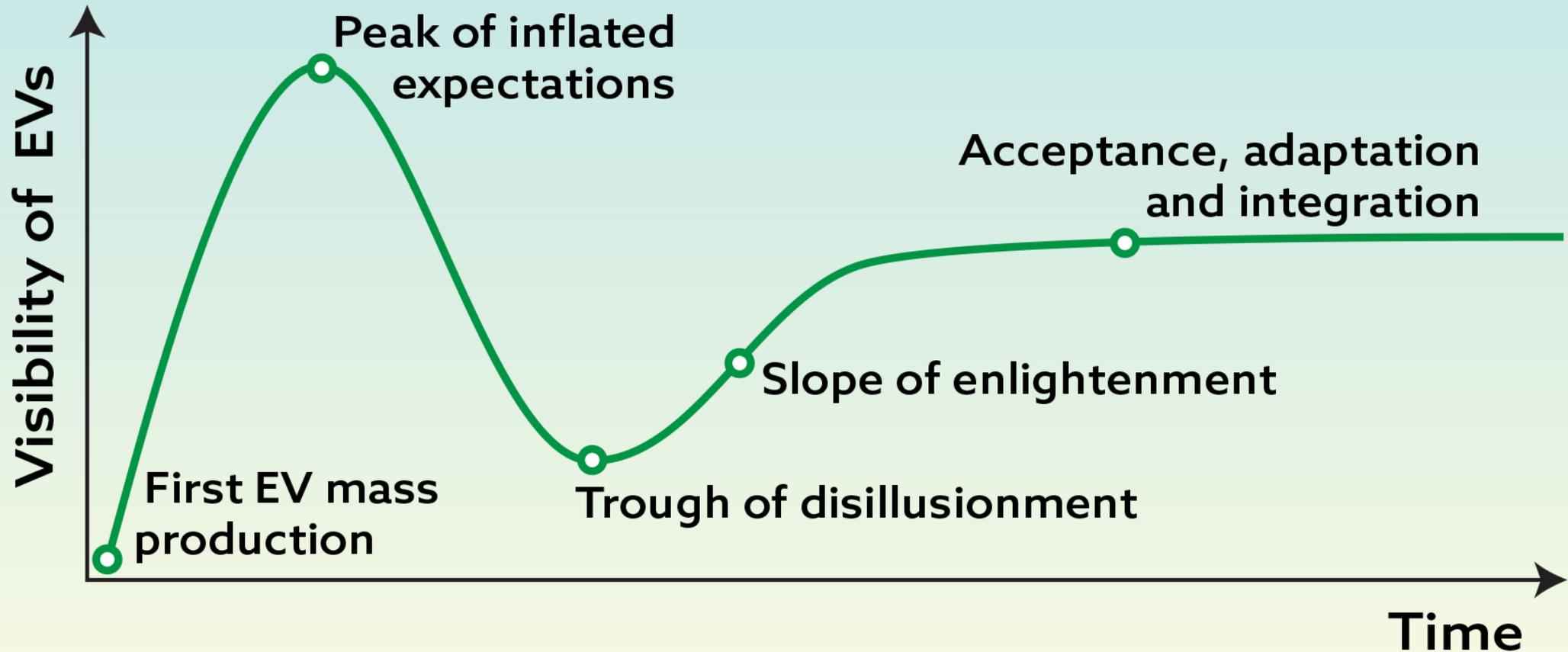
*Pay just for what you need*

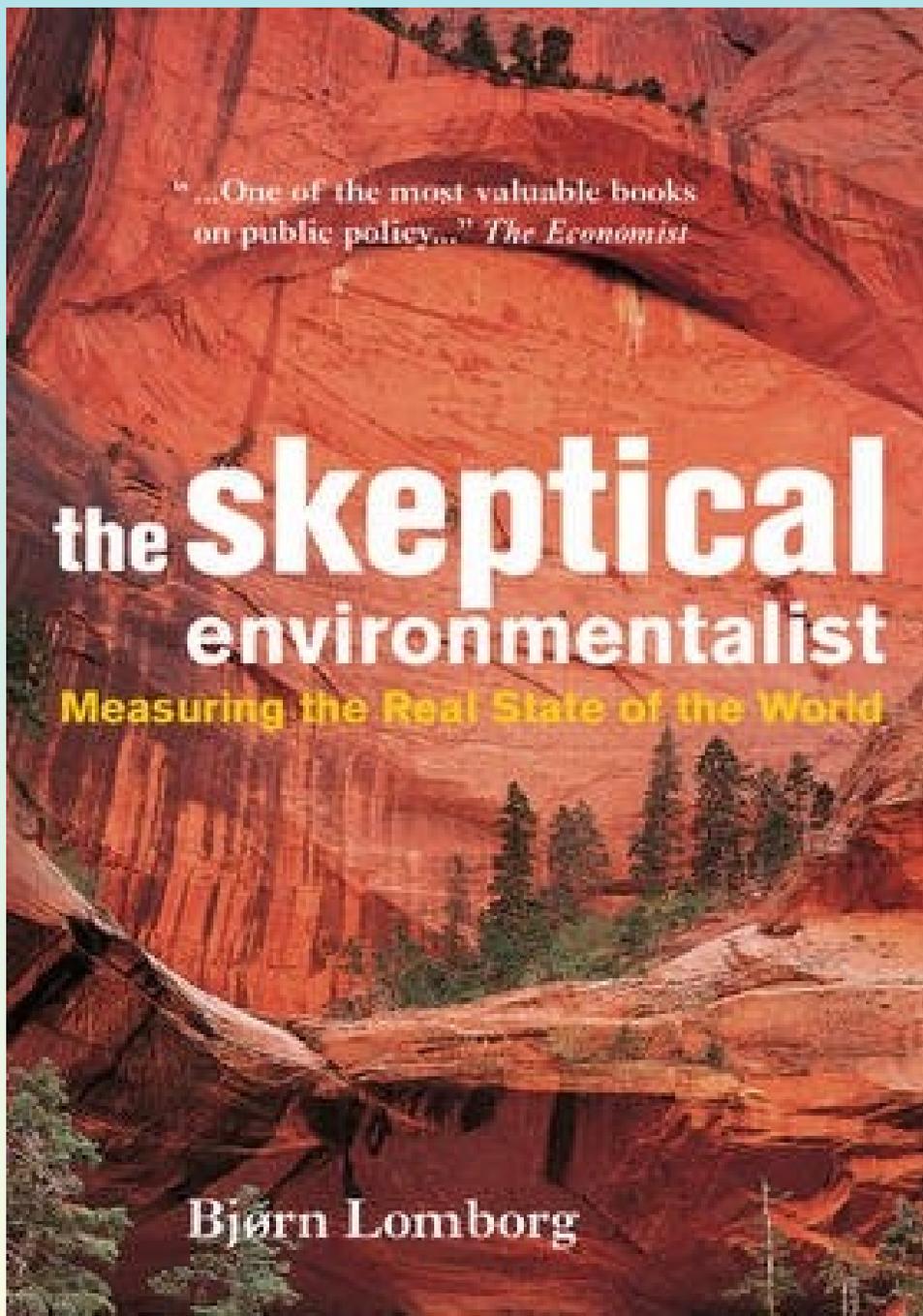
*Even less hassle*

# Stranded assets & business relationships

- ICE vehicles themselves
- Service stations & petroleum distribution infrastructure
- Parking lots
- Insurance
- Mechanics
- Leasing companies as we know them now

## Gartner Hype Cycle for acceptance, adaption and integration of electric vehicles





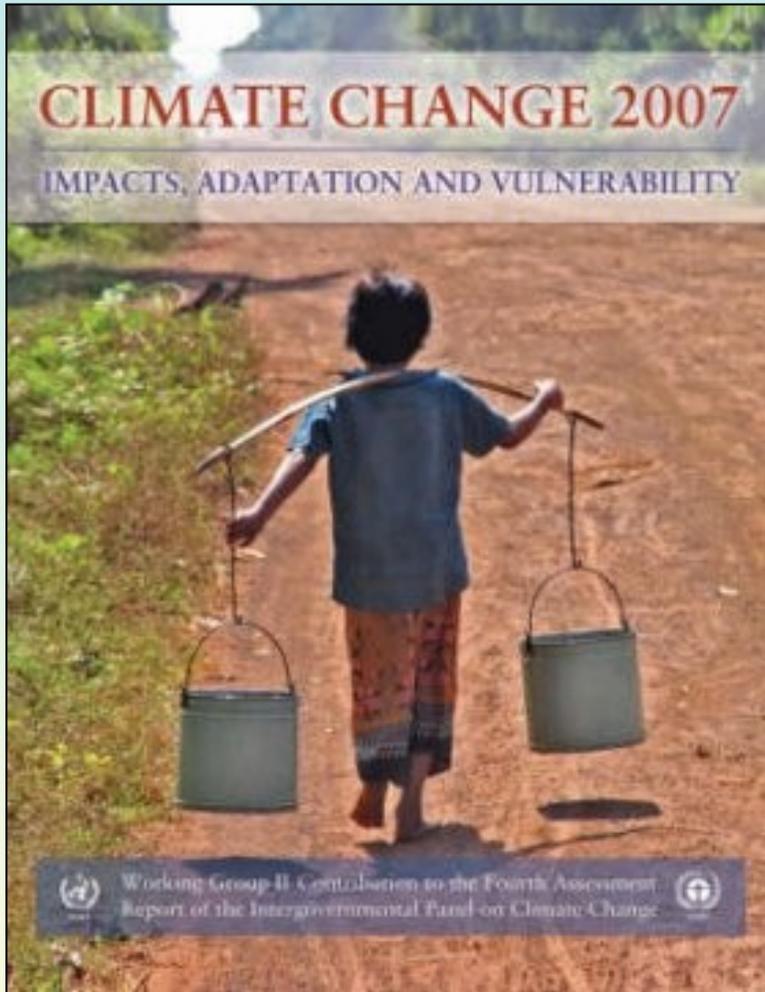
# Bjorn Lomborg's "litany"

2001

515 pages

2,930 endnotes

# Intergovernmental Panel on Climate Change - 4<sup>th</sup> Global assessment 2007

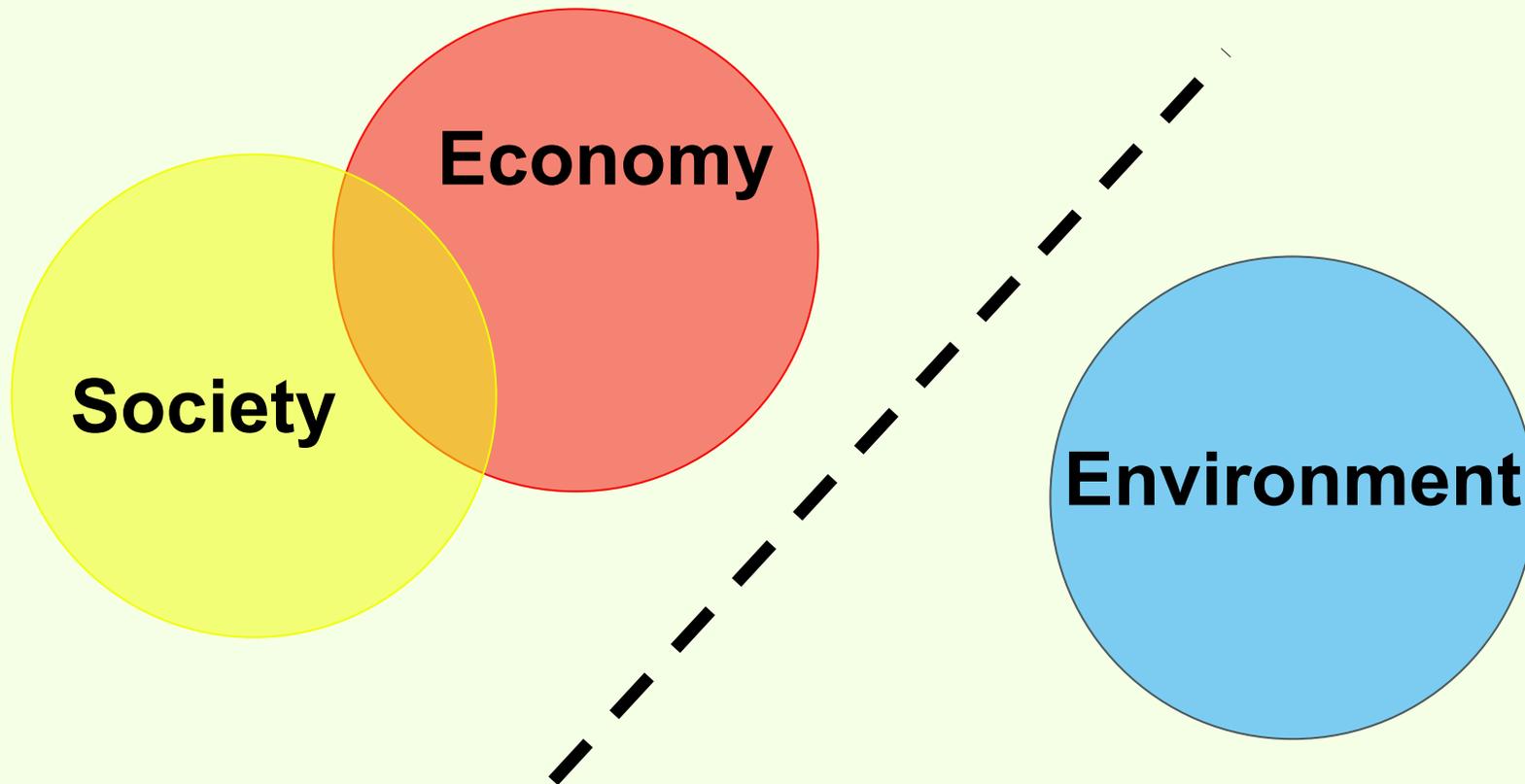


- Reliable knowledge
- ZOD, FOD, SOD
- Review editors
- 1400 expert comments on Australia & NZ Chapter (FOD)
- 543 expert & 189 government comments on SOD

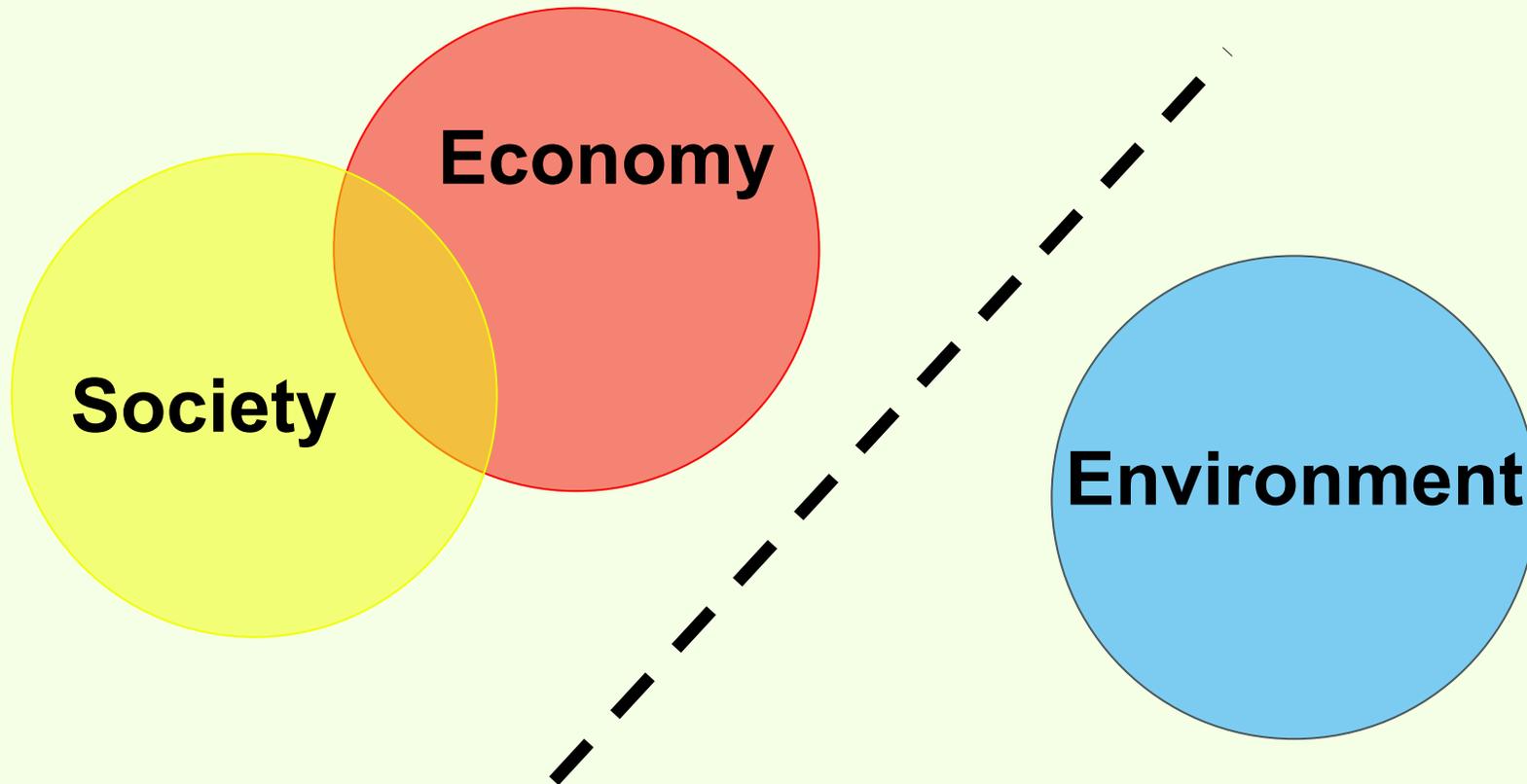
# 'Resilience' thinking .. a better approach than sustainability?

- Going with flow rather than towards a target state
- Focus on what makes systems strong and flexible, rather than on makes them vulnerable
- Ecosystem Management
  - Transdisciplinary systems view
  - People embedded and defining reality
  - Surprise, uncertainty, dynamism
  - Adaptive management
- 'Socio-ecological systems' perspective

# Allocation model for environmental care .. the Treasury's choice



# Allocation model for conservation .. the Treasury's & environmentalist's choice

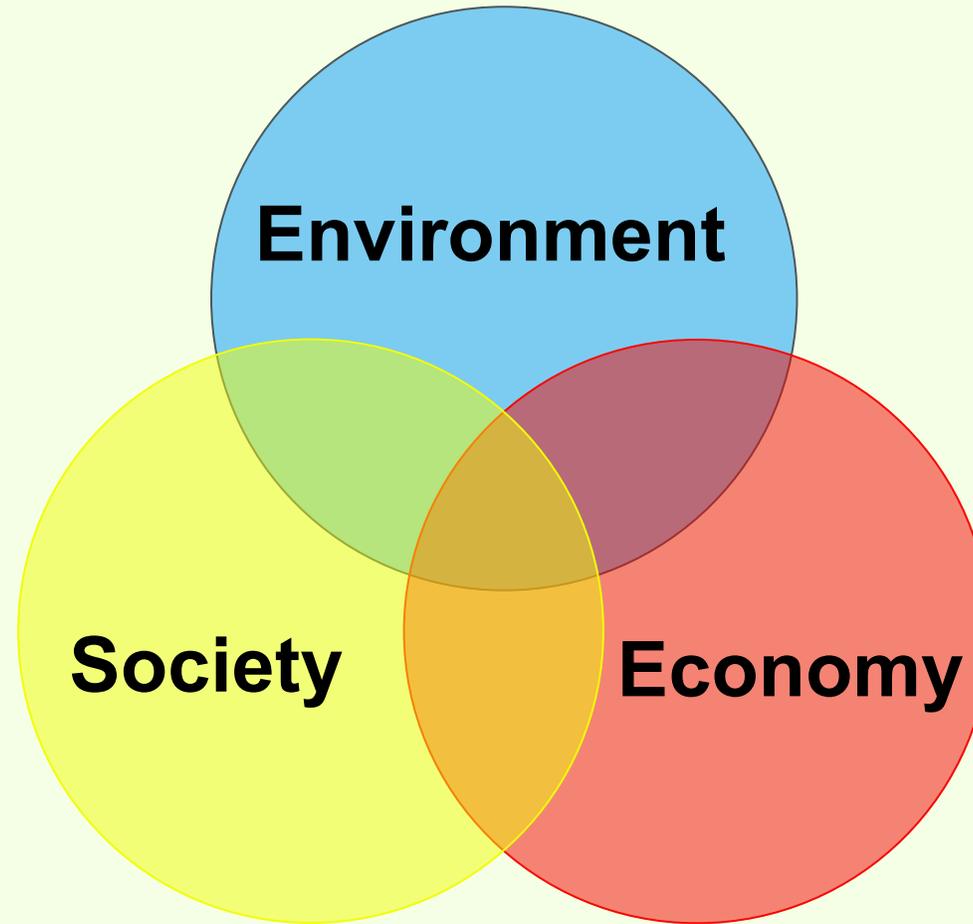


# "Which of New Zealand's political parties do you like the least?"

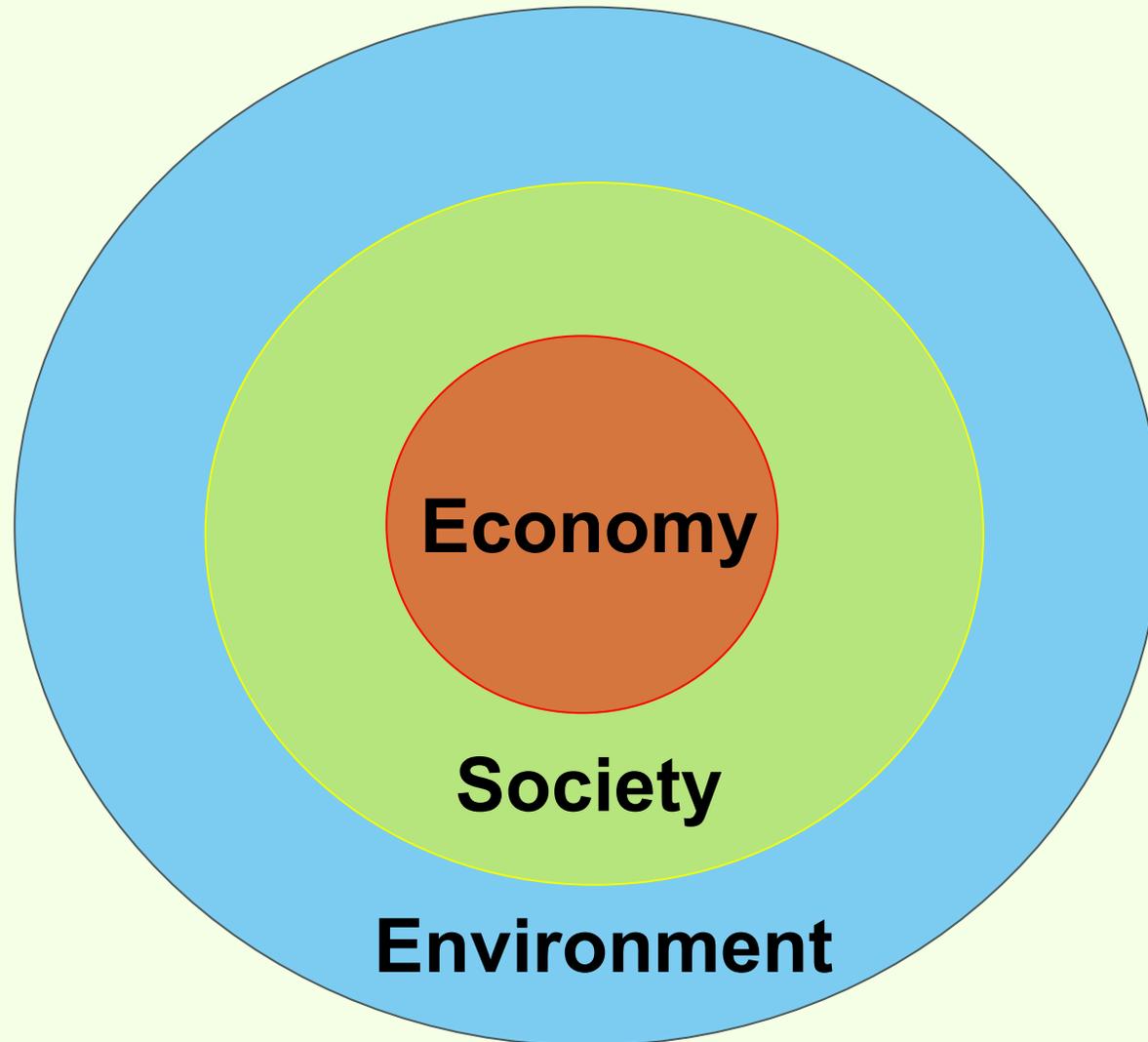
(Otago Daily Times, 22 April 2004, 2002 election)

United Future	0.2 %
Labour	5 %
National	6 %
Alliance	7 %
Progressive Coalition	8 %
NZ First	12 %
ACT	26 %
Green	37 %

The contested interests model  
of environmental care ... 'or' rather than 'and'



# Integrated Model for environmental care ... 'and' rather than 'or'





**Sustainability is a  
“social contract”**

***Ka ora te whenua,  
ka ora te tangata***

***Ka ora te tangata,  
ka ora te whenua!***

# Conclusions: EVs as a solution

- The seeds are set for EVolution
- Demand is ramping
- Supply of EVs is the critical challenge
- Reliance of second-hand imports is a vulnerability
- Guaranteeing affordable battery replacements is the next challenge
- Total cost of ownership looks promising but better quantification and tools are needed to guide investment choices

# Conclusions: Transformation

- Think systems and mobility, not just transport
- Resilience and sustainability together
- Neoliberal model is putting a hand brake on sustainability
- Reframe our environmental paradigm



危 中 機



## CRISIS & OPPORTUNITY

"Opportunity is always present in the midst of crisis." The Chinese word for crisis carries two elements, danger and opportunity. No matter the difficulty of the circumstances, no matter how dangerous the situation, ... at the heart of each crisis lies a tremendous opportunity. Great Blessings lie ahead for the one who knows the secret of finding opportunity within each crisis.



# Thank you

**The Flip the Fleet Team:** 2000+ EV owners • Dima Ivanov • Henrik Moller • Daniel Myall • Vasily Levshin

**Advisors:** Walter Larason • Mark Nixon • Donald Love • Mike Bourke • Kathryn Fitzpatrick

**Information sharing:** Saffron Byron (EECA), Janet Stephenson (Centre for Sustainability, University of Otago)

**Funders:** Low Emission Vehicle Contestable Fund • Energy Efficiency & Conservation Authority • Office of the Parliamentary Commissioner for Environment • Otago Museum & the Science into Action partnership • Unlocking Curious Minds

# DRIVE THE FLEET.ORG

