RACE for 2030

RELIABLE
AFFORDABLE
CLEAN
ENERGY

N1: Fast Track

Business Fleets and EVs:
Taxation changes to support home charging from the grid, and affordability

Final Report 2022

Project partners

Griffith UNIVERSITY

MONASH University

VICTORIA State Government

NSW GOVERNMENT

agl

Government of South Australia

AFMA AUSTRALASIAN FLEET MANAGEMENT ASSOCIATION

energy efficiency COUNCIL

What is RACE for 2030?

The Reliable Affordable Clean Energy for 2030 Cooperative Research Centre (RACE for 2030) is a 10-year, $350 million Australian research collaboration involving industry, research, government and other stakeholders. Its mission is to drive innovation for a secure, affordable, clean energy future.

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1 Executive Summary

This project investigated how tax changes can accelerate the uptake of battery electric vehicles (BEVs) within business fleets by encouraging home charging. The project recommends 17 short-term and long-term tax changes that can accelerate the uptake of business fleet BEVs and encourage home charging.

Business fleets are an effective pathway for early adoption of BEVs but the availability of workplace charging infrastructure is low. Businesses will not invest in workplace charging infrastructure when fleet managers are not choosing BEVs. Fleet managers decide which vehicles to purchase on a range of criteria including Total Cost of Ownership (TCO). Currently there is a wide cost gap between the BEV and an equivalent internal combustion engine vehicle (ICEV), meaning BEVs are not cost competitive.

Some countries, like Norway and the Netherlands, address this capital cost gap through a combination of reform to taxation policy and tax rates; government subsidies and rebates; and regulation. In many overseas jurisdictions, business fleets are the major buyers of BEVs. In Australia, businesses account for around 40% of light vehicle sales. However, EV sales to business fleets comprised a mere 488 vehicles in 2020, or 0.08% of business sales of passenger and light SUV sales.[1]

The project's findings suggest that federal taxation laws for cars can be a cost disincentive for the uptake of BEVS in business fleets. Findings also indicate that there are very few BEVs available in Australia which are 'fit for purpose'.

A 2020 business fleet survey indicated home charging would need to be considered because "over 47% (34,688 fleet vehicles) of passenger car and SUV business fleets are home garaged."[2] In another 2020 survey, 86% of respondents regarded home charging as the "top priority" highlighting the importance of "convenient access" to charging infrastructure which will influence consumers' attitudes towards electric vehicle purchases.[3] This project acknowledges that home charging business fleet BEVs has been disregarded, which is problematic when it is the key source of charging for most BEVs.[4]

Research for this project included:

1. Fleet manager interviews.
2. Fleet manager and fleet employee test surveys.
3. Fringe Benefit Tax (FBT) case studies that explore short-term tax changes for home charging of BEVs.
4. Discussion on income tax literature and legislation to determine short-term tax changes.
5. Modelling of selected tax changes for impact on total cost of ownership.
6. Discussion on overseas jurisdictions literature for FBT and income tax for long term tax changes.

1. Fleet manager interviews

The method of interviewing fleet managers generated qualitative data. This data was then used to underpin taxation changes which support home charging and facilitate BEV affordability.

Most interviewees had given thought to the impact of fringe benefits tax (FBT) on employees' home charging. The trend of opinion was that FBT liability was a discouragement for home charging, while noting the FBT exemption for utility vehicles. In relation to income tax most interviewees supported preferential income tax incentives for BEVs but only when 'fit for purpose' BEV models become available. Questions were raised about the potential for tax rebates and/or subsidies to encourage BEV home charging equipment at fleet employee homes.

2. Fleet managers and fleet employee test surveys

A (preliminary) quantitative survey to fleet managers, has been designed to ascertain perceptions on future uptake of battery-powered electric vehicles.

The (preliminary) quantitative survey to be administered to fleet employees, has been designed to understand attitudes, barriers and enablers with regards to adopting home charging of fleet vehicles.

The preliminary survey instruments were primarily developed from project literature reviews. They were later informed, adjusted and improved to reflect the key findings from the qualitative interviews of a selection of fleet managers. Both survey instruments were tested and will be reviewed by industry partners before being administered to a large sample of respondents in a future project.

1 National Transport Commission, Australian Government, "Carbon dioxide emissions intensity for new Australian light vehicles 2020" 1-64, 51. Annual sales by passenger cars and light SUVS of 579.003 vehicles, 51. Large fleet sales – 25,920 vehicles and Fleet sales – 59,014 vehicles. Electric vehicle sales for Fleet vehicle – 314 EV sales; Large fleet – 173 EV sales

2 Australasian Fleet Management Association (AfMA) and AGL Energy, *Survey: Electric Vehicles in Business Fleets* (2020)

3 Electric Vehicle Council, *State of Electric Vehicles* (2020). 1-99: 18.

4 Marvin Klein, Christine Strauss, and Christian Stummer, *Business information through choice-based conjoint analysis: the case of electric vehicle home charging* (2021).

3. FBT case studies: short-term tax changes

The methodology entailed a review of the literature and FBT legislation for car benefits. Two case studies were used to show the application of FBT car benefits to a Kona BEV and its equivalent Kona ICEV under the two FBT methods of determining tax liability.

The first case study used the FBT statutory method, generally used for determining tax on the private use of salary packaged fleet cars. It took the cost price (inclusive of GST) of the Kona BEV and found that the price premium for the BEV results in FBT payable of $13,228 compared to $7,012 FBT payable for the Kona ICEV, an additional FBT of $6,216 for a BEV.

The second case study used the FBT operating cost method, generally used for determining tax on the private usage of employer-provided fleet vehicles. The findings showed additional FBT of $1,893 for a BEV compared to its equivalent ICEV.

Both car fringe benefits tax methods add to the TCO for BEVs, and are fiscal disincentives to business fleets, penalising the uptake of BEVs. Five recommendations for FBT are proposed to close the TCO gap.

4. Income tax changes: short-term changes

Relevant literature and the income tax legislation were reviewed. Findings indicated that to offset BEV financial disincentives, which can impact on the total cost of ownership and purchasing decisions for business fleets, the following income tax changes are proposed:

- accelerated depreciation rates
- depreciation concessions for the instant asset write off
- depreciation cost limits; and limits on the goods and services tax (GST) credit
- tax deductibility for home charging installation and smart chargers
- tax deductibility for home charging of employer provided fleet BEV.

The fleet manager interview findings were also drawn on to formulate the recommendations.

Seven recommendations are made to change income tax in the short term, to encourage the uptake of fleet BEVs and to support home charging by employees of employer-provided cars.

5. Modelling Total Cost of Ownership for both BEV and ICEVs

Business uptake of BEVs depends on the vehicles total cost of ownership. A case study approach was applied to the high-priced Kona BEV and its equivalent Kona ICEV, providing a Total Cost of Ownership (TCO) comparison under normal market conditions and under 'select' recommended proposed FBT and tax changes. The TCO modelling found Australia's taxation laws are fiscal disincentives to business fleet uptake of BEVs. That is, current tax laws, based on the cost price of the vehicle, increased the cost gap between the paired Kona ICEV and BEV. In addition, the TCO modelling found BEV operating cost savings over three years (fuelling, service and maintenance costs) of $3,936 (in terms of present value) were inadequate to offset the cost gap of the car and charger of $35,008. This work supported the recommended tax changes.

The TCO methodology and variables are not standardised between businesses. The TCO modelling adopted for the paired Kona BEV-ICEVs includes income tax costs and (savings) – arising from recommended tax changes. Without tax changes, the TCO for BEVs remain more expensive and not cost competitive compared to the ICEVs. Thus, resulting in business fleets low or no uptake of BEVs business fleets and lack of workplace charging infrastructure.

The findings indicate that TCO modelling will be critical to determine what combination of recommended tax changes are most effective in offsetting the cost gap and to incentivise business uptake of BEVs. Additional subsidies may be required to offset any remaining cost gap between paired BEV-ICEV.

6. Reforms for FBT and income tax based on overseas jurisdictions: long-term tax changes

To determine long-term FBT and income tax changes, car-related legislation and regulations of selected countries with a high uptake of business fleets were reviewed.

Companies play an important role in the electrification of corporate fleets, as over 50% of passenger vehicles are acquired by business. The policy instruments include regulatory CO_2 emission standards that controls the supply of vehicles at the source, known as 'supply-side' measures which are supported by 'demand-side' taxation measures that are fiscal incentives to encourage the demand and uptake of BEVs.

The review found that a combination of taxation policy reforms such as: vehicle taxes based on CO_2 emissions, nitrogen oxide (NOx) levies, scrap fees, and varying subsidies – successfully offset the cost gap between BEVs and ICEVs and accelerating the uptake of BEVs.

The challenge for policy makers is to determine the combination of 'demand-side' policy measures that will be effective in supporting 'supply-side' regulatory CO_2 emission standards, that will increase the market share of BEVs. Three recommendations have been proposed for FBT in the long term: and two recommendations for income tax in the long-term.

Recommended Tax Changes

This fast track project recommends 17 short-term and long-term tax changes that can accelerate business fleets uptake of battery electric vehicles (BEVs) through home charging of business fleet vehicles at fleet employees' place of residence. They are listed below.

FBT changes for cars and home charging based on current provisions: short-term changes

1 Statutory formula method tax changes for business fleet BEVs

Salary packaged arrangement vehicles – Full exemption

It is recommended that only BEV vehicles be fully exempt from FBT, or

Reduce statutory formula method flat rate

It is recommended that the statutory formula flat rate of 20% apply only to ICEVs. For equivalent BEVs, the flat rate be reduced, ranging from 1%–5% of the base value of the car. Thereby reducing the BEVs taxable value and FBT payable. The reform should remain until price parity is reached between BEV and equivalent ICEV.

2 Change of formula for BEV work fleet vehicles

It is recommended, that an employer-provided, BEV fleet vehicles (*work vehicle/tool of trade*) be fully exempt from FBT under the Operating Cost method and Statutory Formula method.

3 Home charging for BEV fleet vehicles

It is recommended that where an employee takes an employer-provided BEV fleet vehicle (work vehicle/ tool of trade) home for charging that the 'private use' component is exempt from Fringe Benefits Tax.

4 Home charging BEV pool/shared vehicles

It is recommended that where an employee takes an employer-provided 'pool or shared' BEV home for charging, that the 'private use' component is exempt from Fringe Benefits tax. For employer provided 'pool' internal combustion engine vehicles, should be made subject to FBT in all private-use circumstances.

5 ICEV single and dual cab utes

It is recommended ICEVs that are single and dual cab utes be subject to FBT in all private use circumstances when a BEV single and dual cab alternative becomes available.

Income tax changes for cars and home charging based on current provisions: short-term changes.

6 Instant asset write off for BEV fleet/pool vehicles

It is recommended that vehicle assets for employer-provided fleet and pool BEVs, the acquisition costs in the sector or class of passenger, light commercial vehicles that include panel vans and utilities, – be eligible for a 100% depreciation concession also known as the 'instant asset write off', and made available until an agreed uptake target has been reached.

The instant asset write off (IAWO) would exclude petrol, diesel, hybrid, and plug in hybrids cars from IAWO which would require a minor legislative amendment.

7 Accelerated depreciation to apply to salary packaged BEVs

It is recommended for employer-provided BEVs under salary package and salary sacrifice arrangements, that acquisition costs, in the sector or class of passenger, and SUVs — be eligible for accelerated depreciation. It would specifically exclude ICEV light commercial vehicles comprising vans, panel vans and utilities.

The income tax amendment start date should reflect the expected timeframe for when alternative BEV utility vehicles that are 'fit for purpose' become available in Australia.

8 Increase depreciation cost limit for fleet BEVs

It is recommended that the depreciation cost limit for *employer provided* BEVs be equivalent to Luxury Car Tax threshold for fuel efficient vehicles up to $79,659 (inclusive of GST) for the 2021-22 financial year.

The current depreciation cost limit of $60,733 (inclusive of GST) for 2021-22 will *only* apply to employer-provided fleet ICEV and HEVs car acquisition in the sector or class of passenger, light commercial vehicles that include panel vans and utilities.

9 Increase GST credit limit for fleet BEVs

It is recommended that the Goods and Services Tax for purchasing an employer-provided BEV be limited to one-eleventh of the increased depreciation cost limit applying to BEVs, for the financial year.

The current 2021-22 depreciation cost limit and associated GST credit – should continue to *only* apply to employer-provided fleet ICEV and HEV acquisitions in the sector or class of passenger, light commercial vehicles that include panel vans and utilities.

10 Instant asset write off for fleet BEVs' home charging capital costs

It is recommended that for employer-provided *work fleet* BEVs, that private, capital costs of home charging, including installation of charging connections, be eligible for a 100% depreciation concession also known as the 'instant asset write off'. The change would take effect when an agreed uptake target has been reached.

11 Travel between home and work for fleet BEV home charging

It is recommended that *travel* between work and home in employer-provided *fleet* BEVs, that require charging at the employee's place of residence, be tax deductible.

12 Tax deductible for reimbursements of home charging pool BEV

It is recommended that *energy* to charge an employer-provided *pool* BEVs at the employee's place of residence, be tax deductible.

FBT reforms for cars based on review of overseas jurisdictions: longer term.

13 FBT tax rate for car fringe benefits be based on CO_2 emissions

It is recommended that the FBT rate of 47% for car fringe benefits be lowered on a scale that aligns to vehicles with low CO_2 emissions. The aim is to incentivise low CO_2 emission vehicles.

The tax rate scale should apply until there is BEV/ICEV price parity, or when acceptable BEV targets are reached.

14 Special FBT 'statutory fraction' for fleet BEVs

It is recommended that a special statutory fraction apply to BEVs. The statutory fraction, currently 20% (*statutory formula: 20% x car base value x no of days available privately x gross-up factor*) should be a lower fraction to accelerate the uptake of BEVs.

The BEV's taxable value can then be taxed as proposed in Recommendation 13.

The reform is to apply until there is BEV/ ICEV price parity, or when acceptable BEV targets are reached.

15 Discount FBT 'car base value' for BEV fleets
(alternative to recommendation 14)

It is recommended that a BEVs base value factor in the Statutory Method be discounted (*statutory formula: 20% x car base value x no of days available privately x gross-up factor*). The aim is to incentivise low CO_2 emission vehicles.

The BEV's taxable value can then be taxed as proposed in Recommendation 13.

The reform is apply until there is BEV/ICEV price parity, or when acceptable BEV targets are reached.

Income tax reforms for home charging based on review of overseas jurisdictions: longer term.

16 Subsidy to fleet employers for installation of home charging infrastructure

It is recommended for government to encourage the home charging of employer-provided BEVs (*fleet/ tool of trade*), by providing financial support in the form of subsidies to employers for installation of EV charging infrastructure. Subsidies received would be taxable income to the employer.

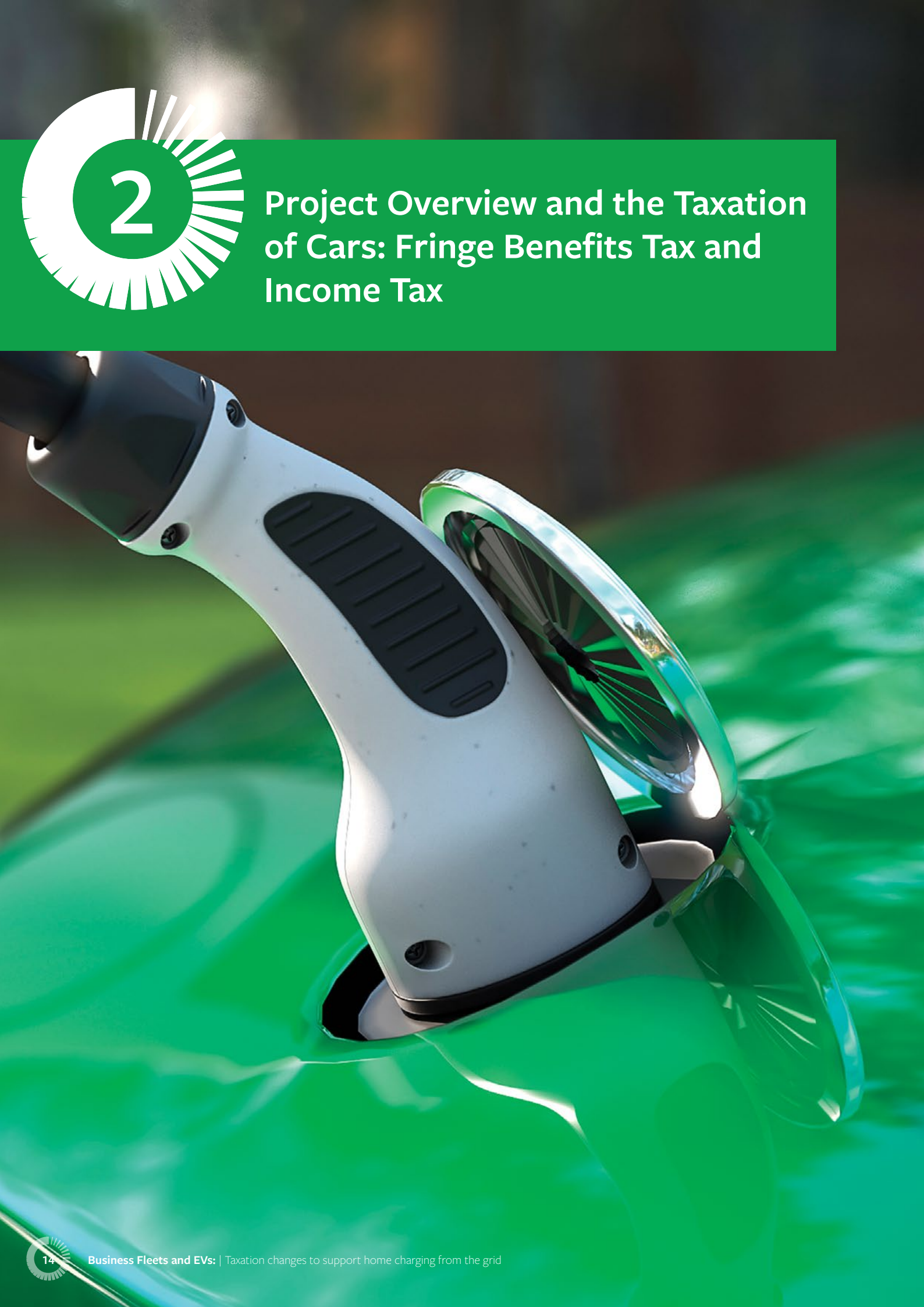
Modelling would be required to determine subsidy caps, number of subsidies allocated, subsidy dates, and conditions of payment.

17 Rebates to fleet employees for installation of home charging infrastructure

It is recommended for government to encourage the home charging of employer-provided BEVs (*fleet/ tool of trade/salary package*) by providing financial support in the form of tax rebates to fleet employees for the installation of EV charging infrastructure.

Modelling would be required to determine rebate caps, tapering of rebates to target low-to-middle income employees, rebate dates, and conditions of payment.

2 Project Overview and the Taxation of Cars: Fringe Benefits Tax and Income Tax



Background and context

Business fleets are an effective pathway for early adoption of BEVs,[5] but a key problem is that business site re-charging infrastructure facility numbers are low. Taxation changes can provide short-term solutions by using fleet employee's home charging, which can include smart charging stations to gain off-peak rates and to avoid grid congestion. A 2020 survey found that 47% of fleet vehicles are home garaged,[6] and this presents an opportunity to widen recharge facilities. Taxation changes over the long term can also provide solutions once an appreciation of a toolkit that uses both technology and taxes is appreciated.

This project has assessed how federal taxation changes, specifically, Fringe Benefits Tax (FBT) and income tax can facilitate the charging of business fleet BEVs from individual fleet employees' homes.

Fleet vehicles will sooner or later transition to BEVs, and lower CO_2 emissions. Regardless of current federal government policies, we need to be ready. BEVs are expected to have a major impact on the grid if charging is not managed. If all new ICEV passenger vehicles are replaced with BEVs and charged simultaneously, in a worst-case scenario, this would negatively affect the grid.

To achieve the aim of recommending taxation changes to facilitate the charging of business fleet BEVs from individual fleet employees' homes, the project has undertaken the following activities:

- A targeted literature review.
- An examination of car-related Fringe Benefits Tax (FBT) and income tax concessions.
- An investigation into taxation impacts to reduce the 'total cost of ownership' (TCO) of BEVs compared to ICEVs. It has taken account of impact on the grid, and BEV affordability.
- Interviews of selected managers of large vehicle fleets to provide insights on how they assess the 'value proposition' of their current fleet vehicle selection for both ICEVs and BEVs.
- The design of a quantitative fleet manager survey and a fleet employees survey, which are both tested. The findings from the fleet manger interviews have informed the design of the surveys.

Overview of the Federal Taxation of Cars

Currently the federal taxes of FBT and income tax discourage the recharging of an employer-provided BEV at an employee's home, as the BEVs would be considered 'available for private use'. This means the FBT tax rate of 47% would apply to the pre-tax value of the BEV (eg. BEV taxable value $50,000 x 2.0802 gross-up x 47% FBT rate) in proportion to the time the car is home garaged. Further, the tax value of the capital cost of the charging infrastructure (for instance, a smart charger), and energy – an operating cost, are also subject to FBT, as both are considered to be private outgoings. For business, if FBT is not paid on these costs, they are also not income tax deductible.

These FBT and income tax impediments are significant barriers to employees' home charging, as noted from discussions with our Industry Reference Group.

Fringe Benefits Tax: employer-provided cars for travel, to and from work

Prior to 1986 employers legally minimised their employees' income tax for by providing non-cash benefits (also known as fringe benefits) to employees, such as cars, in lieu of cash salary. Income tax legislative loopholes allowed employees to confer a low value on these non-cash benefits provided, which reduced their tax liability.

The federal government sought to combat that loss of income tax revenue from non-cash benefits, and introduced Fringe Benefits Tax (FBT) legislation in 1986.[7] FBT is imposed on the employer not the employee, and specifically on employer-provided non-cash benefits to employees for private use. For example, the taxable value of employer-provided vehicles for

5 Dept of Industry Science Energy and Resources, Future Fuels Strategy: Discussion Paper. Powering Choice, (Canberra 2021).

6 Australasian Fleet Management Association (AfMA) and AGL, *Survey: Electric Vehicles in Business Fleets* (2020). AFMA found a high 34,688 fleet vehicles of passenger car and SUV fleets are home garaged. The Electric Vehicle Council survey found that 86% of respondents regarded home charging as the "top priority" highlighting the importance of "convenient access" to charging infrastructure which will influence consumers' attitudes towards electric vehicle purchases. Electric Vehicle Council, *State of Electric Vehicles* (2020). 1-99: 18.

7 *Fringe Benefits Tax Assessment Act* 1986 (Cth), hereafter referred to as the FBT86 Act.

regular travel, from home to work is subject to FBT.[8] Therefore an employee travelling to and from work in an employer-provided vehicle results in an FBT liability at the rate of 47 percent.[9]

Case studies 1 and 2 below demonstrate the two alternative FBT formulas to calculate FBT liability. Both methods use a gross-up factor determine the pre-tax value, and then the 47 percent tax rate is applied.

Case study 1 reflects the FBT statutory method to calculate tax liability.[10] It is based on the value of the car and the period available for private use. An EV may have a considerably higher FBT liability (due to its higher capital cost) than a comparable ICEV. Typically, the statutory method is applied to an employer-provided car for salary packaging and salary sacrifice, as the car use is predominantly private.

CASE STUDY 1: Car Fringe Benefits opt for FBT 'Statutory' method

Statutory formula: Taxable value = (A × B × C/D) – E

- A = the statutory fraction
- B = the base value of the car= $60,000
- C = number of days in year car provided
- D = number of days in FBT year
- E = recipient payment (ie. the employee contribution to costs.) =$560

FBT year ending 31/3/21:

Taxable Value = ($60,000 x 20% x 365/365)-560 = $11,440

Grossed-Up TV = $11,440 x 2.0802 gross-up = $23,797

FBT liability = $23,797 x 47%= $11,184

Case study 2 shows the FBT operating cost method to calculate tax liability.[11] Typically, this method is used for (pool or shared) fleet vehicles as they have a high business mileage component, which results in a lower FBT liability. A log book must be maintained by the various drivers.

CASE STUDY 2: Car Fringe Benefits opt for FBT 'Operating Cost' method

Operating Cost formula: Taxable value = (C x [100%-BP]) – R

Where:

- C = the total operating costs
- BP = business use percentage over holding period
- R = recipients payment

Example

- Cost of car $40,000 (incl. GST). Log book: 90% business use (10% private) for FBT year ending 31/3/21.
- Operating costs: Deemed (25%) depn. $10,000; deemed (4.8%) interest $1,920 = $ 11,920
- Recipient's payment (or employee contribution to costs) = $300

Taxable Value = (11,920 x 10%) – 300 = $892

Grossed-up TV = $892 x 2.0802 gross-up = $1,855

FBT liability = $1,855 x 47% =$872

8 There are exemptions from FBT, such as for pool [fleet vehicles] or shared cars, see Fringe Benefits Tax Regulation 2018, regulation 10. Also exempt from FBT are single cab and dual cab utility vehicles, FBT Act, section 8(a). See also MT2024: *Fringe Benefits Tax: dual cab vehicles eligibility for exemption where private use is limited to certain work-related travel.*

9 FBT86 Act, sections 6 and 7.

10 FBT86 Act, section 9.

11 FBT86 Act, section 10.

Case study 3 shows the FBT liability for an employer-provided smart charger for home charging use 3. It is a 'residual' fringe benefit, the catch all provision for non-cash benefits.[12]

CASE STUDY 3: Residual Fringe Benefit – Employer-provided EV Smart Charger

As part of an employee's salary package, the employer provides a non-cash fringe benefit of EV smart charger for employee's use at their home.

Taxable Value = (2,200 x 100% private use) = $2,200

Grossed-up TV = $2,200 x 2.0802 gross-up = $4,577

FBT liability = $4,577 x 47% =$2,151

Income tax: private vehicle travel, to and from work

For income tax purposes, the cost of travel to and from work is a private or domestic expense.[13] Thus in cases where an employee uses a private vehicle for travel to and from work, any expenses incurred are generally income tax-deductible.

In relation to private vehicle costs for travel, to and from work, potential deductions from provisions including depreciation, 'instant asset write-off' concessions and running expenses — are not income tax-deductible.[14] However, if the employer pays the FBT liability, then those aforementioned items become income tax-deductible. This demonstrates how both the income tax and FBT legislations are linked.

In relation to business fleet vehicles that are home-garaged for charging, the cost of home charging and fleet employee energy costs, this project has considered the following in the income tax context:

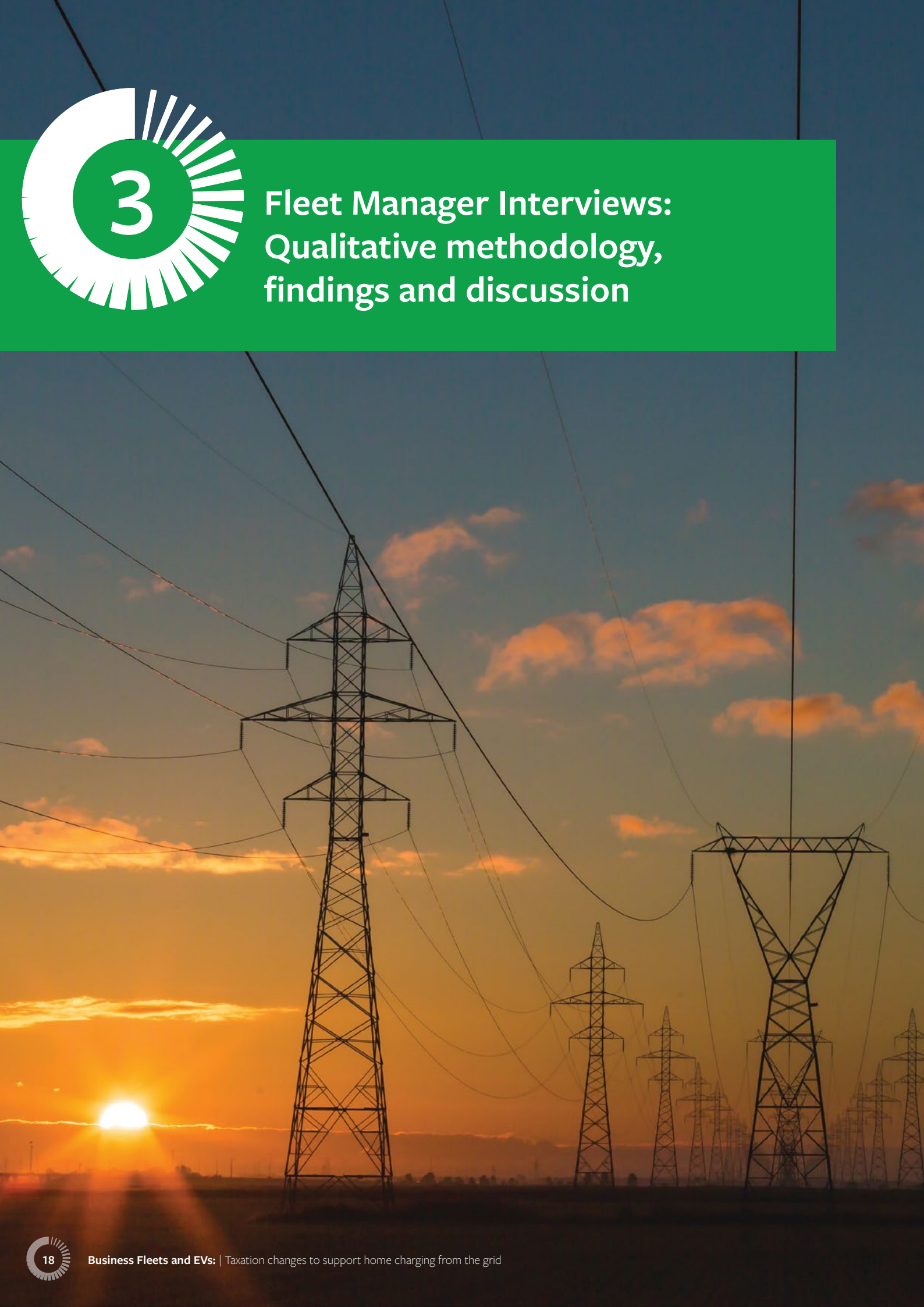
- rate of depreciation
- depreciation cost limit
- tax rebates and subsidies.

12 FBT86 Act, section 45.

13 Income Tax Assessment Act 1997 (Cth), section 8-1(2) (b), hereafter referred to as the ITAA97 Act. See also Lunney v Federal Commissioner of Taxation [1958] HCA 5; (1958) 100 CLR 478 (11 March 1958).

14 ITAA97, Divisions 40 & 28; and sections 328-180, 8-1.

3 Fleet Manager Interviews: Qualitative methodology, findings and discussion



A. Overview of Fleet Manager Interviews

The qualitative approach of interviewing fleet managers was one of the methods used to generate data to investigate taxation changes to support home charging from the grid and to facilitate affordability.

Based on the understanding that business fleets are an effective pathway for early adoption of EVs, the interviews aimed to take account of fleet managers' perceptions of the barriers to the uptake of BEVs in their fleet. The interviews also explored potential tax changes to support home charging by fleet employees.

The interview questions were designed to firstly gather basic data the interviewee organisation's vehicle fleet. Then questions have been crafted around the themes of CO_2 emissions reductions; knowledge of BEV charging impact on the grid; workplace charging infrastructure, managed charging for enhanced grid reliability, awareness of employee home charging of BEVs; taxation; and total cost of ownership.

The overall interview findings and discussion on the theme of taxation are next provided in Section B. For Sub-section B1, interview data was drawn upon to inform recommendations for short-term Fringe Benefits Tax (FBT) and Income Taxation changes for engagement with government policy makers or further modelling, either as part of this project or in the future. Section C provides the findings and discussion on questions about 'awareness of employee home charging of BEVs'. Sub-section C1 outlines recommendations on the theme awareness of employee home charging — for further analysis to be carried out by the Fleet Employer and Fleet Employee surveys, as covered next in this RACE report.

Findings summaries by theme for all interview questions are in Section D of this report. The interview methodology is explained in Section E. The interview instrument can be found in Appendix A.

B. Findings and Discussion: 'Taxation' questions

Q. 7.1 Have you given thought to the fringe benefits tax on employees' home charging fleet BEVs?

Overall findings: Most interviewees have given thought to fringe benefits tax on employees' home charging. The trend was that FBT liability was a discouragement for home charging; or not an issue due to the FBT exemption for utility vehicles.

The literature review in Section 11 of this RACE report reveals that the selected overseas countries use grants to encourage the purchase of home charging equipment. For instance, German residents can apply for a 900 Euro grant for the purchase and installation of a charging station for their home. In the UK, private individuals are eligible for grants that cover up to 75% of the purchase and installation costs of a charging station.

Q. 7.2. What aspects of fringe benefits tax would you like to see modified, to encourage a transition of your fleet cars to BEVs

Overall findings: Interviewees called for an FBT exemption or a rate reduction for BEVs. However, one ASX pointed out that there should be no FBT penalty for ICEV light commercial vehicles as there was no alternative or equivalent BEV models currently available. This point was repeated by other organisations.

The literature review in Section 11 indicates many states have EV charging networks projects either active or newly budgeted, as seen in SA, NSW, WA and Tasmania. Other Australian states and territories provide direct EV purchase subsidies or registration concessions. Therefore, Federal government willingness to make short-term modifications to Fringe Benefits Tax to encourage a transition of fleet cars to BEVs – would support current EV policies of states and territories.

The private use of employer-provided cars in Norway, Netherlands, Germany and the UK have a variety of concessions in their equivalents of fringe benefits tax, as follows:

- In Norway, the taxable value (tax base) of EVs is reduced by 60% on price of car, but with a low cap of 314,400 Krone (AU$50,200).
- In the Netherlands, the taxable value of a ZEV is the registration, car price and level of CO_2 emissions. For example, in the year 2020, if emissions are 0g /km, then tax applies on 8% of the car price to 45,000 Euro (AU$71,500) – plus registration.
- In Germany from 2019, the taxable value of an EV was halved by 50%. From 2020 the tax rate was reduced for BEVs. From 2022, only EVs with minimum range of 60kms will be eligible for the concessions.
- In the UK for the 2020/2021 tax year, employees with an in-kind benefit EVs with emissions of 0g CO_2/km, are not taxed for the during the same period.

Q. 7.3 Would your organisation acquire more BEVs if income tax concessions were modified, such as depreciation, instant-asset-write-off, to preference BEVs?

Overall findings: Preferential income tax incentives for BEVS are supported, but only when 'fit for purpose' BEV models become available. Statutory government and local councils are not subject to income tax, but those organisations that lease cars are likely to have lower payments due to income tax concessions.

The literature review in Section 11 reveals that the selected overseas jurisdictions preference concessional car taxes (and 'FBT'-type concessions) over income tax concessions. In Norway, the annual Motor Vehicle Tax, and Road User tax for EVs are both lower compared to ICEV rates. Dutch car registration and road taxes are based on CO_2 emissions, but ZEVs are exempt. In Germany, ZEVs are exempt from annual car registration until 2030.

Q. 7.4 If there were tax rebates or subsidies for home charging equipment, would that encourage your organisation to transition more of your fleet to BEVs?

Overall findings: ASX companies raised questions on the effectiveness of tax rebates and/or subsidies for home charging equipment. Private companies were more concerned with purchasing vehicles that are 'fit for purpose'. Statutory government and local council responses reflect a tension between who would pay for equipment: employer or employee.

The literature review in Section 11 shows Australian states and territories do not subsidise EV home charging equipment, although indirectly some states have rebates for solar panels. By contrast, German residents can apply for a 900 Euro grant for the purchase and installation of a charging station for their home. In the UK, private individuals are eligible for grants that covers up to 75% of the purchase and installation costs of a charging station.

Q. 7.5 Depreciation and GST credits are capped at car cost ~ $60,000. Is that a disincentive for BEV acquisitions for your organisation?

Overall findings: Most organisations stated that the current depreciation caps are not a problem as they meet the pricing point for their preferred BEV. Two ASX companies raised the issue of a higher BEV prices due to technology, and called for a faster rate of depreciation.

The literature review in Section 11 shows that the UK has an income tax concession that allows 100% depreciation for 0g/km CO_2 emitting vehicles. Germany also has some EV depreciation concessions.

Q. 7.6 Victoria now charges EVs 2.5c km. What would be the impact on your organisation vehicle selection if similar CO_2 emissions-based charges were imposed on ICEVs?

Overall findings: Despite the unlikely prospect of a CO_2 emissions charge on ICEVs in Australia (as seen in Europe), organisations still plan to make the transition to BEVs. One ASX suggested that any application of a CO_2 emissions charge should only target companies, as it may disproportionally impact lower socio-economic groups.

The literature review in Section 11 shows that the Dutch apply a CO_2 emission factor to their Road User tax. Germany and the UK indirectly use a CO_2 emission factor in their EV concessions for private use of employer-provided cars, and annual car registration.

B.1. Recommendations: Short-term Taxation Changes

The findings and discussion on the interview data for taxation (at Section B) has informed the following suggestions of short-term FBT and Income Taxation changes, either as part of this project or in the future.

- **FBT 1:** That salary packaged and salary sacrifice employer-provided BEVs be either fully exempt from FBT; or subject to a lower FBT rate. Rates of 1% to 5% could apply instead of current 20% rate.
- **FBT 2:** That if an employee *regularly* takes an employer-provided BEV home for charging, then the 'private use' component is exempt from Fringe Benefits Tax. This would apply to pool and shared cars.

  Also, employer-provided internal combustion engine vehicles or ICEVs should be made subject to FBT in all private-use circumstances.
- **FBT 3:** That employer-provided (private use) ICEV single cab and dual cab utility vehicles be subject to FBT. This would apply to pool and shared cars. The FBT amendment start date should reflect the expected timeframe for when alternative BEV utility vehicles that are 'fit for purpose' become available in Australia.

  Only employer-provided (private use) BEV single cab and dual cab utility vehicles would be FBT exempt.
- **FBT 4:** That for employer-provided BEVs, the capital costs of home installation of charging connections, smart meters; and operating energy costs — be FBT exempt.
- **Income tax 1:** That for car assets, *only* employer-provided fleet BEVs' acquisition costs, in the sector or class of passenger and light commercial vehicles that include panel vans and utilities,[15] – be eligible for a 100% depreciation concession, also known as the 'instant asset write off.'[16] Petrol and diesel cars or ICEVs, in the same (above-mentioned) sector would be specifically excluded.
- **Income tax 2:** That for the asset class of cars, only employer-provided fleet BEV light vehicles' acquisition costs — be eligible for accelerated depreciation;[17] and specifically exclude ICEV light commercial vehicles comprising vans, panel vans and utilities.[18]

  The income tax amendment start date should reflect the expected timeframe for when alternative BEV utility vehicles that are 'fit for purpose' become available in Australia.
- **Income tax 3:** That employer-provided fleet BEV car travel, to and from work for the purpose of charging a BEV at the employee's place of residence — be tax deductible. ICEVs, would be specifically excluded.
- **Income tax 4:** That for employer-provided fleet BEVs, that the capital costs of home charging, including installation of charging connections, smart meters; and reasonable associated operating energy costs — be deductible from income tax (rather than non-deductible).
- **Income tax 5:** That there is a subsidy to employers for home charging costs. There would need to be caps of value of subsidy, numbers of subsidies allocated, start and end dates of subsidies provided, conditions on payment of subsides, and recognition that subsidies are likely to be taxable income to the employer.[19] This would be a short to medium-term change.

15 Vehicles designed to carry a load of less than one tonne.

16 *Income tax Assessment Act 1997* (Cth), Division 328. Income Tax (*Transitional Provisions*) *Act 1997* (Cth), Subdiv 40-BB. The instant-asset-write-off is available in the financial year in which an eligible asset is first used; Budget 2021-22 and available until 2023. Seer also

17 Concessional deprecation, *Income tax Assessment Act 1997* (Cth), section 40-72, ie. Base value x days held/365 x 200%/asset's effective life.

18 Vehicles designed to carry a load of less than one tonne.

19 *Income tax Assessment Act 1997* (Cth), section 15-10, bounties and subsidies are statutory income.

- **Income tax 6.** That there is a tax rebate to employee. Decisions would be required on the value of a rebate; and its policy objective, ie. the rebate might be tapered to target low to middle income earners. Tax rebates require start and end dates; and there might be conditions on payment of rebates, such as no rebate payable if greater than taxable income. This would be a short to medium-term change.

C. Findings and Discussion: 'Awareness of employee home charging of BEVs' questions.

Q. 6.1 If your organisation allows or were to allow passenger and light commercial vehicles to be home charged, have you considered the positive impact on charging infrastructure shortages at the base?

Overall findings: Organisations seem open to home charging, but concerned about the logistics and policies around who bears private home infrastructure costs.

ASX company interviewees, for example, felt home charging is a good approach to address charging shortages at base; while one suggested fire risk attached to home charging. Some raised problems with and accurate reimbursement of employees; and that and multiple charging of cars at home would impact the grid.

Q. 6.2 How might your organisation's employees respond to an option for home charging?

Overall findings: For this question fleet managers had to reflect on how their organisation's employees might respond to an option for home charging. Some felt the option for home charging would be supported, but cost compensation would be an issue. A dialogue with employees would be required.

ASX company interviewees, for example, thought employees would ask, 'how do you get reimbursed?' One felt the need to make sure 'the employee was very comfortable' with home charging. Another stated, 'So far, the response has actually been quite positive to the employees that we were talking to as potential trial candidates for it'. One company was very specific, noting that interest in home charging is likely to vary based on many factors: 'Inner city versus metropolitan housing; and availability of a garage space versus the need to run extension cords into the street; number of vehicles in the household; do BEVs match employee use requirement/lifestyle; BEV range; and time required to recharge.'

Q. 6.3 Has your organisation had internal discussions on the logistics and costs of installing home charging facilities for BEVs?

Overall findings: Not many organisations have internally discussed the logistics and costs of installing home charging facilities. Perhaps it is too early.

ASX company interviewees, for example, reported that discussions on the logistics and costs of home charging are proceeding. One stated, 'We are committed to becoming more sustainable so we can budget for these costs.' And, 'We would definitely consider chargers for the more permanent employees.'

Q. 6.4 Is there an organisation policy on covering employees' costs for energy? Explain in relation energy for home charging.

Overall findings: Most organisations do not have an energy policy for employees. One organisation considered a trial to investigate energy costs, and two mentioned smart meters.

ASX company interviewees, for example, reported they had not deeply considered a policy on how or who would incur energy charging costs. Although one stated that the employee would pay the energy cost for home charging (ASX 1). Another said, 'It would be important to understand that we would not be just be shifting the CO_2 burden' (ASX 6); another had engaged in a trial where employees could be reimbursed using a smart meter reading (ASX 3). Others confirmed they had considered a policy on energy costs for home charging.

C.1. Recommendations for Employee and Employer Surveys

1. The Fleet Employee Survey, for future research, should explore home charging infrastructure costs. It should gauge willingness to assess home for suitability to install home charging equipment through a 7-point Likert scale (ranging from "strongly disagree" to "strongly agree"). In addition, willingness to cover charging costs will be assessed through a 5 -point Likert scale (ranging from "not willing" to "willing").
2. The Fleet Employee Survey should allow us to identify differences and similarities in how employers expected their staff to respond to an option for home charging and their attitudes and preferences.
3. The Fleet Employee Survey should examine employees' attitudes towards their employers' transitioning (a proportion) of their fleet to BEVs, the possibility of taxation changes acting as an enabler, as well as (to a lesser focus) explore their interest in purchasing an ex-fleet vehicle to understand the current market and potential demand.
4. The Fleet Employee Survey should target employees who are currently using employer-provided vehicles, such as share and pool vehicles, salary packaged vehicles, or a salary sacrifice vehicles. The survey should categorise employees based on the type of employer-provided car they use.
5. The Fleet Employee Survey should explore home charging logistics and cost questions through a range of demographic questions including dwelling type, dwelling tenure, access to protected garage or carport, daily commute distance.
6. The Fleet Employee Survey should gauge willingness to cover home charging costs through a 5 -point Likert scale (ranging from "not willing" to "willing").

   As for the Fleet Employer Survey, its development was supplemented by the key findings of the qualitative interviews with fleet managers. For future research, the primary objective of the preliminary employer survey will be to investigate in future research: *what are the fleet managers' perceptions of the barriers to the uptake of BEVs in their fleet and explore potential tax changes to support fleet employees' home charging.*

D. Findings: Summaries of fleet manager interview responses – Questions 1 to 8.

The qualitative interview results summaries are structured around 16 interviews to fleet managers, categorised by type of organisation and de-identified by use of a code, per Table 1 below. The findings summaries of fleet manager interview responses cover questions 1 to 8.

Table 1. Organisation categorised by type and code

ASX	Private co.	Statutory Govt	Local councils
1			
2			
3			
4			
5			
6			
7			
	1		
	2		
		1	
		2	
		3	
			1
			2
			3
			4
7	**2**	**3**	**4**

1. Basic data about passenger and light commercial cars in the interviewee organisation's fleet

1.3 Range of vehicle numbers

- ASX: 52 – 4000
- Private companies: 550 – 12,000
- Statutory Government: 100 approx. – 340
- Local Councils: 122 – 295

1.4 Range of HEVs and BEV numbers, per vehicle segment

HEVs (passenger cars only)

- ASX companies: 2 – 400
- Private companies: 20 – 9,600
- Statutory Government: 0
- Local Councils: 0-36

BEVs (passenger cars only)

- ASX companies: 0-10
- Private companies: 0-10
- Statutory Government: 0
- Local Councils: 0-19

1.5 Range of average annual kilometres for passenger and light commercial fleet vehicles

- ASX companies: 11,000 – 50,000kms
- Private companies: 16,500 – 35,000kms (Some individuals up to 80,000kms (Pte Co 2)
- Statutory Government: 16,000 – 25,000kms
- Local Councils: 10,000-15,000kms

1.6 Passenger and light commercial fleet vehicles: owned versus leased

- ASX companies: Two companies 100% owned (ASX 1, 2). Three companies approx. 90-100% leased (ASX 4,5,6,7).
- Private companies: 100% leased.
- Statutory Government: One – 100% owned (Stat Govt 1). Two – 100% leased (Stat Govt 2,3).
- Local Councils: 100% owned (Loc Council 2, 3, 4). Five leased (Loc Counc 1).
- Overall: The fleet vehicles were split between 100% owned or 100% leased, which was the result of the organisation's most suitable financing option.

1.7 Percentage of the fleet vehicles replaced each year

- ASX companies: Three companies had car replacement percentages that ranged from 25-30% (ASX 4,6) to 100% (ASX 2). Three companies did not provide percentages, but instead turnover criteria which ranged from 3 years (ASX 7) or 60,000kms (ASX 5) to 2 years or 100,000kms (ASX 1).
- Private companies: 20% (Pte Co 1).
- Statutory Government: 20–25% (Stat Govt 1, 2 ,3).
- Local Councils: Two Local Councils reported 10-20% (Loc Counc 1, 2). Two provided criteria of 2 yrs or 40,000kms (Loc Counc 3,4).

1.8 Targets to increase the uptake of EVs

- ASX companies: Four companies reported no plans to increase EV uptake (ASX 1,5,6,7). Three reported long-term ambitions to reduce CO_2 emissions through EVs. (ASX 2,3,4).
- Private companies: No answer provided.
- Statutory Government: Two reported no plans (Stat Govt 1,3). Plans to double their EV fleet annually until 2022, 2021-144 BEVs and in 2022 – 288 BEVs (Stat Govt 2).
- Local Councils: Three Local Councils cited long term informal strategies to transition to BEVs (Loc Counc 1, 4) or included EVs to get to zero CO_2 emissions by 2030 (Loc Counc 2).

1.9 Selection process for choosing fleet vehicles

- ASX companies: TCO was the most commonly cited consideration (ASX 1, 2, 3, 6), in addition to being fit-for-purpose (ASX 3,4,6). Only one interviewee cited goal of CO_2 emissions reduction for car choice (ASX 1).
- Private companies: Cited EVs, safety and price (Pte Co 2). Main consideration was car choice offered by their preferred supplier (Pte Co 1).
- Statutory Government: Fit-for-purpose was cited by all interviewees. Other factors mentioned included safety (Stat Govt 1), price /TCO (Stat Govt 1, 2) and reliability (Stat Govt 3).
- Local Councils: Fit-for-purpose was cited by all interviewees. Other factors considered were CO_2 emissions (Loc Counc 1,2,4), safety (Loc Counc 2,4) and price (Loc Counc 3,4).

1.10 BEVs on the market that are fit-for-purpose

- ASX companies: Hyundai Ioniq was reported by two companies (ASX 1,4).
- Private companies: No vehicles specified. One company said that a range of suitable passenger vehicles were available.
- Statutory Government: Hyundai Kona (Stat Govt 2) and Ford F150 (Stat Govt 1).
- Local Councils: Passenger – Hyundai Ioniq, and Nissan LEAF (Loc Counc 1,2).

  Commercial – Renault Kangoo (Loc Counc 4).
- Overall: A range of BEV passenger vehicles options are currently available. The lack of light commercial BEV models, or not 'fit-for-purpose', were the common reasons for no or limited uptakes of BEVs in this segment.

Table 2 overleaf summarises the responses to Questions 1.3 to 1.10, by organisation category.

Table 2. Question 1: Responses by organisation category

ENIVRONMENT = SUSTAINABLE

ASX companies	Private co. (o/s parent)	Statutory Govt	Local Govt	Total vehicle nos./salary packaged	HEV/BEV (passenger cars only)	Avg. annual kms (ooo's) (approx)	Owned/ Leased	% replaced annually	Targets to increase EV	Selection process	BEVs that are fit-for-purpose
1				200	2/0	40-50	100% leased	3 years or 60,000km	Barriers remain too high (Range and cost of batteries cited).	Subaru Liberties	No (Not FFP + safety rating)
2				4000/2500	400/8	18-30	100% leased	25	No	FFP, TCO.	Yes
3				624/–	–	25	5/619	25-30%	Reducing CO_2 emissions by 2030.	FFP	Hyundai (FFP)
4				no answer	120/0	30	A couple of 100 owned'/ Remainder leased	800-900 vehicles	Limited plan – reduce fleet size, convert to PHEVs where possible (EVs currently not fit-for-purpose for 80% of fleet).	FFP, TCO.	Limited (cost)
5				1196/416	20/3	20-25	100% owned	2 yrs or 100,000kms	No (TCO barrier).	CO_2 emissions, TCO.	Testing Hyundai Ioniq (range + safety)
6				2500/–	3/10 per vehicle segment	11	100% owned	100% (10 month turnover)	Committed to achieving low emissions within our fleet.	TCO.	NA – employees choose on personal preference.
7				52	?/0	–	6/46	3 year turnover	No (not FFP and range cited as barriers).	None	No (range)
	1			12000/2400	9,600/0 (passenger cars only)	16.5	96-99% leased	20	–	Preferred suppliers.	Limited EVs FFP. Light commercial – No.
	2			550/–	~20/10	Pool: 25-35 Indiv: 35-80	100% leased	4 year lease	–	Price, safety, EVs considered.	Passenger – Number of suitable EVs (battery life, range, costs) Light commercial – No (not FFP, payload).
		1		340/–	0	20	100% owned	20	No	Safety, TCO, FFP.	US Ford F150 (functionality benefits).
		2		102	–	16-17	100% leased	25	2021 – 144 EVs. 2022 – 288 EVs.	Price, EVs, FFP.	Yes (e.g. Hyundai Kona) – FFP but range is an issue.
		3		100/150	?/0	25	100% leased	20	No (infrastructure barrier).	Reliability, FFP.	No
			1	122/40	na	<15	5 leased	20	100% ICEs to BEVs.	FFP, PHEVs or EVs.	Hyundai Ioniq (costs, range, FFP).

ENIVRONMENT = SUSTAINABLE

ASX companies	Private co. (o/s parent)	Statutory Govt	Local Govt	Total vehicle nos./salary packaged	HEV/BEV (passenger cars only)	Avg. annual kms (000's) (approx)	Owned/ Leased	% replaced annually	Targets to increase EV	Selection process	BEVs that are fit-for-purpose
			2	147	36/19	~10-15	100% owned	2 yrs or 40,000kms	Informal strategy. Fleet business unit has an internal strategy. EVs has increased from 16 to 20 in the last 18-24 months.	Safety, CO_2/ environment, FFP.	Passenger – Nissan LEAFs. Light commercial – limited FFP.
			3	295	0	–	100% owned	2 yrs or 40,000kms	Strategy being developed to transition to EVs (no targets currently).	Safety, CO_2 emissions, price, FFP.	–
			4	135/–	24/3	15	100% owned	10	Zero emission 2030. No specifics.	FFP, price, resale value.	Renault Kangoo (van). No electric utes available.

2. CO_2 Emissions and reductions

2.1 Can you explain your policy to green the fleet, including action on CO_2 reductions?

ASX Companies

(ASX 5) has a 3.4 green rating which is going to be revisited. They have a high turnover of ICEV and are reducing CO_2 emissions although they do not believe hybrid and PHEV are effective for reducing CO_2 emissions. Since 2015 (ASX 6) has had an 'environmental challenge to 2050' goal in place, which focuses on reducing the environmental footprint across the entire business. They do not have a fleet CO_2 target but given their rapid changeover of vehicles (every 10 months) they believe using the latest available models provides the highest environmental benefits. They also have in their fleet a range of PHEV/BEV/FCEV's for trialling with the view to make available to employees.

(ASX 4) has issues around supply and demand of EVs. They get a lot of customers, particularly in the heavier class of vehicles, who want to go green but the vehicles that works for them are not available. Instead they are reducing the size of the fleet where they can, are reducing the CO_2 emissions or fuel consumption, converting what they can to hybrid and lastly going the EV option. (ASX 1) referred to their sustainability performance, recording and climate change aims.

For (ASX 2) all the vehicles are fully carbon offset through Green Fleet, a program that has been in place with them for some time. They pay a monthly contribution per fleet vehicle to Green Fleet to plant trees on their behalf. The uptake of hybrids has resulted in fuel consumption reductions. (ASX 3) are in the process of creating a 'greening fleet' strategy focusing on implementing hybrid vehicles and transitioning vehicles that are not hybrid over.

Private Companies

(Pte Co 1) plans are still in draft form but it is anticipated that there will be some very ambitious targets on the CO_2 reductions. Their current polices include electing the most fuel-efficient option, mandating hybrids for all of passenger vehicles as a minimum, and then considering EVs as an alternative where they are fit-for-purpose. They have also significantly reduced their fleet. (Pte Co 2) are challenged to aim green by their French parent company. Their corporate plan is to reduce their fleet by ten percent every year to 2030 as well as having the majority of vehicles that are city-based to be electrical hybrid. They were also conscious of energy from renewable sources for their EVs, which is currently quite challenging.

Statutory Government

(Stat Govt 2, 3) are both highly environmentally aware. (Stat Govt 2) has a 2030 target and a 2050 target and noting "if we're able to replace an ICEV with an EV, then we're going to get great gains from a CO_2 perspective, but what we're also doing is keeping the manufacturers to task around CO_2". It was also noted that they would opt for a less CO_2 polluting ICE car if available. They are aware that of CO_2 limits vary depending on the size of the car, and therefore decisions based solely on CO_2 reductions are not possible.

(Stat Govt 3) were also very aware of greening their fleet, supporting renewable energy and conscious of the future for battery technology. There are issues around peak electricity demand from the grid in charging BEV. They are looking at the different tariffs – to charge at the right time – and the technology around grid-to-vehicle and vehicle-to-grid. (Stat Govt 1) believes there are opportunities to transfer many of their passenger vehicles to hybrid vehicles. They recognise that to make a transition to BEVs will reduce emissions.

Local Councils

All the local councils seem progressive in their sustainability goals, all having set some future target. Whilst the Victorian government is pushing carbon neutral, it was noted that local governments were the ones leading the way in many things which then flow up to the state. Moreland Council was cited as the leading local council in sustainability.

(Loc Counc 1) want the entire fleet carbon neutral by 2028. They will also move away from private used vehicles to pool cars or business use vehicles only within their fleet, such that they are used purely just during business hours. They will look at fully electric trucks in the near future. They also noted they have renewable energy sources which have capacity given that those cars may only need to be charged once or at the most three times a week, based on the fact that they only used in such a small area.

(Loc Counc 2) have set an upper limit of 2,417 tonnes of carbon CO_2 each year. In meeting that target they have incorporated a number of different strategies including transitioning to more fuel-efficient vehicles and electric vehicles where possible. They use telematics to monitor cars and driver behaviour and have a dedicated driver educator to ensure a safe eco-driving culture is used by all of their staff and drivers.

(Loc Counc 3) has an endorsed sustainable energy action plan, being a commitment to achieve 100% renewable electricity supply by 2030 and a 70% reduction in carbon emissions in that same time period. (Loc Counc 4) has a sustainability team, has declared a climate emergency. They are determined to be net zero emissions by 2030, while acknowledging the need to purchase some offsets.

Overall

In terms policies to 'green the fleet', the local councils seem to be the most progressive organisations in their sustainability goals, with some committed to targets for 2030. Statutory Governments have noted the need for targets but are less specific. One private company is being challenged to aim green by their French parent company, but the profit intention is dominant. The ASX companies have some turnkey solutions, such as buying carbon offsets are reducing fleet vehicle numbers.

3. BEV charging and impact on the grid.

3.1 Does your organisation have concerns about the impact on the grid from BEV fleet charging at peak times?

ASX Companies

(ASX 1) does not consider it an issue for them as most vehicles are home garaged. (ASX 2) has concerns, but not a current issue as BEVs are not 'fit for purpose'. At this stage but are watching the evolution particularly around battery range and whole of life costing. For (ASX 3) the concern would be the peak-hour tariff and considering for renewable energy sources the time to charge an EV is in the middle of the day. They would have to look at workplace charges.

For (ASX 4) the grid is not a real concern because there is so few opportunities to put BEVs into their fleet. They also considered it to be dependent on government policies in respect to using renewable energy with BEVs. They consider there is a lack of government policy. (ASX 5) are not interested grid issues because 'the early technology is not good, but will be considering the technology further in 2022.'

(ASX 6) has concerns given the volume of infrastructure and duration required to recharge, places additional challenges for the take-up of PHEV's/BEV's. Whilst charging at work is generally preferred, allowing linkage to the (ASX 6) existing solar infrastructure ensuring energy is sourced from green renewables. and increased utilisation of their charging infrastructure. There are challenges with this given approximately 20% of their fleet are constantly on the road and are more likely to require recharging via public infrastructure as well as from home.

Private Companies

For (Pte Co 1) whilst emissions are a huge issue as a whole organisation, from a fleet perspective, they do not have many vehicles to utilise charging infrastructure at the moment. (Pte Co 2) have never considered charging impact on the grid, but it is something that will be raised within the organisation for the future.

Statutory Government

(Stat Govt 2) thought it was too far in the future to think about charging impact on the grid. Any EV charging of their vehicles will happen during the day, and then only once every three or four days because only a small proportion of the range of BEVs would be used each day. They thought the best scenario would be that the greater majority of electric vehicles are charged from solar. They operate from leased premises, so they have no control over whether there will be solar in the building or charging infrastructure.

(Stat Govt 3) were very conscious of the impacts on the grid and are supporting the change in the technology from a transmission network to more renewable energy. They would not however be driving any change in policy to the infrastructure and believe there is more discussion around new charging points. (State Govt 1) have no concerns, noting that 80% of Tasmania's power is supplied from hydro.

Local Councils

(Loc Counc 2) have no real concerns about the grid, except that the source of the electricity should come from solar. (Loc Counc 3) are aware that any installation of infrastructure for a charging infrastructure to support a transition to electric vehicles is going to require an electricity upgrade at their sites. Their concern has been around their own capacity and not necessarily the macro grid but they can see the issues.

(Loc Counc 4) would have concerns about the grid over the summer if there was a sudden uptake in EVs across the community. They don't believe the grid will be able to handle it all that well.

Overall

In terms of impact on the grid from BEV fleet charging, ASX companys' concerns were more about tariff rates and duration of charging. Some private and statutory companies think it is too far into the future to worry about. All categories had comments about source of energy for charging.

4. Workplace charging infrastructure

4.1 Are all fleet vehicles returned to base each night?

ASX

All companies reported that the majority of fleet vehicles are taken home. This included employee vehicles (ASX 6) and trade/operational vehicles (ASX 5,2).

Private Companies

'The majority of our vehicles will be taken home' (Pte Co 1). One company's vehicles are returned to base however, they are currently trialling BEVs being taken home (Pte Co 2).

Statutory Government

For (Stat Govt 1) 30% of cars are taken home; for (Stat Govt 3) 50% of cars are taken home.

Local Councils

Responses varied, for example, one local council has vehicles returned to base (Loc Counc 2). Three local govts. reported vehicles are taken home (Loc Counc 2, 3, 4). Of these three, one has 87% of its passenger vehicles and 66% of commercial vehicles taken home (Loc Counc 3).

4.2 What charging infrastructure is now available at base? Describe.

ASX

Some companies have no infrastructure (ASX 1,3) or minimal infrastructure, such as 1-4 charging stations (ASX 4,6,7). One company was an outlier with 12 charging stations (ASX 2).

Private Companies

Limited infrastructure. 'A few of our major offices...have fast chargers' (Pte Co 1).

Statutory Government

(Stat Govt 2) has no charging infrastructure. One has minimal infrastructure, such as 'a three-phased power outlet' (Stat Gov 1). One body has 3 fast chargers (Stat Govt 3).

Local Councils

Local Councils range from five to 13 charging stations. One council reported no infrastructure (Loc Coun 3).

4.3 Are there plans for large scale charging of BEVs at base? Explain.

ASX

No

Private Companies

No

Statutory Government

The feasibility of large scale charging of BEVs at base is being considered by one body – 'we have had some very preliminary talks with companies such as Jet Charge'(Stat Govt 1).

Local Councils

Two local govts. reported this would depend on the result of preliminary reports – 'It will be dependent on the completion of the review of the fleet vehicles'(Loc Counc 4); 'In our electric vehicle feasibility study, the scope is to investigate infrastructure'(Loc Counc 3). One local govt. with plans 'to expand and develop the infrastructure at the city so we can increase the number of electric vehicles' (Loc Counc 2).

4.4 Do you have a policy on employees' charging at public infrastructure?

ASX

No

Private Companies

No

Statutory Government

No responses

Local Government

No

Table 3 overleaf summarises the responses to Questions 4.1 to 4.4 by organisation category.

Table 3. Summary of Question 4.1 to 4.4 responses by organisation category

ASX companies	Statutory Govt	Private co. (o/s parent)	Local councils: urban	4.1 Are all fleet vehicles returned to base each night?	4.2 What charging infrastructure is now available at base?	4.3 Are there plans for large scale charging of BEVs at base? Explain.	4.4 Do you have a policy on employees' charging at public infrastructure?
1				N/A	None	No	No
2				No – operational vehicles taken home.	12 charging stations	No	–
3				No – 'majority of fleets vehicles' taken home.	None	No	No ('but it's inevitable that the vehicles will need to be charged at a public charging station along the way.)
4				No – 'overwhelming majority of fleet cars probably go home.'	1-2 charging stations at various locations.	No	–
5				No – 100% trade vehicles taken home.	–	No	Unclear
6				No – typically employee vehicles taken home.	2-4 charging stations.	Unclear ('continues to explore all options')	No
7				Only ICEs returned.	Limited. 'a couple' of charging stations at 2 Melbourne sites.	No	No
		1		No – 'majority of fleets vehicles taken home'. Restricted use.	Limited. 'A few of our major offices... have fast chargers.'	No	No
		2		Yes – trialling BEVs being taken home.	Limited. 1 OEM	No	No
	1			"No – 30% taken home. Coordinator's/ supervisor's vehicles and on-call workers vehicles."	1 charging station. 'A three-phased power outlet. No infrastructure installed.'	No ('very preliminary talks')	–
	2			–	None	–	–
	3			No – '50% of fleets' (taken home?)	3 fast chargers	Unclear – 'We gotta make sure that vehicle is not going to run out of fuel'	NA
			1	–	10 charging stations (seven kW and 22 kW).	1 fast charging unit.	
			2	Yes	13 charging stations. 9, 10 additional charging stations at 2nd location.	Yes – plan 'to expand and develop the infrastructure'	No
			3	No – Commercial: 66% taken home. Passenger: 87% taken home.	None	No (in feasibility study phase)	No
			4	No – coordinator and manager vehicles taken home.	5 charging stations.	No (plans for future depending on outcome of review)	No

5. Managed charging for enhanced grid reliability.

5.1 Has your organisation given thought to managed BEV charging and grid reliability, whether on site or at home

ASX

(ASX 1,2,4) have all either not given thought to managed BEV charging and grid reliability, or considered any impacts. (ASX 3) raised it as a risk when they began to explore the EVs. (ASX 5) believes it's a challenge for the employees. It believes the reimbursement for charging the cars is going to be a problem as well as the practicality of charging for those with only on street parking or for families with multiple cars.

(ASX 6) has given managed BEV charging and grid reliability some thought. Particularly for on-site charging, for example, the heavy amperage required to charge each vehicle and the link to the grid (substation, etc) required to accommodate vehicle recharging. To ensure CO_2 emissions are reduced, return to base locations such as their offices, plus link to daytime charging using renewable energy would be required. Sales representative's needs will need to be factored separately. At this stage BEVs are not a suitable option due to their insufficient range and length of time to recharge.

Private Companies

Both (Pte Co 1,2) have never thought about managed BEV charging and grid reliability. For (Pte Co 1) it is 'definitely a consideration on their plan'. (Pte Co 2) notes it raises some good questions.

Statutory Government

Neither (Stat Govt 1, 3) have thought about managed BEV charging and grid reliability. For (Stat Govt 2) they believe it is not their issue given the vehicles are leased out.

Local Councils

(Loc Coun 1) already have parking bays for electric vehicles which will have a charging unit and its their objective that they be charged from renewable energy, not from the grid. They are one of a number of inner-city councils which teamed up to develop their own renewable energy sources having solar and wind renewable sources, plus batteries. They can install more charging units however the concern is the limited parking spaces during the day compared to the number of vehicles in use, so home charging would also need to be available. They believe there are also issues around timing with some parking spaces requiring permits or being timed.

(Loc Coun 2) believe managed BEV charging and grid reliability is something that needs to be considered, especially if they are looking to expand but they are still at the stage of encouraging the expansion to the electric fleet rather than considering the appropriate infrastructures. (Loc Coun 3) will be reviewing it as part of their feasibility, including smart infrastructure to help manage the demands on their site's capacity. (Loc Coun 4) have given it thought and discussion but believes the initiative should come from state government. In Victoria, when there's an anticipated peak load, governments target certain large businesses requesting them to reduce their capacity.

Overall

In terms of managed BEV charging and grid reliability, one ASX company has considered return to base locations, such as their offices. Private companies and statutory government have not given this issue much thought. Local government raised considerations such as use of non-grid renewable energy, installation of more (and timed) smart charging stations and state government leadership on the issue.

6. Awareness of employee home charging of BEVs.

6.1 If your organisation allows or were to allow passenger and light commercial vehicles to be home charged, have you considered the positive impact on charging infrastructure shortages at the base?

ASX

Home charging is a good approach to address charging shortages at base (ASX 1, 2) There is a fire risk attached to home charging (ASX 3). There would be problems with and accurate reimbursement of employees (ASX 4, 5, 6) and multiple charging of cars at home and impact on the grid (ASX 5, 6).

Private Companies

Have not considered home charging as an approach to address charging shortages at base (Pte Co 1, 2).

Statutory Government

There are not many passenger vehicles that go home, outside of salary packaged vehicles. There are 'not that many BEV utes, so it's a bit problematic' (Stat Govt 1). We lease the vehicle to the agencies, so it is an 'agency-by-agency approach' (Stat Govt 2). 'We have a highly unionised industry. So, employees would immediately be saying, well if I'm charging, that's costing me' (Stat Govt 3).

Local Councils

Some departments may be on call and have to take a vehicle, so yes, there could be home charging (Loc Coun 1). With an electric vehicle, 'potentially, you're asking an employee to contribute to the total cost of ownership' (Loc Coun 3). 'If we put a charger in at someone's house and then the questions would come up: What if that person then leaves? What happens to the charger? How do they bill us? Are they expected just to cop it?' (Loc Coun 4).

Overall

Organisations seem open to home charging, but concerned about the logistics and policies around who bears private home infrastructure costs.

6.2 How might your organisation's employees respond to an option for home charging?

ASX

Employees would ask, how do you get reimbursed? (ASX 2, 4, 5, 7). We need to make sure 'the employee was very comfortable' (ASX 2). 'So far, the response has actually been quite positive to the employees that we were talking to as potential trial candidates for it' (ASX 3). Interest in home charging is likely to vary based on many factors: 'Inner city versus metropolitan housing; and availability of a garage space versus the need to run extension cords into the street; number of vehicles in the household; do BEVs match employee use requirement/lifestyle; BEV range; and time required to recharge' (ASX 6).

Private Companies

There needs to be a framework in place for cost compensation (Pte Co 1, 2). 'For ICEVs employees are given a fuel card and the company looks after the cost' (Pte Co. 1).

Statutory Government

Under a salary package/novated lease arrangement you get a charging cable, and there's about three different levels for home charging. The salary package employee would pay for the energy. (Stat Govt 1). 'We need to get them [the employees] used to how cheap it is to charge' (Stat Govt 2). 'How convenient is it that employees will not have to go to a petrol station. We are having dialogue with all of the unions' (Stat Govt 3).

Local Councils

'Home charging has to be from renewable energy, otherwise we're defeating the purpose' (Loc Coun 1). 'I think most of the staff at the city have an appetite to reduce emissions wherever possible' (Loc Coun 2). It would be supported, but cost compensation would be an issue (Local Coun 3, 4).

Overall: Fleet managers had to reflect on how their organisation's employees might respond to an option for home charging. Some felt the option for home charging would be supported, but cost compensation would be an issue. A dialogue with employees would be required.

6.3 Has your organisation had internal discussions on the logistics and costs of installing home charging facilities for BEVs?

ASX

Discussions are proceeding on the logistics and costs of home charging (ASX 1,2, 4, 6). 'We committed to becoming more sustainable so we can budget for these costs. We would definitely consider chargers for the more permanent employees' (ASX 3).

Private Companies

No, have not considered logistics and costs (Pte Co. 1, 2).

Statutory Government

No, have not considered logistics and costs (Stat Govt 1,3). We'll pay to put a wall charging in your home if the vehicle was assigned to one employee. That would need to be a legitimate reason related to one's job (Stat Govt 2).

Local Councils

No, have not considered logistics and costs in depth (Local Counc 2, 3,4). An employee leaving the organisation is an issue (Local Coun 1, 3).

Overall: Not many interviewees have discussed the logistics and costs of installing home charging facilities. Perhaps it is too early.

6.4 Is there an organisation policy on covering employees' costs for energy, Explain in relation energy for home charging?

ASX

Most had not deeply considered a policy for energy cost for home charging (ASX 1, 2, 6, 7). The employee would pay the energy cost for home charging (ASX 1). It would be 'important to understand that we would not be just be shifting the CO_2 burden' (ASX 6). Yes, we have engaged in a trial where employees could be reimbursed using a smart meter reading (ASX 3). Yes, we have considered a policy on energy costs for EV charging (ASX 4,5).

Private Companies

No, have not considered a policy (Pte Co. 1, 2).

Statutory Government

No, there is no policy. 'Does the driver include a copy of their power bill with a time sheet to payroll? Or install a smart meter? I can claim back 77c/km. Do the drivers of a BEV get the same rate? There are a lot of questions to be answered' (Stat Govt 1).' How will an employee prove their energy charge?' Companies may invest in home charging for their sales people. Home charging seems to be a more efficient way 'for employees to be on the road' (Stat Govt 2). We would reimburse employee energy costs (Stat Govt 3).

Local Councils

'How will an employee prove their energy charge?' Could use a smart meter reading (Local Coun 1). No, have not considered a policy (Local Coun 2, 3, 4).

Overall: Generally, the interviewees do not have an energy policy for employees. One organisation considered a trial to investigate energy costs, and two mentioned smart meters.

7. Tax Questions

7.1 Have you given thought to the fringe benefits tax on employees' home charging fleet BEVs?

ASX

There are financial disincentives for the uptake of BEVs in salary packaging and salary sacrifice (ASX 1). Too early to worry about home charging (ASX 2). We have thought about home charging and FBT costs for charging infrastructure (ASX 3). We do not pay FBT as the majority of vehicles are utilities (ASX 4, 5).

Private Companies

Definitely FBT is a 'massive consideration' (Pte Co 1). We are leaving FBT considerations 'to our finance people' (Pte Co 2).

Statutory Government

Clearly there is FBT on home garaging and it would discourage everyone, so 'do not home garage' (Stat Govt 1). We have no FBT liabilities as our vehicles are utilities (Stat Govt 3).

Local Councils

'We are moving away from salary sacrifice vehicles so not concerned about FBT' (Loc Coun 1). Not concerned about FBT and home charging because of utes and other cars are mainly returned to base (Loc Council 3).

Overall: Most interviewees have given thought to fringe benefits tax of employees' home charging. The trend was that FBT liability was a discouragement for home charging; or it was not an issue due to the FBT exemption for utility vehicles.

7.2. What aspects of fringe benefits tax would you like to see modified, to encourage a transition of your fleet cars to BEVs

ASX

Exempt FBT for all vehicles under operating cost method (ASX 1). Reduction of the 20% rate for FBT Statutory Formula method (ASX 2). We would prefer less FBT (ASX 3). FBT exemption on commercial vehicles only encourages further use. All commercial vehicles should have the same rate. Government 'should not penalise [ICEV] light commercial vehicles', such as utilities, as there is no alternative BEV car. 'We want a green fleet but government will penalise your capital for the privilege' (ASX 4). 'Pay no FBT under the operating cost method' (ASX 5). Change FBT Statutory Formula method for fleet vehicles to two applicable rates to give a benefit to all zero/low emissions vehicle (ASX 6).

Private Companies

An FBT exemption for all commercial vehicles (Pte Co 1). There should be FBT changes to make EVs more attractive to business (Pte Co 2).

Statutory Government

There should be an FBT reduction to account for more expensive technology of BEVs. At the moment, 'there's only disincentive' (Stat Govt 1). Reduction of the 20% rate for FBT Statutory Formula method, but BEVs should be FBT exempt (Stat Govt 2). 'No FBT, as long as you don't use the vehicle for any the private use.' Australia is giving nothing to incentivise uptake of BEVS (Stat Govt 3).

Local Councils

A greater FBT concession for BEVs (Loc Coun 1, 2, 4). We consider that FBT was a fairly minor consideration as most passenger cars are back to base and utilities have restricted private use (Loc Coun 3).

Overall

Interviewees called for an FBT exemption or rate reduction for BEVs. However, one ASX pointed out that there should be no FBT penalty for ICEV light commercial vehicles as there was no alternative or equivalent BEV models currently available. This point was repeated by other organisations.

7.3 Would your organisation acquire more BEVs if income tax concessions were modified, such as depreciation, instant-asset-write-off, to preference BEVs?

ASX

It would be good to get tax incentives for BEVs (ASX 1,3,7). It would 'change the conversation' (ASX 2); particularly about whole of life costs (ASX 1, 4, 5). If there was a similarly priced BEV to the diesel Hilux, 'we'd probably buy it every day of the week' (ASX 4). 'Continuation of instant tax write-off beyond June 2022 would be helpful' (ASX 6).

Private Companies

Tax incentives for BEVs would be good, but a vehicle 'fit-for-purpose is our number one challenge. We didn't have the utility car EV options' (Pte Co 1). Tax incentives would be good, as 'every opportunity is a benefit to transition' to BEVs (Pte Co 2).

Statutory Government

Currently there are incentives to buy ICEVs due to the instant-asset-write-offs, but no preference for BEVs. Many organisations use passenger cars as a 'tool of the trade vehicle' but there are no specific tax incentives for them (Stat Govt 1, 2). Preferential income tax concessions for cars should not be available to ICEVs (Stat Govt 3).

Local Councils

In terms of tax incentives, we 'don't just consider the capital investment in the car', we look at total cost of ownership. 'What we're finding with our vehicles [BEVs and PHEVs] is there is a huge benefit in the operating costs of these vehicles in comparison to ICEVs (Loc Coun 2). Local Councils is not subject to income tax (Loc Coun 1, 3,4).

Overall

Preferential income tax incentives for BEVS are supported, but only when 'fit for purpose' BEV models become available. Statutory government and local councils are not subject to income tax, but those organisations that lease cars are likely to have lower payments due to income tax concessions.

7.4 If there were tax rebates or subsidies for home charging equipment, would that encourage your organisation to transition more of your fleet to BEVs?

ASX

Subsidies should be made available to business (ASX 7); and rebates to employees (ASX 1). If there's a company subsidy, and the individual leaves the company, 'do you pull the charge point out take it away?' (ASX 2). If there's a company subsidy, 'the risk of having a charger in employees' home is quite big' (ASX 3).' I'm not sure tax deductibility on infrastructure or power costs will entice an employee' toward home charging (ASX 4). Consideration of tax rebate/subsidy may be relevant if home charging can be done with green renewable energy (ASX 6).

Private Companies

Rebates and subsides for charging equipment would be good, but a vehicle 'fit-for-purpose is our number one challenge' (Pte Co 1). We will 'transition no matter what to EVs', however certain car models are not available (Pte Co 2).

Statutory Government

A direct rebate to employees for home charging equipment would be good (Stat Govt 1). Government could try to incentivise and provide a rebate to employees or discount electricity bills (Stat Govt 2). The employer 'would have to pay for home charging equipment' as the 'employee won't want to pay' (Stat Govt 3).

Local Councils

The government should incentivise home charging equipment through rebates (Loc Coun 1). I think the appetite is there from a staff perspective for home charging equipment through rebates (Loc Coun 2). 'I'm not sure that the Local Councils would go down the path of expecting our employees to fund home charging equipment' (Loc Coun 3). In terms of incentives 'anything to make [home charging equipment] a little bit more cost-effective' (Loc Coun 4).

Overall: ASX companies raised questions on the effectiveness of tax rebates and/or subsidies for home charging equipment. Private companies were more concerned with purchasing vehicle that are 'fit for purpose'. Statutory government and local council responses reflect a tension between who would pay for equipment: employer or employee.

7.5 Depreciation and GST credits are capped at car cost ~ $60,000. Is that a disincentive for BEV acquisitions for your organisation?

ASX

Depreciation rate for BEVs should be more concessional because of 'degradation of the battery' (ASX 1); and technology changes (ASX 5). Current car depreciation caps are not a problem (ASX 2,3,7). If the government wants to incentivise, look to countries with successful EV uptake and consider their tax regime. There needs to be a vehicle fit for purpose in the market (ASX 4). all ZLEVs covering PHEV, BEV and FCEV's could benefit from a relaxation/removal of the cap (ASX 6).

Private Companies

Current car depreciation caps are fine as they meet out 'price point' (Pte Co 1).

Statutory Government

Current car depreciation caps should be raised (Stat Govt 2, 3).

Local Councils

Current car depreciation caps are not a problem for our preferred BEVs (Loc Coun 1, 2, 3). Current car depreciation caps are a problem for our preferred BEV (Loc Counc 4).

Overall

Most organisations stated that the current depreciation caps are not a problem as they meet the pricing point of their preferred BEV. Two ASX companies raised the issue of a higher BEV prices due to technology, and called for a faster rate of depreciation.

7.6 Victoria now charges EVs 2.5c km. What would be the impact on your organisation vehicle selection if similar CO_2 emissions-based charges were imposed on ICEVs.

ASX

Emissions-based charges would be a big shift and 'not ideal' (ASX 1,3). There would be both a fuel excise and emissions tax, a 'disastrous policy' (ASX 4). CO_2 emissions-based charges 'makes sense' (ASX 5). Unless the CO_2 emissions-based charge is 'targeted to only apply to companies, the risk is that it may disproportionally impacting lower socio-economic groups' (ASX 6).

Private Companies

Emissions-based charges 'would be a big impact for us' because it comes back to a car that is fit-for-purpose (Pte Co 1). A CO_2 emissions charge might not affect the decision to the transition to BEVs, but we would need to review the total cost of ownership (Pte Co 2).

Statutory Government

Emissions-based charges would not hasten our transition to EVs (Stat Govt 3) as 'there's got to be something there to transition to' (Stat Govt 1). It is fair and reasonable that charges should be based on CO_2 (Stat Govt 2).

Local Councils

Emissions-based charges have been discussed many times: 'what is the city's stance on costs versus emissions reductions?' There is a lot of emphasis on emissions reduction (Loc Coun 2). If there were a CO_2 emissions-based charge, then there would have to be a reduction in fuel tax to offset double dipping (Loc Coun 3). I know ICEVS are under review but council would not be happy with an emissions charge (Loc Coun 4).

Overall:

Despite the unlikely prospect of a CO_2 emissions charge on ICEVs in Australia (as seen in Europe), interviewees still plan to make the transition to BEVs. One ASX suggested that any application of a CO_2 emissions charge should only target companies, as it may disproportionally impact lower socio-economic groups.

8. Total-cost-of-ownership (TCO) Questions

8.1 Can you share data on the TCO of a BEV to an ICEV?

ASX

BEVs more expensive due to capital costs, maintenance costs are comparable (ASX 4). TCO benefits of BEVs include less frequent servicing and cheaper to fuel (ASX 1). No data available (ASX 2,3,6,7).

Private Companies

TCO is 'actually quite similar' (Pte Co 1). No data available (Pte Co 2).

Statutory Government

BEVs save $800 to $10,00 per 20,000kms on fuel. Factoring in tyres and service costs, over two ownership cycles BEVs result in 'more savings' (Stat Govt 2). No data available (Stat Govt 1, 3).

Local Councils

TCO of a BEV higher than ICEV, '$18,000 per vehicle more expensive' (Loc Council 3). Anecdotally, 'almost on parity in a five-year total cost of ownership scale' (Loc Council 2). No data available (Loc Council 4).

Overall

Few interviewees had data on TCO. Two organisations claimed BEV TCO was higher due to capital costs. Two organisations reported TCO was similar.

8.2 Would you consider increasing the uptake of BEVs, if its TCO was closer to an ICEV?

ASX

Yes, 'provided... infrastructure is there to support them' (ASX 4). Yes (ASX 2,3); 'however each vehicle still needs to be fit for purpose' (ASX 6).

Private Companies

No, fit-for-purpose is more important (Pte Co 1). Yes, 'but it's got to meet the operational criteria first' (Pte Co 2).

Statutory Government

Yes, 'absolutely' (Stat Govt 1, 3).

Local Councils

Policy is to transition to BEVs (Loc Council 1). 'We're trying to increase and spread awareness within the organisation that we are trying to increase the uptake of electric vehicles' (Loc Council 2). Yes (Loc Council 3,4).

Overall

All but one organisation would consider BEVs. Infrastructure and fit-for-purpose were cited as additional barriers that would need to be considered.

8.3 As BEVs can be expensive, does the lease period need to be longer?

ASX

No, because there are car safety issues with extending the lease (ASX 1, 5, 6). No, 'standard 3-4 years' is adequate (ASX 2). 'Difficult to answer...but it doesn't necessarily mean that the leases need to be longer' (ASX 3). 'Probably have to have the lease period longer' (ASX 4).

Private Companies

No, 'the lease periods would be shorter than our traditional' lease periods' (Pte Co 1). Cost would be cheaper with a longer lease, but needs to be weighed against the risk of performance decreasing and breakdowns and lower residual value (Pte Co 2).

Statutory Government

NA, not leasing of vehicles (Stat Govt 1,2, 3).

Local Councils

'It would definitely need to be increased' due to lower maintenance requirements (Loc Council 4). For a 5-year BEV lease, you are 'basically paying the same as having a combustion fuelled vehicle over three or four years', which suggests a longer lease would be preferred (Loc Council 1).

Overall

Local councils prefer longer leases due to TCO savings. Majority of ASX companies responded that lease periods would not need to be extended.

8.4 Are you concerned with the BEVs resale or residual value?

ASX

Yes, cost of battery replacement is a concern (ASX 1,3,6); additionally, as the price of BEVs decreases so does resale value (ASX 2). 'Manufacturers need to release more commercial options on batteries if they need to be replaced' (ASX 1). EVs have a lower residual value compared to ICEVs (ASX 4). However, 'as market acceptance and volumes grow, this is expected to improve' (ASX 6). 'Hard to tell without any market for second-hand vehicles' (ASX 5).

Private Companies

Yes (Pte Co 1). Battery age reducing residual value is a concern (Pte Co 2).

Statutory Government

'Yes and no' vehicles are disposed of 'within their useful life' (Stat Govt 1). Uncertain – minimal information available. 'EV owners aren't turning their cars over' (Stat Govt 2); and the Australian second-hand BEV market is not yet established (Stat Govt 3).

Local Councils

No, 'over recent years...they're starting to get stronger' (Loc Council 2); and battery life is not going to be an issue when BEVs are only two or three years old (Loc Council 3). Nissan Leaf observed to have low resale value, but other BEVs 'hold their value really quite well' (Loc Council 4).

Overall

Limited information is available on the BEV resale value and its second-hand market. Uncertainty over replacement batteries, and the associated costs, and how this might impact resale value was a common concern cited by interviewees.

8.5 In terms of TCO, can you comment on anticipated fuel savings and CO_2 reduction from an increased uptake of BEVs?

ASX

'TCO will reduce because of the anticipated savings on service, fuel and CO_2 reduction' (ASX 1). Fuel savings 'would be on average per vehicle $200 per month' (ASX 3). BEVs TCO and CO_2 emissions are 'not yet leading the class, however this is expected to improve over coming years' (ASX 6). There would be fuel savings, but 'from a CO_2 reduction objective, I'm not convinced' (ASX 4). TCO information not available (ASX 2, 5, 7).

Private Companies

BEVs have significant fuel savings (Pte Co 1,2). Limited information on CO_2 reduction available (Pte Co 1). 'Our goal is to reduce our emissions by 60 percent, and one of the ways we're going to do that is to transition to EVs' (Pte Co 2).

Statutory Government

Anticipate fuel savings and CO_2 reductions from BEVs (Stat Govt 1, 2). 'Fuel savings is significant' (Stat Govt 3).

Local Councils

'Increased uptake of BEVs is obviously going to have a positive effect on fuel savings' (Loc Council 2). Estimated fuel savings of 50% and CO_2 emission reduction of 23% (Loc Council 3). TCO information not available (Loc Council 4).

Overall

Majority of interviewees expect fuel savings and CO_2 reduction. Several interviewees commented that further modelling on CO_2 reductions was needed.

E. Methodology for the Qualitative Interviews

The qualitative approach of fleet manager interviews is one of the methods used to generate data to investigate taxation changes to support home charging from the grid and to facilitate affordability.

Based on the understanding that business fleets are an effective pathway for early adoption of EVs, the project explored a range of specified project issues relevant to the limited uptake of BEVs in car fleets, including taxation changes to support home charging.

The interview questions were designed to firstly gather basic data about electric vehicles in the interviewee organisation's vehicle fleet. Drawing on the literature and the project's contract requirements, the main questions were structured to progress through the themes of CO_2 emissions reductions;[20] knowledge of BEV charging impact on the grid;[21] workplace charging infrastructure,[22] managed charging for enhanced grid reliability,[23] awareness of employee home charging of BEVs;[24] taxation;[25] and total cost of ownership.[26]

The first set of draft questions were sent to the industry partners for comment. Suggestions were received back by 25 June 2021. The responses were collated and questions revised. The interview questions were tested. The final interview questionnaire (Appendix A) received ethics approval from Griffith University. The Information Sheet (explanatory statement) and Consent Form were approved.

Sixteen fleet managers were interviewed from around Australia and included ASX-listed companies, private companies, statutory government bodies and local city councils. The organisational interviewees were introduced to the project's researchers by the Australasian Fleet Management Association, and the sample is considered randomly selected.

The interviews were conducted for up to one hour over Zoom or MS Teams, recorded and later transcribed. Primary data from 160 hours of interviews has been generated from this small sample of fleet managers. The text of the interview transcriptions was scanned into a database (NVivo) which facilitated the thematic coding of data.

The categories of interviewee organisations are shown in Table 4 overleaf.

20 Dept of Industry Science Energy and Resources, "Future Fuels Strategy: Discussion Paper. Powering Choice", ed. Dept of Industry Science Energy and Resources (Canberra 2021). See page 3, 'The Government aims [inter alia] ... to reduce emissions in the road transport sector.'

21 Tony Wood, Alison Reeve, and James Ha, *Towards Net Zero: Practical policies to reduce transport emissions* (Grattan Institute, 2021). See page 4, 'Ensure buildings and the electricity grid are electric vehicle-ready.'

22 Anh Bui, Peter Slowik, and Nic Lutsey, "Los Angeles Electric Vehicle Charging Infrastructure Needs and Implications for Zero-Emission Area Planning", (The International Council on Clean Transportation, 2021). It notes public and workplace charger deployment will need to ramp up quickly to support zero-emission vehicle goals.

23 Toon Meelen, Brendan Doody, and Tim Schwanen, 'Vehicle-to-Grid in the UK fleet market: An analysis of upscaling potential in a changing environment' (2021) 290(125203) *Journal of Cleaner Production*. Notes that car fleets of organisations are often identified as a particularly suitable application domain for V2G.

24 Government of Ireland, 'Transport Energy', Department of the Environment, Climate and Communications, Dublin, https://www.gov.ie/en/policy-information/e1539-transport-energy/. Notes that home charging is considered the primary method of charging for the majority of EVs in Ireland.

25 The interviews explore taxation alternatives in response to the current Australian policy slogan for zero emissions of 'Technology not Taxes', see <https://www.facebook.com/scottmorrison4cook/videos/229506609060279/>.

26 See NSW Government, 'Total Cost of Ownership Calculator', https://www.transport.nsw.gov.au/projects/electric-vehicles/total-cost-of-ownership.

Table 4. Sixteen interview organisations, by type and code

ASX	Private co.	Statutory Govt	Local councils
1			
2			
3			
4			
5			
6			
7			
	1		
	2		
		1	
		2	
		3	
			1
			2
			3
			4
7	**2**	**3**	**4**

The research process is inductive, as opposed to the deductive nature of quantitative research, where answers to hypotheses lead to claims in the nature of statistical generalisations made about broader populations. The interview emphasis has been on gaining insights from the perspective of those with experience in fleet vehicle management.

The interviews aimed to build an understanding of fleet managers' perceptions of the barriers to the uptake of BEVs in their fleet, and how tax changes to support fleet employee home charging might help.

The analysis of the interview data has focussed on identifying taxation themes, patterns and building theories to make meaningful generalisations – albeit limited to the data collected.

What is important from this small sample of interviews, has been the insights from persons in the field. The interview outputs from the 16 fleet managers has informed the design of a larger quantitative Fleet Manager survey and a Fleet Employee survey, covered in the next part of this RACE report.

Thus, the fleet manager interview data has formed discrete sets of ideas and will be empirically tested in the wider subsequent survey phase, which will support broader generalisations of key relevant themes from the interviews.

Appendix A

INTERVIEW QUESTIONS TO FLEET MANAGERS

1. Proposed uptake of EVs in Fleet

1.1 Can you explain your role with fleet vehicles?

1.2 In your organisation, who is responsible for the acquisition policy for passenger and light commercial vehicles?

1.3 What are vehicle numbers in your passenger and light commercial fleet?

1.4 What are the PHEVs and BEV numbers, per vehicle segment?

1.5 What are the average annual kilometres for your passenger and light commercial fleet vehicles?

1.6 How many passenger and light commercial fleet vehicles are owned versus leased in your organisation?

1.7 Around what percentage of the fleet vehicles are replaced each year?

1.8 Does your organisation have targets to increase the uptake of EVs? *Explain*.

1.9 What is the selection process of choosing vehicles for your fleet? *Explain*.

1.10 Are there BEVs on the market that are fit-for-purpose your organisation? *Explain*.

2. CO_2 Emissions and reductions

2.1 Can you *explain* your policy to green the fleet, including action on CO_2 reductions?

3. BEV charging and impact on the grid

3.1 Does your organisation have concerns about the impact on the grid from BEV fleet charging at peak times? *Explain*.

4. Workplace charging infrastructure

4.1 Are all fleet vehicles returned to base each night? If not, *explain* in terms of car numbers and car type taken home.

4.2 What charging infrastructure is now available at base? *Describe*.

4.3 Are there plans for large scale charging of BEVs at base? *Explain*.

4.4 Do you have a policy on employees' charging at public infrastructure? *Explain*

5. Managed charging for enhanced grid reliability.

5.1 Has your organisation given thought to managed BEV charging and grid reliability, whether on site or at home? *Explain*.

6. Awareness of employee home charging of BEVs.

6.1 If your organisation allows or were to allow passenger and light commercial vehicles to be home charged, have you considered the positive impact on charging infrastructure shortages at the base? *Explain* with reference to the different types of EVs.

6.2 How might your organisation's employees respond to an option for home charging?

6.3 your organisation had internal discussions on the logistics and costs of installing home charging facilities for BEVs? *Explain*.

6.4 Is there an organisation policy on covering employees' costs for energy? *Explain* in relation energy for home charging.

7. Tax questions

7.1 Have you given thought to the fringe benefits tax on employees' home charging fleet BEVs?

7.2. What aspects of fringe benefits tax would you like to see modified, to encourage a transition of your fleet cars to BEVs?

7.3 Would your organisation acquire more BEVs if income tax concessions were modified, such as depreciation/instant-asset-write-off, to preference BEVs? *Explain.*

7.4 If there were tax rebates or subsidies for home charging equipment, would that encourage your organisation to transition more of your fleet to BEVs? *Explain.*

7.5 Depreciation and GST credits are capped at car cost ~ $60,000. Is that a disincentive for BEV acquisitions for your organisation? *Explain.*

7.6 Victoria now charges EVs 2.5c /km. What would be the impact on your organisation vehicle selection if similar CO_2 emissions-based charges were imposed on ICEVs? *Explain.*

8. Total-cost-of-ownership (TCO)

8.1 Can you share data on the TCO of a BEV to an ICEV?

8.2 Would you consider increasing the uptake of BEVs, if its TCO was closer to an ICEV?

8.3 As BEVs can be expensive, does the lease period need to be longer?

8.4 Are you concerned with the BEVs resale or residual value?

8.5 In terms of TCO, can you comment on anticipated fuel savings and CO_2 reduction from an increased uptake of BEVs?

4 Fleet Manager and Fleet Employee Test Surveys: quantitative methodology and test outcomes

4.1 Fleet Manager Test Survey

The (preliminary) quantitative survey instrument to survey fleet managers (employers)' perceptions on future uptake of battery-powered electric vehicles (BEVs) was primarily developed based on a literature review. It was also adjusted and improved to reflect the key findings from the fleet employer interviews, thereby allowing to build on the earlier work conducted as part of this project. See the Preliminary Survey Instrument in Appendix A 'Fleet Employers' Perceptions on Future Uptake of Battery-Powered Electric Vehicle (BEVs).'

The items included in the survey instrument were primarily chosen from the literature review conducted. The literature review focused on three aspects: motivations, challenges, and enablers to increase the number of BEVs in a fleet. Literature has highlighted several motivations for organisations to adopt BEVs. For instance, the availability of government support through tax benefits and grants, lowering environmental impacts, and improving the organisation's public image have been identified as crucial motivations among the US and Dutch organisations to adopt BEVs (Sierzchula, 2014). Other motivations include organisational innovativeness, perceived environmental benefits and positive effects on employee motivation (Globisch et al., 2018). Accordingly, the literature suggests both external and internal factors driving the adoption decision of BEVs. In order to capture a broad range of internal and external factors motivating the fleet managers to adopt BEVs, we have used an institutional theory (Buysse and Verbeke, 2003; Delmas and Toffel, 2004) and the business cases for sustainability perspective (Carroll and Shabana, 2010; Schaltegger et al., 2019).

In addition to the literature review, the survey item development was supplemented by the key findings of the qualitative interviews with fleet managers. Attention was paid to the results of possible motivations, challenges, and enablers. The primary objective of this preliminary employer survey was to investigate: *what are the fleet managers' perceptions of the barriers to the uptake of BEVs in their fleet and explore potential tax changes to support fleet employees' home charging*.

Other objectives of interest were to understand the fleet profile and replacement decisions and examine how fleet managers perceive taxation and home charging infrastructure as enablers.

Key survey measures:

Initial set of screening questions

The survey begins by asking the respondents to provide some information about their organisation and their job roles. The purpose of these initial screening questions is two-fold. First, these questions help us ensure that we survey the intended audience, i.e., organisations that currently have employer-provided vehicles, such as fleet vehicles, pool vehicles and salary packaged vehicles. Second, these questions also help us ensure that we get the responses from the most relevant person in the organisation. Therefore, we have also included some questions about the organisational characteristics such as fleet size (in terms of no. of vehicles), employees, and organisational type (whether it is a local government, state or federal government, private business ASX-listed or other types). This will help us categorise fleet manager perceptions based on the organisational characterises for further analysis.

Fleet profile

These questions aim to further explore the fleet profile of the respondent organisations. This is achieved through examining the following details.

- Fleet by vehicle type (asking the respondents to provide vehicle number details for fuel and vehicle types)
- Triggers of the purchase of replacement vehicles (e.g., *predefined age limit, end of warranty period, end of finance contract, predefined kilometre limit and unfit fit for purpose*)
- Age of fleet when at replacement
- % of the fleet that is home garaged overnight
- Fleet by location
- Annual kilometres travelled by fleet
- Fleet vehicle ownership (e.g., owned vs. leased)

Some of these questions were adopted from Khan et al. (2021) and Australasian Fleet Management Association (2020).

Motivations and challenges to adopting BEVs

The key motivations for the adoption of BEVs were developed based on DiMaggio and Powell (1983) institutional framework of isomorphism[27]. These questions revolve around three isomorphic forces: coercive, normative and mimetic.

- **Coercive pressures** are measured by posing two questions (i.e., meeting shareholders/investor/rate-payers demands and preparing to meet future regulatory/policy requirements)
- **Normative pressures** are measured by raising three questions (i.e., BEVs is a part of the corporate social responsibility initiatives, improvements in organisational image/public relations and legitimisation of organisational practices)
- **Mimetic pressures** are measured by asking three questions (i.e., competition in the industry, organisations awareness of the industry best practices and environmental awareness of employees/customers)

All these measures have all been adapted from Phan and Baird (2015), and for each of the measures, respondents will be asked to indicate to what extent they agree or disagree with a list of specifically developed statements on 7-point Likert Scales. Also, we have included an option to provide fleet managers unfamiliarity with the question (i.e., "I do not know") as the impact of some of these institutional pressures may be outside the purview of fleet managers.

While these questions based on institutional pressures capture the motivations in an organisational field, three questions were also included to identify the internal organisational motivations. They focus on the business case for sustainability as suggested by Carroll and Shabana (2010), checking on "how a company can actively create synergies between managing environmental or social issues in a way that increases corporate economic performance" (Schaltegger et al., 2019, p. 192). These three questions address cost-effective decision making, reductions in greenhouse gas emissions and enhancement in revenue potential. Similar to that of the other questions in motivations, these questions ask respondents to indicate to what extent they agree or disagree on the given statements on 7-point Likert Scales while having the option to indicate their unfamiliarity with the question (i.e., "I do not know").

The challenges for the adoption of BEVs were primarily drawn from the AFMA (2020) survey report on "Electric Vehicles in Business Fleets." These questions identify the challenges under three categories. They are BEV-related issues, charging/infrastructure issues and support, education, and other issues.

BEV-related issues are measured along several dimensions, including affordability, uncertain resale value, higher total cost of ownership, higher fringe benefits tax, limited choices, inadequate long-range battery, limited battery warranty, high replacement cost of battery and low capacity of BEV batteries.

- **Charging/infrastructure issues** are measured on items such as cost of setting up workplace charging infrastructure, room at base for working place charging infrastructure, site/base suitability, regulations prohibit a number of charging stations at base, organisation will not install charging stations at leased premises, excessive work centres to install charging stations, availability of fast chargers at public charging infrastructure, electricity cost, grid reliability, number of charging stations requirement and complexity of setting up managed workplace BEV.
- **Support, education, and other issues** are measured using policy/regulatory support, environmental concerns on source of electricity from the grid, interest in sourcing renewable energy, knowledge about BEVs and charging infrastructure, top manager awareness/support and employee willingness to use BEVs.

These questions are measured by requesting the respondents to indicate their agreement on the given statements on 7-point Likert Scales. Further, an option to show "I do not know" was provided, considering the possibility that some of these questions may fall outside the scope of some fleet managers.

Taxation changes

The changes in the present BEV related taxation system were considered as an enabler to promote the uptake of BEVs. It poses a range of tax policy measures and requires the respondents to indicate how these measures would encourage the uptake of BEVs for work/tools of trade and salary packaged vehicles. These measures include fringe benefit tax exemptions for BEVs, reduction in statutory formula percentage, provision for asset write-offs, faster depreciation rates, depreciation cost limits, GST tax credit, subsidies, and tax changes to reduce the cost gap between BEV and ICEV. These items were measured on a 7-point Likert scale ranging from "strongly disagree" to "strongly agree".

Availability of home charging BEV and tax changes

Due to the lack of or low workplace charging infrastructure, which hinders the uptake of BEVs, one immediate remedial measure is to use fleet employees' home charging. This can reduce cost (using smart chargers to gain off-peak rates), provide drivers' convenience and safety, and improve energy management (through 'peak shaving' and 'distributed consumption'). In particular, low-cost home charging facilities are essential for BEV operating cost-related savings (Scorrano et al., 2020). Studies show that the proportion of drivers

27 This process by which organizational structure or processes become identical to those of another in a similar organizational field (DiMaggio and Powell, 1983).

having the possibility to charge at home is quite large. For instance, this is 27% in Italy, while in Australia, AFMA (2020) shows that around 47% of fleet vehicles are home garaged, indicating a vast potential for home charging. In order to explore this possibility, we ask the fleet managers about their organisation's likelihood of transitioning home garaged work/tools of trade ICEVs to BEVs. We check several aspects, including the possibility of home charging of BEVs, availability of smart charger, and low rate of home charging BEVs on a 5-point Likert scale ranging from "Highly unlikely" to "Highly likely." It also included an option to indicate their interest to know more information (i.e., "Interested to know more").

In pursuing the home charging possibilities, one potential barrier can be the costs in installing home chargers for the organisation to transition to BEVs. Therefore, we check the respondents how the following proposed tax changes may encourage the uptake of BEVs. We ask fleet managers' level of agreement on the following statements.

Importance of availability of additional functions of the smart charger

- Coverage of the costs of installing home (smart) charger
- Tax exemptions for the cost of installation and smart charger
- Tax deductions for the cost of installation and smart charger
- Subsidies for the installation of the home charging facilities

Survey testing and recommendations

The preliminary quantitative employer survey will be used for obtaining feedback from a small group of representatives of the target audience. Recommendations will then be developed and reported in the final project report.

4.2 Fleet Employee Test Survey

The (preliminary) quantitative survey instrument to survey employees' using employer-provided fleet vehicles – 'fleet employees' – was developed based on a literature review and was informed by key findings from the fleet employer interviews, therefore building on the earlier work conducted as part of this project. See the Preliminary Survey Instrument at Appendix B 'Employees' Attitudes Towards Battery Electric Vehicles and Home Charging'.

Specifically, variables that were included in the survey were chosen drawing on the conducted literature review, particularly with regards to studies identifying motivations as well as barriers and enablers to the adoption of (battery) electric vehicles. An example of a key barrier identified by previous research is the access to a garage or carport where charging equipment could be installed. The majority of city residents lack this access (Klein et al., 2021, p. 375). Other factors are cost, such as the higher purchase cost of BEVs, and range anxiety (Di Foggia, 2021; Yuan et al., 2018). Prior experience with BEVs has been shown to be an enabler of the adoption of BEVs, as it can reduce range anxiety (Bühler et al., 2014). The literature review conducted as part of this research project was complemented with a small-scale literature review to identify relevant behavioural studies that have looked at the adoption of EVs, with the goals of identifying key behavioural theories or frameworks and existing validated scales to inform survey design. In particular, we drew on the Theory of Planned Behaviour, a well-established theory which has been applied to the context of the adoption of electric vehicles and energy transitions (Ajzen, 1991; Mohamed et al., 2016; Upham et al., 2019).

Besides the literature review, the survey development was also informed by findings from the conducted fleet employer interview. A focus in this was findings about what fleet employers considered possible barriers and enablers for employees if they were to adopt home-charging.

The primary objective of the (preliminary) employee survey was to investigate: *What are employee's attitudes towards, and barriers and enablers with regards to, adopting home charging of fleet vehicles?*

The aforementioned question and the corresponding survey elements have been designed to correspond to the interview findings which asked fleet employers to reflect on how their organisation's employees might respond to an option for home charging. This will allow us to identify differences and similarities in how employers expect their staff to respond, and employee's attitudes and preferences.

Other objectives of interest were examining employees' attitudes towards their employers' transitioning (a proportion) of their fleet to BEVs, the possibility of taxation changes acting as an enabler, as well as (to a lesser focus) explore their interest in purchasing an ex-fleet vehicle to understand the current market and potential demand.

Key survey measures

Initial set of screening questions

At the beginning of the survey, survey respondents will be asked several questions to ensure we are only surveying our target audience, i.e. employees that are currently using employer-provided vehicles, such as fleet vehicles, pool vehicles, salary packaged vehicles, or a salary sacrifice vehicles. We also included questions to allow us to categorize employees based on the type of employer-provided car they use (e.g. pool vehicles, salary packaged or salary sacrifice).

Drivers and barriers for home charging behaviours

Several questions were included to measure a range of possible barriers and enablers to the home charging of fleet electric vehicles at employees' homes. Below is a list of the most important measures:

- **Employees' capability for home charging** is measured through a range of demographic questions including *dwelling type, dwelling tenure, access to protected garage or carport, daily commute distance*.
- **Employee knowledge of BEVs** is measured using a scale adopted from Pevec et al. (2020). Respondents were asked to evaluate their familiarity with the concept of battery electric vehicles on a 4-point scale ("never heard of it"; "heard of it, but I am not familiar"; "I know something"; "I am very familiar").
- **Preference for EV charging** is measured by asking respondents to rank three options in their order of preference (ie. charging at base, at a public charging station, at their home).
- **Willingness to assess home for suitability to install home charging equipment and to install equipment** is measured on a 7-point Likert scale (ranging from "strongly disagree" to "strongly agree").
- **Willingness to cover installation cost** is measured on a 5 -point Likert scale (ranging from "not willing" to "willing").
- **Willingness to cover charging cost** is also measured on a 5 -point Likert scale (ranging from "not willing" to "willing").
- **Drivers or barriers to home charging** more generally, will also be measured in an open-text question asking respondents to reflect on their main reasons for taking/ or not taking up the home charging option ("In deciding whether you might choose to take up a home charging option, what influenced your decision? What would be your main reasons for taking up or not taking up this option?").

Taxation as enabling solution

- A series of questions with regards to tax as a potential enabling factors have been included, which are tailored to the employees' specific situation (i.e. using a fleet vehicle, pool vehicle, salary packaged vehicle, or a salary sacrifice vehicle). These questions were developed based on the fleet employer survey.

Employee support for BEVs as fleet vehicles

- We also measure employee support for their employers' transitioning to BEVs as fleet vehicles through a number of measures. Respondents will be asked to imagine their organisation decided to introduce (more) BEVs in their passenger and light commercial vehicle fleet and then indicate to what extent they agreed or disagreed with a serious of statements measuring different attitudes and the well-known barrier of range anxiety.
- **Willingness/intention to drive fleet BEV.** Respondents are asked to indicate agreement to the statement *"I would be willing to drive a battery electric vehicle as employer-provided car" on a 7-point Likert scale* (*ranging from "strongly disagree" to "strongly agree"*).
- **Preference for BEV.** Respondents are asked to respond to the statement *"I would prefer to drive a battery electric vehicle as employer-provided car over a conventional* (*internal combustion engine*) *vehicle" on a 7-point Likert scale* (*from to "strongly agree"*).
- **Interesting in test driving BEV** is measured by agreement with the statement *"If my company was to offer test driving or a trial program of using a battery electric vehicle as an employer-provided car, I would be very interested to enrol" on a 7-point Likert scale* (*ranging from "strongly disagree" to "strongly agree"*).
- **Range anxiety.** Respondents are asked to indicate agreement to the statement *"If I was driving a battery electric vehicle, I would be worried about being left in the middle of a trip due to an empty battery" on a 7-point Likert scale* (*ranging from "strongly disagree" to "strongly agree"*). This statement was developed based on definition from (Yuan et al., 2018).

Psychological predictors of the adoption of home charging

Key psychological variables predicting the adoption of home-charging were developed drawing on the Theory of Planned Behaviour (Ajzen, 1991; Mohamed et al., 2016; Upham et al., 2019).

The following measures have all been adapted from Ajzen (2002), and for each of measures respondents were asked to indicate to what extend they agreed or disagreed with a list of specifically developed statements on 7-point Likert Scales.

- **Perceived behavioural control.** The variable measures if employees perceive that they have the capacity and autonomy for home charging. In other words, if they feel confident that it is within their control and that they are able to install and use home charging equipment (*e.g.* their family/house mates approve, they own property or the landlord approves installation of charger). Respondents were asked to indicate agreement to the statements *"I am confident that I can arrange the instalment of EV charging equipment at my home", and "If I had a charger installed, I think charging the electric vehicle at my home is easy"*

on a 7-point Likert scale ranging from "definitely false" to "definitely true". Respondents were then asked to respond to *"My installing the charging equipment and home charging the employer-provided car is up to me" on a scale from "strongly disagree" to "strongly agree"*.

- **Injunctive norm.** This variable measures an individual's perception of whether other people approve or disapprove of an option, or how they think people *should* act. The statement was *"Most people who are important to me approve of me choosing a home charging option and installing the charger at our home" with a response scale of "strongly disagree" to "strongly agree"*.
- **Descriptive norm.** This variable measures an individual's perception of how they think other people in this situation would typically behave. Respondents were asked to respond to the statement *"Most of my colleagues would choose the option to home charge when using an employer-provided electric vehicle" on a scale from "strongly disagree" to "strongly agree"*.
- **Attitude towards home charging.** Attitudes were measured by asking respondents to respond to the statement *"For me charging the company BEV at my home would be ..."* either on a scale from *"very good"* to *"very bad"*, or from *"very inconvenient"* to *"very convenient"*.
- **Intention to home charge** was measured with the statement *"I intend to home charge if this option was available to me and my employer fully paid for my home charging equipment and energy costs"* with a response scale from *"very likely"* to *"very unlikely"*.

Employee interest in purchasing ex-fleet vehicle

To explore employee interest in purchasing an ex-fleet BEV, respondents were asked to indicate their *likelihood that they would choose to buy a battery electric vehicle, which is a former fleet or salary packaged vehicle* on a sliding scale from 1-100%. We also included questions around their *level of concern about the vehicle's re-sale value,* and *their willingness to pay a price premium* for purchasing a BEV over a conventional internal combustion engine vehicle.

Environmental attitudes

- **Environmental concerns.** A measure was adapted from a previous study on EV adoption (Mohamed et al., 2016). Respondents were asked to indicate to what extent they agreed for disagreed with a series of four statements *on a 7-point Likert scale* (*ranging from "strongly disagree" to "strongly agree"*).
- **Support of employers transitioning fleet to BEV.** We developed two statements to measure employee support, asking respondents to indicate their agreement *on a 7-point Likert scale* (*ranging from "strongly disagree" to "strongly agree"*).

Other demographics

Lastly, we collected a series of demographic variables, including

- Household vehicle ownership
- EV and BEV ownership experience
- BEV driving experience
- Home access to green energy,
- Income
- Education etc.

Survey testing and recommendations

The preliminary quantitative employee survey was tested with two representatives of the target audience using a 'thinking aloud' technique. Survey testers were commenting out loud while filling in the survey with the researchers taking notes and occasionally asking for additional clarifications. Besides allowing us to detect any unclear language or survey logic, this technique enabled us to also gain broader insights into the thought processes of survey respondents when approaching the survey, and enabled them to make general recommendations.

The outcomes of the test are reported below. Recommendations were developed based on these findings.

Summary of results from testing

The survey testing results suggest clearly that the choices (and underlying attitudes, motivations, barriers/enablers of behaviours) differ substantially for a situation where an employee temporarily uses a pool or fleet vehicle in contrast to a novated lease or salary sacrifice vehicle. For example, purchase price is a well-known barrier to EV adoption which is more relevant for salary-sacrifice vehicles in contrast to fleet/pool vehicles purchased by the employer. Functional considerations also come into play (e.g. family friendly) for salary sacrifice vehicles that are less relevant for a temporarily used pool/fleet vehicle.

- Tester 1 noted that in her case (a novated lease) the language 'employer-provided car' does not feel applicable/ suited to her situation; she felt the car was 'chosen' rather than 'provided'.
- Tester 2 commented on the language 'home garaged' which appeared as not suitable, and also felt that 'employer-provided' did not accurately reflect her situation.
- Both employees also commented that they did not have to share their car with other employees.

In summary, our testing suggest that employees tend to view the car not as 'employer-provided' which they 'home garage' but as their own car, which they choose and which they accordingly garage at home or outside their home.

This has several implications for survey design:

- Language or framing for several questions needs to be adjusted, especially 'employer-provided' and 'home garaged'.
- Under a novated lease/salary sacrifice model, both testers said they would not expect the employer to pay for installation costs. They suggested an alternative option: Are installation costs covered under salary sacrifice, i.e. is the car purchase cost and installation cost a package?
- Under a novated lease agreement, fuel costs are covered. Would charging costs similarly be covered under salary-sacrifice?

Some of these recommendations – changes to language and some tailoring using 'display logic' – have already been implemented post survey testing. Three additional broader recommendations are listed below.

Recommendation 1:

a. The Fleet Employee Survey could be revised to include different survey pathways tailored to the different situations of employees, especially of 'novated lease' or salary sacrifice in contrast to 'pool vehicles'.

b. Alternatively, the Fleet Employee Survey could consider if 'novated lease'/salary sacrifice vehicle users are our intended target audience and eligible for the survey, or whether they should be excluded.

c. It is recommended to undertake additional testing post revision to ensure language is appropriate, as well as test for survey length or duration to complete in a larger sample.

Our results suggest that employees using a car permanently as their own vehicle via a salary sacrifice arrangement may still use pool/fleet vehicles for temporary use. This has several implications for survey design:

- As multiple situations can apply for a respondent; Q.2 'Which of the below best describes your situation?' instructions need to be clarified.
- It should be considered if all employees – irrespective of their personal situation –should answer questions about their attitudes towards BEVs as pool/fleet vehicles. In the present survey version, employees are instructed to answer according to their own situation. This means if they have a salary package or salary sacrifice vehicle, their views on pool/fleet vehicles are not captured.

Recommendation 2:

- Clarify instructions for Q.2 'Which of the below best describes your situation?' to accommodate for situations where situations apply to an employee. (This recommendation has been implemented.)
- The Fleet Employee Survey could be further refined by developing stronger framing that sets the scene for which lens to apply to a specific question – i.e. a chosen salary packaged/salary sacrifice car vs. an employer-owned option – to avoid ambiguity.
- As noted, the general reflections and thoughts captured in the 'thinking aloud' technique suggests that the considerations, motivations and attitudes underlying behaviours such as purchasing a BEV, installation of home charging costs and covering the costs of charging are complex. Likewise, there is a variety of arrangements under which employees may be using employer-provided vehicles that have specific implications for motivations and choices. Due to this we put forward the following general recommendation:

Recommendation 3:

- In-depth, qualitative research such as interviews or focus groups among fleet employees could be conducted in a further phase of this project to provide a deeper understanding of the complex barriers and enablers, or commonly held beliefs among employees. This could then inform a revision of the survey and strengthen its tailoring to different groups among our target audience of fleet employees. This recommended approach is similar to the Fleet Employer survey which in the current 'fast track' project was informed by the qualitative fleet manager interviews.

The current survey design was informed by a literature review, application of a suitable theoretical framework and the fleet employer interviews. However, the current design has limitations with regards to enabling more complex behavioural modelling and predictions of uptake of BEVs or home charging.

Recommendation 4:

- In a future phase of this project, we would recommend conducting an additional literature review focussed on behavioural models and frameworks that have been successfully applied in similar research settings. The Fleet Employee survey could then be revised accordingly to further strengthen its theoretical basis which would allow for more complex predictive modelling of behaviour changes.

For a list of additional, more detailed comments/findings from the survey testing, please see Appendix C.

Appendix A: Fleet Employers' Perceptions on Future Uptake of Battery-Powered Electric Vehicle (BEVs)

Preliminary Survey Instrument

INTRODUCTION AND CONSENT

Thank you for your interest in the survey. Before continuing, please read the below information carefully.

This survey is being conducted by Griffith University. The survey aims to better understand corporate fleet managers' perceptions of electric vehicles (including plug-in hybrid and fully electric vehicles) and their potential role in business fleets. It also aims to understand corporate fleet managers' understanding of the motivations, challenges and enablers of adopting electric vehicles in business fleets. If you agree to participate, we will only need about 15 minutes of your time to complete this survey.

Your participation is completely voluntary. Even if you agree to participate, you can choose to withdraw from the survey any time before you submit your responses. If you withdraw, any responses you provided will not be used. If you participate, your answers will remain completely anonymous and will be reported in summary format only so that no individual can be identified.

Please remember that there are no right or wrong answers. We are interested in your opinions only.

If you have any concerns or complaints about the project, you can contact the Manager of the Griffith University Human Research Ethics Committee. You can also download a full explanatory statement here [insert online link].

Concerns or complaints

Project number:	[insert No from ethics application]
Manager:	Griffith University Human Research Ethics Committee (GUHREC) Room 0.10, Bray Centre (N54) Office for Research Griffith University QLD 4111
Tel:	+61 7 3735 4375
Email:	research-ethics@griffith.edu.au

To fill in the survey, please note the following acronyms used in the survey:

- **BEV:** battery electric vehicles
- **PHEV:** plug in hybrid electric vehicles
- **HEV:** hybrid electric vehicles
- **ICEV:** internal combustion engine vehicle

SECTION A: ORGANISATIONAL AND RESPONDENT PROFILE

Before you begin, we'd like to ask you a few questions to obtain more information about your organisation and your job role.

1. My organisation's fleet size (in terms of no. of vehicles) is

- ☐ < 100
- ☐ 100 -249
- ☐ 250 – 499
- ☐ 500+

2. My organisation's no. of employees is

- ☐ < 100
- ☐ 100–299
- ☐ 300 – 499
- ☐ 500+

3. My organisation is

- ☐ Local govt.
- ☐ State/Fed govt.
- ☐ Private business
- ☐ ASX-listed company
- ☐ Other

4. My job role is

- ☐ Fleet Manager
- ☐ Owner / Partner
- ☐ Director / CEO
- ☐ Operations Manager
- ☐ Other (please specify) _____

5. Who is responsible for the acquisition policy for passenger and light commercial vehicles in your organisation?

- ☐ Fleet Manager
- ☐ Owner / Partner
- ☐ Director / CEO
- ☐ Operations Manager
- ☐ Other (please specify) _____

SECTION B: FLEET PROFILE

6. Please indicate your organisation's fleet by vehicle type [insert no.]

Fuel type	Total	Passenger cars	SUVs	Single and Dual Cab Utes	Light and Heavy Commercial Vehicles
Work/Tool of trade vehicles					
Petrol					
Diesel					
BEV					
PHEV					
HEV					
Salary packaged vehicles					
Petrol					
Diesel					
BEV					
PHEV					
HEV					
Pool vehicles					
Petrol					
Diesel					
BEV					
PHEV					
HEV					

7. What typically triggers the purchase of replacement vehicles in your fleet? (top reason)

- ☐ Predefined age limit
- ☐ End of warranty period
- ☐ End of finance contract
- ☐ Predefined kilometre limit
- ☐ No longer fit for purpose
- ☐ Other

8. What's the average age of fleet when it is replaced?

- ☐ 1 year
- ☐ 2 years
- ☐ 3 years
- ☐ 4 years
- ☐ 4+ years

9. Please indicate your organisation's average age and retention of vehicles (in months)

	Months
Passenger cars	
SUVs	
Light Commercial Vehicles (<3.5t)	
Heavy Commercial Vehicles (>3.5t)	

10. Please indicate your organisation's % of the fleet that is home garaged overnight as "work fleet/tools of trade" commencing from employees home

	Tools of trade Proportion [insert %]
Passenger cars	
SUVs	
Single and Dual Cab Utes	
Light and Heavy Commercial Vehicles	

11. Please indicate your organisation's fleet by location [insert no.]

Location	Number of permanent work/office sites	Passenger cars and SUVs	Other vehicles
Sydney			
Regional NSW			
Melbourne			
Regional VIC			
South-East QLD			
Regional QLD			
Adelaide			
Regional SA			
ACT			
NT			
Perth			
Regional WA			
Hobart			
Regional TAS			

12. What are the average annual kilometres travelled by your fleet?

Work/Tool of trade vehicles

- ☐ < 15,000
- ☐ 15,000 -20,000
- ☐ 20,001 – 49,999
- ☐ 50,000+

Pool vehicles

- ☐ < 15,000
- ☐ 15,000 -20,000
- ☐ 20,001 – 49,999
- ☐ 50,000+

13. Please indicate what percentage of your fleet vehicles are owned vs. leased

Purpose	Owned	Leased	Novated leased
Work/Tool of trade vehicles			
Pool vehicles			
Salary packaged vehicles			

SECTION C: BEV PURCHASE AND CHARGING INFRASTRUCTURE

14. Is your organisation planning to add BEVs into the fleet?

- ☐ Yes
- ☐ In 12 months
- ☐ In 1-2 years
- ☐ In 3-5 years
- ☐ If you answer yes – GO TO Question 14A – then to Question 15.
- ☐ No
- ☐ Don't know

If you answered 'Yes" to in question 14, refer to question 14A (for organisations adopting BEVs)

14A. In my organisation, the key motivation/s to increase the number of BEVs in the fleet is/are

[randomise order of items]	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	I don't know
Using BEVs help us meet shareholders/investor/rate-payers demands	☐	☐	☐	☐	☐	☐	☐	☐
Using BEVs prepare us to meeting future regulatory/ policy requirements	☐	☐	☐	☐	☐	☐	☐	☐
Decisions to use BEVs as a part of the corporate social responsibility initiatives	☐	☐	☐	☐	☐	☐	☐	☐
Using BEVs help us improve the organisational image/ public relations	☐	☐	☐	☐	☐	☐	☐	☐
Operating a fleet of BEVs will help us legitimize our organisation's activities	☐	☐	☐	☐	☐	☐	☐	☐
Decisions to use BEVs is a result of the competition in the industry	☐	☐	☐	☐	☐	☐	☐	☐
Decisions to use BEVs in our fleet is due to my organisations awareness of the industry best practices	☐	☐	☐	☐	☐	☐	☐	☐
Using BEVs in our fleet is due to the environmental awareness of employees/customers	☐	☐	☐	☐	☐	☐	☐	☐
Using BEVs in our fleet is a cost-effective decision	☐	☐	☐	☐	☐	☐	☐	☐
Operating BEVs will help reduce greenhouse gas emission and climate change	☐	☐	☐	☐	☐	☐	☐	☐
Using BEVs in our fleet can enhance the revenue potential	☐	☐	☐	☐	☐	☐	☐	☐

15. The main challenge/s in my organisation to increase the number of BEVs in the fleet is/are:

[randomise order of items]	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	I don't know
BEV-related issues								
Affordability (purchase cost) of BEVs	☐	☐	☐	☐	☐	☐	☐	☐
Uncertain resale value of BEVs	☐	☐	☐	☐	☐	☐	☐	☐
Higher total cost of ownership to ICEVs	☐	☐	☐	☐	☐	☐	☐	☐
Higher FBT (fringe benefit tax)	☐	☐	☐	☐	☐	☐	☐	☐
Limited choice of BEV models that are fit for purpose	☐	☐	☐	☐	☐	☐	☐	☐
Limited choice of affordable BEV models	☐	☐	☐	☐	☐	☐	☐	☐
Inadequate long-range battery	☐	☐	☐	☐	☐	☐	☐	☐
Limited battery warranty or high replacement cost of battery	☐	☐	☐	☐	☐	☐	☐	☐
Capacity of BEV battery to travel the distances required	☐	☐	☐	☐	☐	☐	☐	☐
Charging/infrastructure issues								
Cost of setting up workplace charging infrastructure for BEVs	☐	☐	☐	☐	☐	☐	☐	☐
Insufficient room at base for working place charging infrastructure	☐	☐	☐	☐	☐	☐	☐	☐
Site/base unsuitable for working place charging infrastructure	☐	☐	☐	☐	☐	☐	☐	☐
Regulations prohibit number of charging stations at base	☐	☐	☐	☐	☐	☐	☐	☐
Organisation will not install charging stations at leased premises	☐	☐	☐	☐	☐	☐	☐	☐
Too many work centres to install charging stations	☐	☐	☐	☐	☐	☐	☐	☐
Lack/availability of fast chargers at public charging infrastructure	☐	☐	☐	☐	☐	☐	☐	☐
Increased electricity cost when charging at peak times at base.	☐	☐	☐	☐	☐	☐	☐	☐
Grid reliability issues if all fleet vehicles charged at peak times	☐	☐	☐	☐	☐	☐	☐	☐
Too many charging stations required to charge all fleet vehicles	☐	☐	☐	☐	☐	☐	☐	☐
Complexity of setting up managed workplace BEV charging infrastructure for enhanced grid reliability	☐	☐	☐	☐	☐	☐	☐	☐
Support, education, and other issues								
Lack of policy/regulatory support	☐	☐	☐	☐	☐	☐	☐	☐
Environmental concerns on source of electricity from the grid	☐	☐	☐	☐	☐	☐	☐	☐
More interested in sourcing renewable energy	☐	☐	☐	☐	☐	☐	☐	☐
Lack of knowledge about BEVs and charging infrastructure	☐	☐	☐	☐	☐	☐	☐	☐
Lack of top manager awareness/support	☐	☐	☐	☐	☐	☐	☐	☐
Unwillingness of employees to use BEVs	☐	☐	☐	☐	☐	☐	☐	☐

16. Do you currently have any BEV charging infrastructure? Please select all relevant items.

- ☐ City area
- ☐ Regional area
- ☐ None in city area
- ☐ None in regional area

SECTION D: TAXATION CHANGES

17. Thinking about the following policy measures, and how they may encourage the uptake of BEVs for work/tools of trade and for salary packaged vehicles if the tax breaks were as follows:

[randomise order of items]	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	I don't know
Exempt FBT for BEV work/tools of trade vehicles	☐	☐	☐	☐	☐	☐	☐	☐
Exempt FBT for BEVs for salary packaged/salary sacrifice vehicles	☐	☐	☐	☐	☐	☐	☐	☐
Alternatively, reduce statutory formula percentage from 20% to 1-5%	☐	☐	☐	☐	☐	☐	☐	☐
Provide instant asset write off for BEVs only	☐	☐	☐	☐	☐	☐	☐	☐
BEVs should depreciate faster than ICEVs, because of the technological advancements, e.g. battery cost reduction, that leads to a decrease in the resale value of earlier variants.	☐	☐	☐	☐	☐	☐	☐	☐
Depreciation cost limit and GST tax credit for BEV work vehicles should be higher than the cost limit of $60,733 for 2021-22 (inclusive of GST)	☐	☐	☐	☐	☐	☐	☐	☐
Provide subsidies to reduce cost gap between BEV and ICEV	☐	☐	☐	☐	☐	☐	☐	☐
Maintaining logbook under the FBT operating cost method, and fleet employers are required to pay higher FBT. If employer transitions ICEV to BEV, and can provide it is work/ tool of trade, then BEV should be exempt from FBT.	☐	☐	☐	☐	☐	☐	☐	☐
Tax changes to reduce cost gap and total cost of ownership (TCO) between ICEV until price parity reached.	☐	☐	☐	☐	☐	☐	☐	☐

SECTION E: AVAILABILITY OF HOME CHARGING BEV WORK/ TOOLS OF TRADE

To alleviate the lack or low workplace charging infrastructure, and the low uptake of BEVs, an immediate solution is to use fleet employee's home charging, which can include smart chargers to gain off-peak rates and avoid grid congestions. Around 47% of fleet vehicles are home garaged (AfMA, AGL, 2020). Home charging BEVs can provide the following benefits:

- convenience of fleet employee charging from home
- avoids and saves commute to public charging station if fleet BEV can be home charged
- home charging will prepare fleet employees to acquire an ex-fleet BEV
- home charging allows BEVs to be charged at lower energy rates, improves BEVs operating costs
- installation of smart charger enables access to low rates of electricity when energy demand is low
- installing smart charger is capable of recording and sending details of BEV charge to the fleet manager for reimbursement
- smart charger can directly access renewable energy, from solar panels.

18. Given the following considerations on home charging, how likely would your organisation consider transitioning home garaged work/tools of trade ICEVs to BEVs

	Highly unlikely	Unlikely	Neutral	Likely	Highly likely	Interested to know more
If BEVs could be home charged	☐	☐	☐	☐	☐	☐
If smart charger is installed for fast charging of work/tool of trade	☐	☐	☐	☐	☐	☐
If smart charger can access lower rates of energy	☐	☐	☐	☐	☐	☐
If smart charger reduces the administrative burden in recording the amount of charge for work BEV, which is sent online for fleet employee reimbursement	☐	☐	☐	☐	☐	☐
If the low rate of home charging BEVs, will significantly reduce the fuel costs ICEVs and the Total Cost of Ownership	☐	☐	☐	☐	☐	☐

In relation to initial costs, the installation and the cost of a smart charger for home charging is around ($2000–$3000). Should a fleet employee leave employment, the smart charger can be removed for a minimal fee and reinstalled in another fleet employee's residence.

19. Thinking the above costs in installing home chargers for the organisation to transition to BEV's, and how the following proposed tax changes may encourage the uptake of BEVs.

Please indicate your level of agreement on the following statements.	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	I don't know
My organisation should install a smart charger than a standard charger because of the additional functions of the charger is important for business operations of a BEV	☐	☐	☐	☐	☐	☐	☐	☐
My organisation would cover the costs of installing home (smart) charger (cost of around $2,000–3,000), which will be an asset of the business, for work vehicles/ tools of trade vehicles	☐	☐	☐	☐	☐	☐	☐	☐
My organisation would agree to cover costs of installing home (smart) charger (cost of around $2,000- $3,000) for salary packaged vehicles that is all or mostly available for private use	☐	☐	☐	☐	☐	☐	☐	☐
Cost of installation and Smart Charger ($2,000–$3,000) needs to be exempt from FBT for work/tools of trade BEVs.	☐	☐	☐	☐	☐	☐	☐	☐
Cost of installation and Smart Charger for work/tools of trade needs to be tax deductible	☐	☐	☐	☐	☐	☐	☐	☐
Government subsidises should be provided towards the installation of the home charging facility	☐	☐	☐	☐	☐	☐	☐	☐

Appendix B: Employees' Attitudes Towards Battery Electric Vehicles and Home Charging

Preliminary Survey Instrument

INTRODUCTION AND CONSENT

Thank you for your interest in the survey. Before continuing, please read the below information carefully.

This survey is being conducted by Monash University. The aim of the survey is to better understand employees' attitudes towards electric vehicles (including plug-in hybrid and fully electric vehicles) and their potential role in business fleets and the possibility of home-charging of electric vehicles.

If you agree to participate, we will only need about 15–20 minutes of your time to complete this survey.

Your participation is completely voluntary. Even if you agree to participate, you can choose to withdraw from the survey any time before you submit your responses. If you withdraw, any responses you provided will not be used. If you participate, your answers will remain completely anonymous and will be reported in summary format only so that no individual can be identified.

Please remember that there are no right or wrong answers. We are interested in your opinions only.

If you have any concerns or complaints about the project, you can contact the Manager of the Griffith University Human Research Ethics Committee. You can also download a full explanatory statement here [insert online link].

Concerns or complaints

Project number:	[insert No from ethics application]
Manager:	Griffith University Human Research Ethics Committee (GUHREC) Room 0.10, Bray Centre (N54) Office for Research Griffith University QLD 4111
Tel:	+61 7 3735 4375
Email:	research-ethics@griffith.edu.au

SECTION A: INITIAL SCREENING QUESTIONS

Before you begin, we'd like to ask you a few questions to make sure that we are surveying only employees that are currently using employer-provided vehicles. In this survey, we mean by 'employer-provided vehicle' either a fleet vehicle, a pool vehicle, a salary packaged vehicle, or a salary sacrifice vehicle (incl. novated lease). This could be a car you are using temporary, every day as a 'tool of trade' for example for regular work travel, or more permanently.

1. Do you currently use an employer-provided vehicle?

- ☐ Yes
- ☐ No – but I have used one in the past year (2020)
- ☐ No – but I am planning to use one in the coming year
- ☐ No

[Display custom screen out message if "No" is selected. "We're sorry. You do not meet the eligibility for this survey which focusses only on employees' using employer-provided vehicles. We sincerely thank you and appreciate your interest in participating."]

2. Which of the below best describes your situation?

If more than one situation applies, please choose one and answer the survey about this car or situation.

- ☐ When I use an employer-provided fleet car, I pick up the car at my workplace and return it after use. This may be arranged through a company hiring or booking service; often the car is for temporary use, up to a few days.
- ☐ When I use an employer-provided fleet car, I pick up the car at my workplace and take it home. I need to make a special arrangement with my employer for the vehicle to be homed garaged.
- ☐ I am using a car under salary packaging and my employer fully covers all costs. The car is typically parked at my home (e.g. home garage). When at work, the car is not available for other employees to use.
- ☐ I am using a car under salary packaging known as 'salary sacrifice'. I pay all the costs and typically park the car at my home (e.g. home garage). When at work, the car is not available for other employees to use.
- ☐ Other (please specify) _____

SECTION B: EMPLOYEE KNOWLEDGE OF BEVS

In the following, this survey will ask questions about electric vehicles and particularly focusses on battery electric vehicles, as a specific type of electric vehicles.

A battery electric vehicle (BEV) is a type of vehicle that runs entirely on battery power, which makes them a fully electric vehicle. There's no petrol or diesel fuel involved at all. This is different to hybrid electric vehicles, which use a combination of petrol and battery power.

3. Please evaluate your familiarity with the concept of battery electric vehicles

- ☐ Never heard of it
- ☐ Heard of it, but I am not familiar
- ☐ I know something
- ☐ I am very familiar

SECTION C: EMPLOYEE SUPPORT FOR BEV AS FLEET VEHICLE AND FOR HOME CHARGING

4. What is your current employer-provided car?

- ☐ Internal combustion engine vehicle
- ☐ A conventional car that runs on petrol or diesel
- ☐ Battery electric vehicle (BEV) Runs entirely on battery power; no use of petrol or diesel fuel [Use survey program logic for these respondents to skip to question 6]
- ☐ Hybrid electric vehicles (PHEV or HEV)
- ☐ Runs on a combination of petrol and battery power
- ☐ I am not sure.

Subsection C.1: Employee support for BEV as fleet vehicle

[Display logic: Display intro text dependent on answers under Q 'Which of the below best describes your situation?']

[Display if answer option a, or b, or c was selected] Please imagine your organisation decided to introduce (more) battery electric vehicles (BEVs) in their passenger and light commercial vehicle fleet. In this section, we would like to understand your view on this.

[Display if answer option d was selected] Please imagine you were choosing a new car and battery electric vehicles (BEVs) would be an option. We understand cost considerations and functionality come into play in this decision. We are interested in your view on driving a BEV if it was a viable (e.g. affordable, practical) option for you.

5. Please indicate to what extent do you agree or disagree with the following statements:

5a. I would be willing to drive a battery electric vehicle as employer-provided car

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neutral
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree

5b. I would prefer to drive a battery electric vehicle as employer-provided car over a conventional (internal combustion engine) vehicle

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neutral
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree

5c. If my company was to offer test driving or a trial program of using a battery electric vehicle as an employer-provided car, I would be very interested to enrol

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neutral
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree

5d. If I was driving a battery electric vehicle, I would be worried about being left in the middle of a trip due to an empty battery.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neutral
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree

SUBSECTION C.2: EMPLOYEE ATTITUDES TOWARDS (HOME) CHARGING OF EVS

[Display logic: Display intro text dependent on answers under Q 'Which of the below best describes your situation?']

[Display if answer option a, or b, or c was selected] An electric vehicle whether it's a plug-in hybrid vehicle or a battery EV requires charging during or after use. For the next questions, we would like to understand your preferences if charging an employer-provided car that you are using short-term.

[Display if answer option d was selected] An electric vehicle whether it's a plug-in hybrid vehicle or a battery EV requires charging during or after use. For the next questions, we would like to understand your preferences with regards to charging your salary sacrifice car.

6. Which of the available charging options listed below would you prefer? Imagine in all cases your employer covers the cost.

Please rank the options below in your order of preference.

- ☐ Charging the car at my workplace
- ☐ Charging the car at a public charging station (takes max. 20 min)
- ☐ Charging the car at your home (if this was possible)

7. Please indicate below what best describes your opinion with regards to different charging options.

If I had the necessary charging equipment at home, for me charging the company BEV at my home would be:

- ☐ Very inconvenient
- ☐ Inconvenient
- ☐ Somewhat inconvenient
- ☐ Neither convenient nor inconvenient
- ☐ Somewhat convenient
- ☐ Convenient
- ☐ Very convenient

8. If no or inadequate charging stations were available at your work place, how prepared would you be to charge the employer-provided BEV at a public charging station? Assume your employer covers the cost.

- ☐ Not willing
- ☐ Not really willing
- ☐ Undecided
- ☐ Somewhat willing
- ☐ Willing

9. How long would you be prepared to charge for at a public charging station?

- ☐ Up to 10 min
- ☐ Up to 20 min
- ☐ Up to 30 min
- ☐ Up to 60 min
- ☐ Up to 2 hours
- ☐ However long it takes

10. To what extent do you agree or disagree with the following statement. It is more convenient to charge from home (if this option was offered to me) than charging at a public charging station

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neutral
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree

11. Do you currently have an electric vehicle charger (e.g. Level 1, Level 2 or smart charger) at your home?

- ☐ Yes [Use survey program logic for these respondents' to skip to question 16]
- ☐ No

Installing an electric vehicle charger would require a licensed electrician to assess the suitability of your home or rented residence for installing a charger (either Level 1, Level 2 or Smart Charger) and the capacity of the residential power grid.

If suitable it would then require the installation which typically takes about 1 hour. The charger is roughly the size of a small backpack.

To what extent do you agree or disagree with the following statement.

12. I would be willing to have an electrician assess my home for suitability and (if suitable) install a charger?

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neutral
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree

Given what you now know about what's involved to set up home EV charging, to what extent do you agree or disagree with the below statement:

13. I intend to home charge if this option was available to me and my employer fully paid for my home charging equipment and energy costs

- ☐ Very likely
- ☐ Likely
- ☐ Somewhat likely
- ☐ Neither likely nor unlikely
- ☐ Somewhat unlikely
- ☐ Unlikely
- ☐ Very unlikely

14. In deciding whether you might choose to take up a home charging option, what influenced your decision? What would be your main reasons for taking up or not taking up this option?

_____

_____

_____

_____

_____

_____

_____

15. The cost for the charger and installation ranges between $2,500 (for a Level 2 charger) and $4000 (for a Smart charger). How willing would you be to cover the cost of installation if this meant you could charge your employer-provided car at home?

- ☐ Not willing – I expect my employer to fully pay for the home charging equipment
- ☐ Somewhat willing – I would be happy to pay a share of the cost with my employer
- ☐ Willing – I would be willing to pay the cost

[Display logic: Do NOT display if under Q 'Which of the below best describes your situation?', answer option 'd' (salary sacrifice) was selected]

16. How willing would you be to cover the energy costs for home charging your employer-provided car?

- ☐ Not willing – I expect my employer to compensate me for energy costs
- ☐ Somewhat willing – I would be happy to pay a share of the energy costs with my employer
- ☐ Willing – I would be willing to pay the energy costs with government rebate assistance

SECTION D: TAXATION AS ENABLING SOLUTION

[Display logic: Display intro text dependent on answers under Q 'Which of the below best describes your situation?']

[Display if answer option "a" or "b" or "d" is selected]

17. How willing would you be to pay fringe benefits tax if home charging an employer-provided car? Fringe Benefits Tax (FBT) is an employer tax on benefits, such as cars, provided to employees. Sometimes employees opt to pay the FBT.

- ☐ Not willing
- ☐ Not really willing
- ☐ Undecided
- ☐ Somewhat willing
- ☐ Willing

[Display if answer option "d" is selected]

18. If fringe benefits tax were removed or reduced for battery electric vehicles, how likely would you be encouraged to transition to a salary sacrifice BEV?

- ☐ Very likely
- ☐ Likely
- ☐ Somewhat likely
- ☐ Neither likely nor unlikely
- ☐ Somewhat unlikely
- ☐ Unlikely
- ☐ Very unlikely
- ☐ I don't know

[Display if answer option "d" is selected]

19. Victoria has introduced a road user charge for electric vehicles of 2.5c/km and other states will follow in the future. If similar CO_2 emissions-based charges were imposed on petrol/diesel cars, how likely would that encourage you to salary package a BEV?

- ☐ Very likely
- ☐ Likely
- ☐ Somewhat likely
- ☐ Neither likely nor unlikely
- ☐ Somewhat unlikely
- ☐ Unlikely
- ☐ Very unlikely
- ☐ I don't know

[Display if answer option "c" or "d" is selected]

20. Please indicate for each of the situations described below how likely this change would encourage you to transition to a salary packaged battery electric vehicle.

	Very likely	Likely	Somewhat likely	Neither likely nor unlikely	Somewhat unlikely	Unlikely	Very unlikely	I don't know
If your organisation acquired lower-priced battery electric vehicle from short-term government concessions	☐	☐	☐	☐	☐	☐	☐	☐
If you were eligible for a tax rebate or a government subsidy for home charging equipment and energy costs	☐	☐	☐	☐	☐	☐	☐	☐
If your home charging equipment and energy costs could be [used piped text to insert either 'salary packaged' or 'salary sacrificed'].	☐	☐	☐	☐	☐	☐	☐	☐

[Display if answer option "a" or "b" is selected]

21. Please indicate for each of the situations described below how likely this change would encourage you to occasionally charge your employer's fleet /pool car at your home.

	Very likely	Likely	Somewhat likely	Neither likely nor unlikely	Somewhat unlikely	Unlikely	Very unlikely	I don't know
If you were eligible for a tax rebate or a government subsidy for home charging equipment and energy costs	☐	☐	☐	☐	☐	☐	☐	☐
If your organisation fully paid for your home charging equipment and energy costs	☐	☐	☐	☐	☐	☐	☐	☐

SECTION E: PSYCHOLOGICAL PREDICTORS OF THE ADOPTION OF HOME CHARGING

SUBSECTION E.1: Subjective norms about home charging

22. Most people who are important to me approve of me choosing a home charging option and installing the charger at our home.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neutral
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree

23. Most of my colleagues would choose the option to home charge when using an employer-provided electric vehicle.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neutral
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree

SUBSECTION E.2: Perceived behavioural control (Capacity and autonomy for home charging)

24. I am confident that I can arrange the instalment of EV charging equipment at my home

- ☐ Definitely true
- ☐ True
- ☐ Somewhat true
- ☐ Neutral
- ☐ Somewhat false
- ☐ False
- ☐ Definitely false

25. If I had a charger installed, I think charging the electric vehicle at my home is easy

- ☐ Definitely true
- ☐ True
- ☐ Somewhat true
- ☐ Neutral
- ☐ Somewhat false
- ☐ False
- ☐ Definitely false

26. Installing the charging equipment and home charging the employer-provided car is up to me

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neutral
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree
- ☐ [Display only if renting]

27. I am confident that I would get permission from my landlord to install an EV charger

- ☐ Definitely true
- ☐ True
- ☐ Somewhat true
- ☐ Neutral
- ☐ Somewhat false
- ☐ False
- ☐ Definitely false

SECTION F: EMPLOYEE INTEREST IN PURCHASING EX-FLEET VEHICLE

Imagine your work would offer you the choice to purchase a former electric vehicle after it has been used for a few years. This could include former fleet or pool vehicles, or salary packaged vehicles. (This would allow you and other employees to have access to second-hand electric vehicles, which are currently not commonly available.)

In this section, we would like to understand your opinion about this option

28. In general, how likely is it that you would choose to buy a battery electric vehicle, which is a former fleet or salary packaged vehicle?

0%	20%	20%	30%	40%	50%	60%	70%	80%	90%	100%

29. When deciding about whether to purchase a former fleet BEV, how concerned are you about the vehicle's re-sale value?

- ☐ Not at all concerned
- ☐ Slightly concerned
- ☐ Somewhat concerned
- ☐ Moderately concerned
- ☐ Extremely concerned

30. Would you be willing to pay a price premium (and how much) for a BEV over a conventional internal combustion engine vehicle?

- ☐ Yes – up to 5000
- ☐ Yes – up to 10.000
- ☐ Yes – up to 15.000
- ☐ Yes – up to 20.000
- ☐ Yes – any amount
- ☐ No – I'd only consider buying a BEV if it costs the same as a standard car

SECTION G: ENVIRONMENTAL ATTITUDES

31. To what extent do you agree or disagree with the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
Transitioning to battery electric vehicles can help reduce CO_2 emissions and climate change.	☐	☐	☐	☐	☐	☐	☐
I would like to see my employer transition (a proportion) of their existing corporate fleet to battery electric vehicles to reduce the company's CO_2 emissions	☐	☐	☐	☐	☐	☐	☐

32. To what extent do you agree or disagree with the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
I think people should change their behaviour to reduce climate change and protect the environment	☐	☐	☐	☐	☐	☐	☐
I am very concerned about human behaviour and its influence on climate change and the environment	☐	☐	☐	☐	☐	☐	☐
I think climate change is a threat to me, and my family	☐	☐	☐	☐	☐	☐	☐

SECTION H: HOUSEHOLD VEHICLE OWNERSHIP &EMPLOYEE AWARENESS OF BEVS

33. Do you own a car now?

- ☐ Yes
- ☐ No [Use survey program logic for these respondents' to skip to question 38]

34. How many vehicles do you have in your household (can be family or members in a shared house)?

_____

_____

35. Do you currently own an electric vehicle?

This includes electric vehicle that run fully on electricity, or those that are hybrids running on electricity and petrol

- ☐ Yes
- ☐ No [Use survey program logic for these respondents' to skip to question 38]

36. What type of electric vehicle do you own? You can select multiple if you own more than one car

- ☐ Battery electric vehicle (BEV)
- ☐ Runs entirely on battery power; no use of petrol or diesel fuel.
- ☐ (Plug-in) hybrid electric vehicles (PHEV or HEV)
- ☐ Runs on a combination of petrol and battery power.
- ☐ I am not sure.

[Display if "BEV" is selected under Questions 36]

37. What model/made is your BEV? If you don't know you can leave this field blank.

_____

_____

38. Have you ever driven a battery electric vehicle? This could have been through a test drive.

- ☐ Yes
- ☐ No
- ☐ I've driven some type of electric vehicle, not sure which

39. How likely do you think it is that you would choose a battery electric vehicle as your next car?

0%	20%	20%	30%	40%	50%	60%	70%	80%	90%	100%

SECTION F: DEMOGRAPHICS

40. What is the highest level of education qualification you have completed?

- ☐ Year 10 or below
- ☐ Year 11
- ☐ Year 12
- ☐ Certificate I/II
- ☐ Certificate III/IV
- ☐ Diploma/Advanced Diploma
- ☐ Bachelor's degree
- ☐ Graduate diploma/Graduate certificate
- ☐ Postgraduate degree

41. What is your approximate HOUSEHOLD income?

This refers to the total income from all household occupants, and includes income from wages and salaries, government benefits, pensions, allowances and any other income you usually receive, before deductions for tax, superannuation contributions, health insurance, amounts salary sacrificed, or any other automatic deductions.

- ☐ Less than $399 per week ($20,799 per year)
- ☐ $400-$799 per week ($20,800-$41,599 per year)
- ☐ $800-$1,249 per week ($41,600-$64,999 per year)
- ☐ $1,250-$1,999 per week ($65,000-$103,999 per year)
- ☐ $2,000-$2,999 per week ($104,000-$155,999 per year)
- ☐ $3,000-$3,999 per week ($156,000-$207,999 per year)
- ☐ $4,000 or more per week ($208,000 per year)
- ☐ Prefer not to answer

42. Which of the below best describes your dwelling type?

- ☐ Single Detached House
- ☐ Townhouse/Semi-Detached
- ☐ Apartment or Condo
- ☐ Other

43. Do you own or rent?

- ☐ I own
- ☐ I rent
- ☐ Other – please specify _____

_____

44. Does your home have a protected garage or carport?

- ☐ Yes
- ☐ No

45. Do you have access to renewable energy infrastructure at your home, such as solar panels?

- ☐ Yes
- ☐ No [Use survey program logic for these respondents to skip to question 47]

46. Would you be willing to consider this infrastructure (e.g. solar panels) when charging an employer-provided car at your home? Assume you will be reimbursed for the costs.

- ☐ Not willing
- ☐ Not really willing
- ☐ Undecided
- ☐ Somewhat willing
- ☐ Willing

47. Would you be willing to consider using green energy at a price premium when charging an employer-provided car at your home? Assume you will be reimbursed for the costs.

- ☐ Not willing
- ☐ Not really willing
- ☐ Undecided
- ☐ Somewhat willing
- ☐ Willing

48. On a day that you don't work from home, how far is your commute time and distance to work (include daily errands en route):

Time in minutes _____

Distance in km _____

THANK YOU FOR PARTICIPATING

As a reminder, should you have any concerns or complaints about the project, you can contact the Executive Officer of the Monash University Human Research Ethics Committee.

Project number: [insert No from ethics application]

Tel: +61 3 9905 2052

Email: muhrec@monash.edu.au

Appendix C: Summary of other comments from Fleet Employee Preliminary Survey Testing

Below is a list of other feedback that was provided and a response in how this was/ can be implemented:

- Survey is overall understandable, language is clear in the majority of questions.
  - Language suggestions (except for the noted use of 'employer-provided car' and 'home garaged') have been directly implemented.
- Survey flow / logic worked for respondents. No comments were made or problems observed.
- In response to Q.2 'Which of the below best describes your situation?', answer option d 'I am using a car under salary packaging known as "salary sacrifice". I pay all the costs and the car is home garaged. When at work, the car is available for other employees to use', both testers commented that they did not have a stipulation to share their car.
  - This statement as been taken out as a result.
- Tester 2 found the use of the word 'plug-in' in the BEV definition in Section B confusing as a BEV also needs to be plugged in for charging.
  - The definition was rephrased.
- Tester 2 commented on Q: 'If no or inadequate charging stations were available at your work place, how prepared would you be to charge the employer-provided BEV at a public charging station?' that using public charging stations would not be an option for her, because so few stations exist.
- Tester 1 considered the question on solar panels as very important. Question prompted her to think: 'Would I have enough power/energy in my solar panels to charge my EV or would I need to install additional?"
- Tester 1 noted some overlap in some questions, and commented that the answer to the question 'Which of the available charging options listed below would you prefer' would depend on who covers cost.
  - Small changes have been made to reduce (perceived) redundancy and reduce the unclarity re: costs.
- Overall, cost considerations appear very important to survey respondents and come into play in answering questions, followed by considerations about feasibility (e.g. EVs being available for the needed function such as a large enough family car). Tester 2 recommended adding an additional question asking respondents about the price bracket they would generally be willing to spend on a new car, as certain price brackets may preclude an EV option.
  - We recommend to add a question.
- For Section G which asks about environmental values, Tester 2 recommended adding a question to capture if employees would consider the purchase of an EV indeed as an environmentally friendly option. This cannot be taken for granted as the environmental benefit/harm of purchasing are being disputed. For example, there are arguments that prolonging the use of a second-hand vehicle is more environmentally-friendly due to less use of resources. Others have raised concerns around the negative environmental impact of batteries and their disposal.
  - A question asking this was included in the original survey, however this was rephrased to make this increase clarity.
  -

5 Recommended FBT changes for cars based on current provisions: short term changes

Overview

Private use of employer-provided cars gives rise to a fringe benefit within the meaning of the FBT Act.[28] Business fleet vehicles, that might be subject to FBT, fall under the following categories:

1. **Salary sacrifice vehicles** under arrangements commonly known as *"salary packaging"* are where the employee agrees to forgo part of their future entitlement to salary or wages in return for the employer providing them with benefits of similar value. Such vehicles are garaged at the employee's place of residence, are available for private use and subject to FBT,[29] but paid by the employee via salary sacrifice.
2. **Salary packaged vehicles** for executive staff are situations where the employer pays the FBT. The vehicle is garaged at the executive's place of residence, available for private use and subject to FBT.[30]
3. **Fleet vehicles**, in cases where the vehicles are garaged at the employee's home are subject to FBT on the proportionate basis, as generally these vehicles are mainly for business use.[31]
4. **Pool vehicles** are typically garaged at base and exempt from FBT, providing the private use of the vehicle is minor infrequent and irregular, and the use of the vehicle is limited to work-related travel.[32]

Modelling the impact of car FBT methods on the BEV and equivalent ICEV

Drawing on the above categories of business fleet vehicles, the FBT costs to business fleets have been modelled by applying the Statutory Formula Method and the Operating Cost method to the cost of a new BEV and its equivalent internal combustion engine vehicle (ICEV). The model has aimed to determine whether FBT is a disincentive to the uptake of BEVs and support the proposed recommendations.

To ensure a 'like for like' comparison was made between the paired BEV-ICEV,.[33] The case study of the paired BEV-ICEV has been applied to identify the impact of taxation policy and taxation levels on the total cost of ownership for the Kona BEV compared to its equivalent Kona ICEV.

The following case studies compare the impact of the Statutory formula method (Table 1) and Operating cost method (Table 2) on the paired Kona BEV-ICEV.

28 Fringe Benefits Assessment Act 1986. Hereafter FBTAA.

29 FBTAA sub-section 7(1) and (3). Generally, the statutory formula method is adopted, FBTAA, Section 9.

30 Ibid.

31 The alternative operating cost method is elected dues to a higher proportion of business kms, FBTAA section10, operating cost method.

32 *FBT Regulations 2018* (Cth), Reg 10.

33 MY21 OS.V4 KONA EV ELITE and MY21 OS.V4 KONA 2.0L MPI 2WD CVT ELITE. Business fleets are more likely to be interested in the Kona BEV because of its long ranger battery capacity of 415 kilometres.

5.1 Case Study 1: Statutory formula method

The employer has a choice in calculating the taxable value for providing the employee a car benefit either under the statutory formula method (known as the default method) or the operating cost method[34] subject to the FBT rate of 47%.

The statutory formula method is usually applied on salary packaged car benefits and is the simplest to administer. However, industry group advise that statutory formula method can apply to home garaged fleet vehicles (*work vehicle/tool of trade*) – when fleet employees fail to maintain logbooks.[35]

This means, the statutory formula approach will be adopted, and the fringe benefits tax liability will arise on the day on which the car is available for the private use of an employee, "irrespective of the fact that there may have been no actual private use of the car on that day."[36]

If so, the taxable value of the car benefit is determined by applying a flat 20% statutory rate to the 'base value' of the car, which is the cost price of the car inclusive of GST, dealer's delivery charge and luxury car tax, where applicable.[37] Thus BEVs will be at a disadvantage because the price premium will typically result in a higher FBT payable than its equivalent ICEV[38] as shown in Table 1.

The taxable value of the Kona BEV based on high premium purchase price including delivery charge of $61,500 (exclusive of GST) results in an additional FBT tax of $13,228, totalling $74,728. While the equivalent Kona ICEV, totals $39,612, a difference of $35,116. For most salary packaging arrangements post-tax contributions can be made to reduce the taxable value of the vehicle to zero. And any additional lease and operating costs for the vehicle is made on a pre-tax basis.[39] Thus, higher employee contributions will need to be made for the Kona BEV compared to the equivalent Kona ICEV.

Business fleet managers, choice of fleet vehicle based on TCO, will not choose a Kona BEV, nor will a fleet employee choose a BEV as a salary packaged vehicle, when there is an initial cost gap of $28,900 and an additional $6,216 of FBT payable (annually), over and above the FBT payable on the equivalent Kona ICEV. This means, in the first year of ownership the cost gap between the Kona BEV-ICEV will be $35,116 as shown in Table 1.

Table 1. Statutory formula method: Case study comparing FBT for paired Kona BEV- ICEV

Details	KONA BEV	KONA ICEV	Additional FBT Costs for BEV $
Average CO_2 emissions	0	144g/km	
Sales in 2020	488	12,514	
Purchase Price (MSRP)	60,500	31,600	28,900
Delivery charge	1,000	1,000	
GST	6,150	3,260	
Taxable value	67,650	35,860	
Tax payable (47%)[40]	13,228	7,012	6,216
Purchase price, delivery, FBT	74,728	39,612	35,116
Entitled to GST input tax credit			

* Manufacturer's suggested retail price (MSRP) excludes dealer delivery, stamp duty and other government chargers.

34 FBTAA, Sec 9 and 10.

35 Mace Hartley, CEO of Australasian Fleet Managers Association, 21.9.21

36 MT 2027. Miscellaneous Taxation Ruling. Fringe Benefits Tax: private use of cars: home to work travel.

37 Taxation Ruling TR 2011/3 FBT, meaning of "cost price" of a car.

38 Senate Committee Australian Government, The Senate Select Committee on Electric Vehicles Report, (2019).89

39 Parliamentary Budget Office, *Revenue implications of changes to vehicle taxation measures – Fringe benefits tax exemption* (2018).

40 Taxable value BEV ($60,500 + 1,000 + GST 6,150) .2 x Type 1 factor 2.0802*47%= $13,228. ICEV ($31,600 + $1,000 + GST 3,260) x .2 x 2.0802 x 47% tax = $7,012

FBT tax at the highest rate of 47% fails the fairness criterion

The tax rate imposed is not fair, equitable and efficient for all employees. That is, the FBT tax of 47% is a 'surrogate income tax on employees who receive benefits for private consumption.'[41] Car benefits are taxed at the highest rate, when the recipient of the car benefit may be on a lower tax rate, than 47%. This is inequitable when the availability of salary packaged BEV car benefit is most likely limited to higher income employees.

In effect, the higher taxes for BEVs under the FBT statutory formula method is not neutral and discourages all fleet managers and employees in choosing a BEVs. The lack of affordability of BEVs is an impediment for businesses to address workplace charging infrastructure.

Exempt FBT for salary packaged arrangements

In view of the adverse distortionary effect of the statutory formula method on the uptake of BEV, the proposed recommendation is to fully exempt FBT for employees salaried packaged BEV's until price parity is reached, as discussed in Section 5.1. Proposed long term reforms discussed in Section 8.

Alternative reform

Alternatively, it is proposed that the FBT statutory flat rate of 20% be reduced to 1-5% for a BEV, reducing the annual FBT payable, and addressing the cost gap between the paired BEV-ICEV. Such changes in reducing the flat rate or the taxable value are reforms adopted in overseas jurisdictions which have made a significant impact on the uptake of BEVs, discussed in Section 8. In effect, the FBT payable for the BEV will be less than the FBT for equivalent ICEV.[42]

By reducing the statutory flat rate of 20% to 1% will reduce the FBT for the BEV to $661 compared to $13,228 and is significantly less that the FBT of $7,012 payable for the ICEV, a difference of $6,351, which is equivalent to subsidies available in many countries incentivising the uptake of BEVs and employee's choice of salary packaged vehicle.

41 Dale Boccabella, "The truth about FBT on cars: meaningful tax reform is hard," *The Conversation* (2013), https://theconversation.com/the-truth-about-fbt-on-cars-meaningful-tax-reform-is-hard-16235. 11.10.2021

42 EV advocacy group Drive Electric.62 EV advocacy group Drive Electric47 has proposed that FBT is applied to an EV at the rate of an equivalent ICE vehicle rather than the full EV cost – _i.e. setting the FBT rate for an EV so that it pays an equivalent amount of FBT in absolute dollar terms as its ICE equivalent.

5.2 Case Study 2: Operating Cost Method

Business fleets may elect to use the operating cost method for employer-provided fleet vehicles (work vehicle/tool of trade) where the taxable value is based on the operating costs of the car, reduced by any business use.[43] To establish the business percentage of kilometres travelled, business fleet employees will be required to maintain proper logbook records for a continuous period of at least 12 weeks.[44] Failure to maintain proper logbook and odometer records, the statutory formula method will apply.

Although the operating cost method is preferred for fleet vehicles (work vehicle/tool of trade), because high work kilometres travelled results in lower FBT payable, the method fails to encourage business to transition their fleets to BEVs.

The following example compares the fiscal impact of the operating cost method on the Kona BEV to its equivalent Kona ICEV as shown in Table 2.

Table 2. Operating cost method: Case study comparing FBT for paired Kona BEV- ICEV

Details	KONA BEV	KONA ICEV	Additional FBT Costs for BEV $
Purchase Price (MSRP)	60,500	31,600	28,900
Deliver cost	1,000	1,000	
GST	6,150	3,260	
Cost price (inclusive of GST)	67,650	35,860	
Operating costs (including GST)			
Fuel/electricity	720	1,600	
Repairs and service	700	1300	
Replace tyres	240	400	
Registration	900	900	
Insurance	900	900	
Total operating costs	**3,460**	**5,100**	**(1,640)**
Add Deemed operating costs			
Deemed depreciation[45]	16,912	8,965	7,947
Deemed interest (assumed vehicle is owned)[46]	3,057	1,620	1,437
Total operating costs	23,430	15,685	7,745
Logbook method[47] (Assume 25% private use)	5,857	3,921	
Fringe Benefits Tax Payable[48]	5,727	3,834	1,893

43 FBTA Act, sub-section 10(1)

44 FBTA Act, section 10A, 10B, and s162B When car used for the purpose of producing assessable income, s162C Holding period of car, s162D deemed specifications of matters in car records, s162D unsigned or fraudulent entries in log book records, s162F reasonable estimate of number of business kilometers, s162G logbook year of tax, s162H applicable log book period, s162J Business percentage established during log book period, s162K Replacement cars – car fringe benefits, s162L replacement cars – otherwise deductible provisions, s162M re-acquisition of cars.

45 Deemed depreciation under Sec 11(1) = cost price of a car $67,650 X depreciation rate under diminishing value method of 25% x 365 days/365 days

46 Deemed interest under Sec 11(2) = cost price of a car $67,650 x statutory interest rate under a taxation determination of 0.452 = $3,057

47 Logbook to be maintained in the first year you use a logbook method, for a 12-week period, which is valid for 5 years. The logbook must record the reason for the journey, start and end date of the journey and odometer readings at the start and end of the journey and kilometres travelled. MT 2041

48 Taxable value Operating cost $23,917 x (100% – business percentage applicable to the car 75%=25%) x Type 1 factor 2.0802*47%= $5,846

The operating cost method is calculated in accordance with the formula: (A x B) – C, where:

- A is the total operating costs of the car during the holding period.
- B is the percentage of private use; and
- C is the amount of any recipient's payments.[49]

Though the actual operating costs for the Kona BEV ($3,460) is less than its equivalent Kona ICEV ($5,100), business fleets owned or hired under a hire-purchase agreement are required to include 'deemed' operating costs: "deemed depreciation and deemed interest" based on the cars cost price including GST and luxury car tax, as appropriate.[50] Thus, this disadvantages BEVs because the price premium for the Kona BEV, means higher taxes and higher TCO than for the Kona ICEV.

The FBT system disadvantaging business uptake of BEVs will disincentivise business to address the lack of workplace charging infrastructure. This has been described as a 'chicken and egg' problem, where "the commercial viability of EVs depends on a widespread charging network being in place but the case for building that network is also dependent on the number of EVs on the road.[51] This interrelated demand for EVs and lack of charging infrastructure will be alleviated by the projects proposal of allowing home charging of fleet employees work BEVs. However, the affordability of BEVs must be addressed, with the proposed recommendations discussed in Section 5.1.

Pooled or shared cars

The pooled or shared BEVs will be exempt from FBT if there was no private use of the car during the year of tax, or any private use by the employee or an associate of the employee is minor, infrequent, and irregular.[52]

Single and Dual Cab Utility vehicles

Single and dual cab utility vehicles are specifically exempt from FBT.[53] The employer is not required to keep logbooks for this exemption. Work-related travel is restricted to and from work and any travel that is incidental to travel in the course of performing duties or employment, for which there will be no FBT.[54]

This FBT exemption has resulted in family sedans being traded in for a dual cab utility and consequent FBT savings. This exemption has encouraged the uptake of larger vehicles with higher CO_2 emissions.[55] In December 2020, the sales volume of the Toyota HiLux was up by 42.2% and the Ford Ranger was up by 27.4%.[56]

In New Zealand, full exemption for utes also applies and the vehicles, like in Australia are the top selling vehicles.[57] The development of EV utility models that are 'fit for purpose' is approximately five years behind other light vehicles and removal of this exemption, is likely to be unpopular from business and rural communities.[58]

Support from Fleet manager interviews – FBT discourages uptake of BEVs

The fleet managers interviewed (see Section 3) were asked, 'What aspects of fringe benefits tax would you like to see modified, to encourage a transition of your fleet cars to BEVs?' Overall, interviewees called for an FBT exemption or a rate reduction for BEVs. However, one ASX pointed out that there should be no FBT penalty for ICEV light commercial vehicles as there was no alternative or equivalent BEV models currently available. This point was repeated by other organisations. One organisation commented that FBT is a financial disincentive for the uptake of BEVs in salary packaging and salary sacrifice (see Section 3, ASX 1).

49 FBTAA, Section 10

50 FBT TR 2011/3; Australian Government, Australian Taxation Office, Fringe benefits tax – a guide for employers. Accessed 24.9.2021, https://www.ato.gov.au/law/view/document?DocID=SAV/FBTGEMP/00008&PiT=99991231235958/ For fleet vehicles leased, there is no deemed depreciation or deemed interest, because the actual lease costs form part of the operating cost of the car.

51 Competition Markets Authority, Electric Vehicle Charging Market Study, (UK Government 2021).

52 FBTAA sub-section 8(2)(b)

53 FBTAA, sub-section 47(6); sub-section 8(2)

54 MT 2024 (20)

55 BDO Australia, "ATO Crack Down on Dual Cab Utes" 2019, accessed 11.9.21, https://www.bdo.com.au/en-au/insights/automotive/articles/ato-crack-down-on-dual-cab-utes

56 Joshua Dowling, "Facts 2020 WRAP: New car sales recovered in December, amid lowest year since 2003", accessed 11 September 2021, https://www.drive.com.au/news/vfacts-2020-new-car-sales-recovered-in-december-amid-lowest-year-since-2003/

57 Concept Consulting, *How New Zealand can accelerate the uptake of low emission vehicles* (2021), efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwww.concept.co.nz%2Fuploads%2F1%2F2%2F8%2F3%2F128396759%2Fev_study_rept_1_v1.0__1_.pdf&clen=2307887&chunk=true; Concept Consulting, *How New Zealand can accelerate the uptake of low emission vehicles.*

58 Ibid

Fringe benefits tax for BEVs impacts on Total Cost of Ownership

Fleet managers base their decision of BEVs on the vehicles TCO compared to conventional vehicles.[59] It is acknowledged that TCO is the primary consideration for fleet managers and BEVs expected fuel cost savings are currently insufficient to overcome the higher upfront purchase prices compared with conventional vehicles. The DISER state that they would investigate the "tax treatment of electric vehicles where appropriate" and "look to normalise electric vehicle expenses to internal combustion vehicle expenses."[60]

The fleet managers interviewed (see Section 3) were asked, 'Would you consider increasing the uptake of BEVs, if their TCO was closer to an ICEV?' Overall, all but one organisation would consider BEVs. Infrastructure and fit-for-purpose were cited as additional barriers that would need to be considered.

To reach or reduce price parity between paired BEVs-ICEVs and incentivise the uptake of BEVs, FBT changes for cars under both the Statutory Formula method and the Operating Cost method would be required.

5.3 Literature: Fiscal Impact of FBT exemptions

For the 2019 Senate Report on EVs, the Parliamentary Budget Office modelled the estimated fiscal impact to the government in exempting "all newly purchased battery electric, plug-in hybrid, and hydrogen fuel electric vehicles from the fringe benefits tax FBT without the requirement for a post-tax contribution. The proposal was to apply from 1 July 2019 out to 2021-22. This would apply to salary packaging arrangements and would allow employers to pay for all lease and operating costs of such vehicles using an employee's pre-tax salary without incurring an FBT liability, which would reduce the effective (equivalent post-tax) cost of such vehicles.[61]

Financial implications

Over the 2018-19 Budget forward estimates (out to 2021-22), the Government fiscal and underlying cash balances would decrease by $140 million.[62] The fiscal implications were estimated as a loss of $20 million in 2019-20; loss of $40 million in 2020-21 and loss of $90 million in 2021-22, totalling $140 million.

Projected uptake

The assumed behavioural response was the reduction in the effective (equivalent posts-tax) cost of vehicles, projected as follows:

- purchase of new battery electric and hydrogen fuel cell electric vehicles would grow to 15 per cent of total vehicle purchases by 2028-29;
- the response would approximately double the number of new purchased BEV, PHEV and hydrogen fuel cell electric vehicles.

In the absence of a behavioural response to the proposal, the proportion of new vehicle purchases made under the salary packaging arrangements is the same for electric and non-electric vehicles. Around 8% of new vehicles are purchased under the salary packaging as of 2017-18.[63]

Revenue implications of proposed recommendations

The proposed revenue implications would need to be modelled. However, the implications most likely would be less than projected by the Parliamentary Budget Office, because the proposed changes only refer to Battery Electric Vehicles.

59 Anastasio Tsakalidis et al., "Electric light commercial vehicles: Are they the sleeping giants of electromobility," *Transport Research Part D* 86, no. 102421 (2020).

60 Dept of Industry Science Energy and Resources, Future Fuels Strategy: Discussion Paper. Powering Choice, (Canberra 2021). 14, 19.

61 Parliamentary Budget Office, *Revenue implications of changes to vehicle taxation measures – Fringe benefits tax exemption.*

62 Australian Senate, *Senate Select Committee on Electric Vehicles*, Commonwealth of Australia (Canberra, 2019).90

63 Ibid.

5.4 Recommendations for FBT changes: short-term

The following proposals for recommended FBT changes for cars are based on current provisions, and are short-term changes. The aim is to reduce the cost gap between paired BEV-ICEV and reach price parity to accelerate the uptake of BEVs. The recommendations only apply to specific business fleet types.

1 Statutory formula method tax changes for business fleet BEVs

Salary packaged arrangement vehicles – Full exemption

It is recommended that only BEV vehicles be fully exempt from FBT, or

Reduce statutory formula method flat rate

It is recommended that the statutory formula flat rate of 20% apply only to ICEVs. For equivalent BEVs, the flat rate be reduced, ranging from 1%–5% of the base value of the car. Thereby reducing the BEVs taxable value and FBT payable. The reform should remain until price parity is reached between BEV and equivalent ICEV.

2 Change of formula for BEV work fleet vehicles

It is recommended, that an employer-provided, BEV fleet vehicles (*work vehicle/tool of trade*) be fully exempt from FBT under the Operating Cost method and Statutory Formula method.

3 Home charging for BEV fleet vehicles

It is recommended where an employee takes an employer-provided BEV fleet vehicle (*work vehicle/ tool of trade*) home for charging that the 'private use' component is exempt from Fringe Benefits Tax.

4 Homecharing BEV pool/shared vehicles

It is recommended where an employee takes an employer-provided 'pool or shared' BEV home for charging, that the 'private use' component is exempt from Fringe Benefits tax. For employer provided 'pool' internal combustion engine vehicles, should be made subject to FBT in all private-use circumstances.

5 ICEV single and dual cab utes

It is recommended ICEVs of single and dual cab utes be subject to FBT in all private use circumstances when a BEV single and dual cab alternative becomes available.

6 Recommended income tax changes for cars and home charging based on current provisions: short-term changes

6.1 Approach

The methodology or approach for this section has the objective of presenting recommendations for short-term income tax changes. The approach includes an overview of the relevant literature that is discussed with the relevant income tax legislation. The fleet manager interview findings are then drawn on to present the income tax recommendations, which are supported further by the literature.

6.2 The Legislation and Literature

Income tax legislation has been reviewed for the following provisions relevant to employer-provided vehicles:

- Depreciation rates for car assets
- Depreciation tax concessions
  - Instant asset write off
  - Temporary full expensing
  - Accelerated depreciation
- Depreciation cost limit for cars

Depreciation

The Commissioner's estimate of effective life for most cars is generally 8 years, which is 12.5% of the vehicle cost per year under prime cost, or 25% under diminishing value method, introduced in January 2006.[64] And rates for commercial vehicles are 25% and 20% of vehicles costs due to their shorter lives. Vehicle cost for depreciation purposes includes stamp duty, delivery charges, initial repairs and improvements. The claim for depreciation on cars is limited to $60,733 (inclusive of GST) for 2021-22. It is proposed that the depreciation rate and depreciation cost limit be reviewed for BEVs.

Depreciation rate for BEVs

The Commissioner of Taxation's ruling on effective life for vehicles of 8 years has not been reviewed for BEVs. That is, the resale value and the depreciation rate is sufficiently known for ICEVs, but the resale value for a BEV is still unsettled.[65]

The DISER report stated there was a "perception that BEVs available today depreciate faster than internal combustion engine vehicles due to rapid technological development, the small number of these vehicles in the market, and uncertainty about the longevity of lithium-ion batteries.[66] Nonetheless, the report stated: according to "consultation with industry" this was becoming less of an issue, "particularly as manufacturers are providing extended warranties on batteries."[67] The DISER report did not address BEV's rate of depreciation, and resale value as a barrier to the uptake of BEVs. The Berkeley et al survey found that resale value is an important factor when selecting a vehicles, and 'anxiety over resale value' emerged as a net concern.[68]

In the 2019 Senate Report on EVs Mr Behyad Jafari, the Chief Executive Office for Electric Vehicle Council stated:

"Depreciation is an issue because there is not a lot of data available, and people are asking questions like: what is the risk associated with reselling an electric vehicle?"[69]

The Senate Committee heard evidence that EVs are subject to greater depreciation of value than ICEVs because rapid technological development renders older models obsolete and concerns about the longevity of battery life.[70] According to Wu et al, concessional depreciation of the capital cost of the BEV should be based on the vehicle purchase price less the "present resale value with consideration of the time value of money."[71]

64 TR 2011/2 "Depreciation of Work Related Motor Vehicles," Australian Taxation Office, 2021, accessed 27.9.2021, https://atotaxrates.info/tax-deductions/work-related-car-expenses/depreciation-of-vehicles/

65 *World Electric Vehicle Journal 11 (2020)*, https://doi.org/doi:10.3390/wevj11010022

66 Dept of Industry Science Energy and Resources, Future Fuels Strategy: Discussion Paper. Powering Choice, (Canberra 2021). 14. T Gotsis, *Electric vehicles in NSW*, NSW Dept of Planning Industry and the Environment (T. Gotsis, 2018), https://apo.org.au/node/17209

67 Ibid.

68 Berkeley, Nigel, David Jarvis and Andrew Jones. "Analysing the Take up of Battery Electric Vehicles: An Investigation of Barriers Amongst Drivers in the Uk." Transportation Research Part D 63 (2018): 466-81.

69 Australian Senate, *Senate Select Committee on Electric Vehicles*, Commonwealth of Australia (Canberra, 2019). 30

70 Ibid, 29

71 Inderbitzin Alessandro Wu Geng, Bening Catharina, "Total cost of ownership of electric vehicles compared to conventional vehicles: A probabilistic analysis and projection across market segments," *Energy Policy* 80 (2015).

Businesses can self-assess the effective life of a depreciating asset,[72] which must meet the factors that determine the effective life of a depreciating asset. For example, the market value and technological obsolescence.[73] With technological obsolescence "assets effective life does not necessarily end with each technological advance, and a taxpayer can still use the asset for a specified purpose even though a newer model exists."[74] Analysing the decline in the market value is an important factor in the determination of the assets effective life, where it can be shown that "... its value actually falls, or is expected to fall, over time."[75]

Resale value of BEVs

In the absence of a second-hand BEV market, there is uncertainty on the residual values that will be achieved by BEVs. Thus, compounding the high initial price of BEVs if resale value is low when compared to their equivalent ICEV.[76]

Zhou et al, finds that BEVs generally are expected to depreciate faster than conventional vehicles and hold "significantly less value compared with ICEVs HEVs and PHEVs.[77] That is, BEVs are a relatively new technology, subject to continuous technological improvements, a major concern is battery degradation with implications on the vehicle's resale value.[78] "Consumers concern over degraded battery performance (shorter electric range) faster evolving technologies, and rapid model upgrading all contribute to the lower residual values of PEVs, in recent years."[79] That is, BEVs depreciate faster than ICEVs mainly because of technological advancements and battery cost reduction, lead to a decrease in the resale value of earlier variants.[80] For example, Levay et al found that small EVs such as the Nissan Leaf are among the vehicles that depreciate the most in the first years of ownership, a partial reason is that the purchase price of some EV models decreased as a result of technological advances.[81] Parker et al found that when the second generation of Nissan Leaf BEV were released, the high five year depreciation of 82% matched the low resale value for the Nissan Leaf.[82]

Hasan et al, states that changes in the depreciation rate plays a crucial role in the relative scenario of different types of vehicles as it affects the resale value significantly.[83]

Policymakers need to consider the lower residual values of BEVs when deciding upon related incentives and this should be incorporated into the vehicles analysis to better reflect the total cost of ownership.[84] In addition, given the positive effects of BEV technology advancement, policymakers should also consider incentivising technology research and development to accelerate the adoption of new BEVs.[85] Therefore it is proposed that depreciation incentives be introduced for BEVs with either a 100% write off or an accelerated rate of depreciation.

BEV depreciation concessions apply in the European Union and vary between Member States. Belgium applies a 120% deductibility for BEVs and normal rates of depreciation for other vehicles. The United Kingdom's regular depreciation rate is 18% and EVs can accelerate the write off to 100% in the first year, which they state is a "purely potential accounting benefit."[86] The rate of depreciation in Spain is 100% when the car is used strictly for business purposes only, 70% when used for both business and private purposes and 20% if the car is strictly a benefit and not used for business purposes.[87]

The Australian Government introduced an instant asset write off and accelerated depreciation, but the concessions applied to all vehicles and limited the depreciation incentives to eligible business with certain aggregate turnovers. There is no specific incentive to increase the uptake of BEVs by large business fleets.

72 ITAA 1997, Section 40-105

73 Taxation Ruling 2021/3 paragraph 39

74 Taxation Ruling 2021/3 paragraph 22 and 39

75 Ibid. A written determination is required from the Commissioner specifying the conditions for a shorter effective life for a BEV.

76 Jarvis David Berkeley Nigel, Jones Andrew, "Analysing the take up of battery electric vehicles: An investigation of barriers amongst drivers in the UK," *Transportation Research Part D* 63 (2018). 468

77 Zhaomiao. Guo, Zhou, Yan, "Residual value analysis of plug-in vehicles in the United States," *Energy Policy* 125 (2019).

78 Scorrano, Danielis, and Giansoldati, "The Economic case for electric vehicles in public sector fleets: An Italian Case Study."

79 Guo, "Residual value analysis of plug-in vehicles in the United States." X. Zhao, Doering, O. C., & Tyner, W. E., "The economic competitiveness and emissions of battery electric vehicles in China," *Applied Energy* 156 (2015).

80 Zhao, "The economic competitiveness and emissions of battery electric vehicles in China." Hao. Xu, Zhenhong, Lin., Hewu, Wang., Shiqi, Ou., Minggao, Ouyang, "Range cost-effectiveness of plug-in electric vehicle for heterogeneous consumers: An expanded total ownership cost approach.," *Applied Energy* 275 (2020).

81 P.Z. Levay, Y. Drossinos, and C. Thiel, "The effect of fiscal incentives on market penetration of electric vehicles: a pairwise comparison of total cost of ownership."," *Energy Policy* 105 (2017).

82 Nathan Parker, Hannah L. Breetz et al., 'Who saves money buying electric vehicles? Heterogeneity in total cost of ownership' (2021) 96 Transportation Research Part D 1.

83 Md Arif Hasan et al., "Costs and emissions: Comparing electric and petrol-powered cars in New Zealand," *Transportation Research* D 90, no. 102671 (2021).

84 Guo, "Residual value analysis of plug-in vehicles in the United States."

85 Ibid.

86 Data Force, "Transport & Environment Company Car Report," (2020). https://www.transportenvironment.org/sites/te/files/publications/2020_10_Dataforce_company_car_report.pdf. 50

87 Ibid.59

Depreciation concessions

In the 2021-2022 income year, subject to the depreciation cost limit of $60,733 (inclusive of GST), an eligible business taxpayer that satisfies certain turnover criteria, gets the following concessions:

- Instant asset write off.[88]
- Temporary full expensing.[89]
- Accelerated depreciation.[90]

For eligible businesses the following aggregate turnover applies:

- Small business with aggregate turnover < $10m.
- Medium to large businesses with aggregate turnover of < $5 billion.

Instant asset write-off

The instant asset write-off applies to small, medium-large businesses, and excludes large businesses. The instant asset write off applied to assets first used or installed for a taxable purpose in business between 12 March 2020 and 30 June 2021, a concession that typically gets announced and extended at Federal Budget time. This concession has been replaced by the Temporary Full Expensing concession.[91]

Temporary full expensing

All eligible businesses are entitled to the temporary full expensing concession, where the business' highest aggregate turnover is less than $5 billion from 6 October 2020 to 30 June 2023 (again extended due to COVID).[92]

Temporary full expensing legislated to assist businesses to recover from the impact of the corona virus pandemic (COVID-19) and is "temporary' because it does not apply to asset first used or installed for taxable purpose after 30 June 2023. The "temporary instant asset write-off tax concession provides full expensing for a business assets purchased between 6 October 2020 to 30 June 2023.

Accelerated depreciation

Accelerated depreciation that uses a double write off factor: Base value of asset x days held by taxpayer/365 x 200%/asset's effective life.[93]

Depreciation incentives fail to increase uptake of BEVs

Despite lockdowns, new vehicle sales climbed 33% in August 2021 in Australia, compared to the same month last year, with demand still strong.[94] For sales to increase by 33% most likely would have been incentivised by the Temporary Full Expensing concession.

However, the instant asset write-off, temporary full expensing and/or accelerated depreciation has had no significant effect on the uptake of BEV's by business fleets. That is, business fleets EV sales fell for large fleets in 2020 (173 vehicles) compared to 2019 (215 vehicles). Additionally, average emission intensity was the highest for business buyers for passenger cars and light SUVs (158 g/km) and for heavy SUVs and light commercial vehicles (220g/km) for 2020.[95]

This is despite the significant decrease in receipts for the temporary full expensing measure and the instant asset write off, including income tax years from 2020-21 to 2023-24, estimated as $26.7 billion over the forward estimates period and $3.2 billion over the medium term, in the Treasurer's Budget Report for 2021-22.[96]

In the 2020, large business fleets of passenger vehicles and light SUVs (25,920) and heavy SUVs and light commercial vehicles (34,891), totalled 60,811 vehicles. Business fleets of passenger vehicles and light SUVs (59,014) and heavy SUVs and light commercial vehicles (104,257), totalled 163,271 vehicles.[97] Thus totalling 224,082 in fleet vehicles accounting for 55% of total business buyers (403,824).

Effectively, the depreciation incentives have increased the uptake of ICEVs and not BEVs. It is argued that IAWO-type concession should also apply to BEVs of employer-provided fleet and pool vehicles with aggregate turnovers > $5 billion in order to incentivise and accelerate the uptake of BEVs used in the carrying on of the business. Lopez states that depreciation write-offs for EVs should be instant or accelerated to encourage corporate fleets to invest in EVs.[98]

88 ITAA 97, s. 328-181. See also <https://www.ato.gov.au/Business/Depreciation-and-capital-expenses-and-allowances/Backing-business-investment---accelerated-depreciation/>.

89 *Income Tax (Transitional Provisions) Act 1997* (Cth), Subdiv 40-BA.

90 ITAA 97, s. 40-72.

91 *Income Tax (Transitional Provisions) Act 1997* (Cth), Subdiv 40-BA.

92 Australian Government 2021-22 federal budget announcement on 11 May 2021, to extend the incentive for 12 months until 30 June 2023. At the time of finalizing this project, the extension is not law. https://www.ato.gov.au/General/New-legislation/In-detail/Direct-taxes/Income-tax-for-businesses/JobMaker-Plan---temporary-full-expensing-to-support-investment-and-jobs/

93 ITAA, section 40-72.

94 Simon Evans, "New car sales jump 33pc despite lockdowns" 4-5 September, 2021, Australian Financial Review.

95 Australian Government National Transport Commission, *Carbon dioxide emissions intensity for new Australian light vehicles 2020* (2021). 54

96 Honourable Josh Frydenberg MP, Budget 2021-22, Budget Measures Budget Paper No.2 2021-22, (Treasurer of the Commonwealth of Australia, 2021). file:///Users/s341244/Downloads/bp2_2021-22.pdf

97 National Transport Commission, *Carbon dioxide emissions intensity for new Australian light vehicles 2020.*

98 Saul Lopez, *Company cars: How European governments are subsidising pollution and climate change*, Transport & Environment, (Belguim, 2020).

6.3 Fleet Manager Interviews: Findings

The fleet manger interviewees were asked, 'Would your organisation acquire more BEVs if income tax concessions were modified, such as depreciation, instant-asset-write-off, to preference BEVs?'

ASX

It would be good to get tax incentives for BEVs (ASX 1,3,7). It would 'change the conversation' (ASX 2); particularly about whole of life costs (ASX 1, 4, 5). If there was a similarly priced BEV to the diesel Hilux, 'we'd probably buy it every day of the week' (ASX 4). 'Continuation of instant tax write-off beyond June 2022 would be helpful' (ASX 6).

Private Companies

Tax incentives for BEVs would be good, but a vehicle 'fit-for-purpose is our number one challenge. We didn't have the utility car EV options' (Pte Co 1). Tax incentives would be good, as 'every opportunity is a benefit to transition' to BEVs (Pte Co 2).

Statutory Government

Currently there are incentives to buy ICEVs due to the instant-asset-write-offs, but no preference for BEVs. Many organisations use passenger cars as a 'tool of the trade vehicle' but there are no specific tax incentives for them (Stat Govt 1, 2). Preferential income tax concessions for cars should not be available to ICEVs (Stat Govt 3).

Local Councils

In terms of tax incentives, we 'don't just consider the capital investment in the car', we look at total cost of ownership. 'What we're finding with our vehicles [BEVs and PHEVs] is there is a huge benefit in the operating costs of these vehicles in comparison to ICEVs (Loc Coun 2). Local Councils is not subject to income tax (Loc Coun 1, 3,4).

Overall the interviewees supported preferential income tax incentives for BEVS, but only when 'fit for purpose' BEV models become available. Statutory government and local councils are not subject to income tax, but those organisations that lease cars are likely to have lower payments due to income tax concessions.

6.4 Recommendations for income tax changes: short-term

The following proposals for recommended income tax changes for cars and home charging are based on current provisions and are short-term changes.

6 Instant asset write off for BEV fleet/pool vehicles

It is recommended that vehicle assets for employer-provided *fleet* and *pool* BEVs, the acquisition costs in the sector or class of passenger, light commercial vehicles that include panel vans and utilities,[99] — be eligible for a 100% depreciation concession also known as the 'instant asset write off',[100] and made available until an agreed uptake target has been reached.

The instant asset write off (IAWO) would exclude petrol, diesel, hybrid, and plug in hybrids cars from IAWO which would require a minor legislative amendment.[101]

An IAWO is appropriate for employer-provided fleet and pool BEV vehicles given business high kilometres travelled. By contrast, for an employer-provided BEV under a salary package arrangement, accelerated depreciation would be more appropriate. Such vehicles have very high private use.

7 Accelerated depreciation to apply to salary packaged BEVs

It is recommended for employer-provided BEVs under *salary package and salary sacrifice arrangements*, that acquisition costs, in the sector or class of passenger, and SUVs[102] — be eligible for accelerated depreciation.[103] It would specifically exclude ICEV light commercial vehicles comprising vans, panel vans and utilities.[104]

The income tax amendment start date should reflect the expected timeframe for when alternative BEV utility vehicles that are 'fit for purpose' become available in Australia.

Depreciation cost limit

Depreciation cost limit based on the vehicles cost[105] is a financial disincentive for businesses choosing a BEV when the price premium is higher than the depreciation cost limit.[106] Businesses are either penalised or discouraged for choosing BEVs when depreciation cannot be claimed in full because the BEVs cost price exceeds the depreciation cost limit. For example, in Table 1, the Kona BEV cost price (including delivery charges) of $61,500 exceeds the depreciation cost limit of $55,212 (exclusive of GST)[107] by $6,288, which cannot be claimed for depreciation. This is a financial disincentive to business fleets in choosing a BEV, which the full cost cannot be depreciated.

99 Vehicles designed to carry a load of less than one tonne.

100 Eg. *Income Tax (Transitional Provisions) Act 1997* (Cth), Subdiv 40-BB; and *ITAA 97*, section 328-181.

101 See for example *Treasury Laws Amendment (Increasing the Instant Asset Write-Off for Small Business Entities) Bill 2020*. A schedule of changes to the legislation at division would be drawn up.

102 Vehicles designed to carry a load of less than one tonne.

103 ITAA 97, s. 40-72. Base value x days held/365 x 200%/asset's effective life.

104 Vehicles designed to carry a load of less than one tonne.

105 ITAA 1997, Subdivision 40-C, Sec 40-10. Cost base for depreciation includes the expenses you incur to start holding the asset and additional expenses that contribute to its present condition and location (improvements). Cost base includes amount paid for the vehicle, including stamp duty, delivery charges, initial repairs or improvements. Input tax credits are excluded (GST) from cost.

106 ITAA 1997, Subsection 40-230

107 ITAA 1997, Subsection 40-230. Depreciation cost limit $60,733 includes GST of $5,521.

For simplification and certainty, the depreciation cost limit for BEVs of both work vehicles and salary packaged arrangements could either be based on the LCT threshold of $79,659 (inclusive of GST) for fuel efficient vehicles or $68,740 (inclusive of GST) for other vehicles for the 2021-22 financial year.[108] The $68,740 threshold for other vehicles, is similar to the threshold of $68,750 (inclusive of GST) for the NSW rebate of $3,000 (for BEV and hydrogen fuel cell vehicles), and the threshold of $68,740 (inclusive of GST) for entitlement to the Victorian 'Zero Emissions Vehicle Subsidy of $3,000.[109] Given the price barrier of BEVs, the LCT threshold of $79,659 (inclusive of GST) for fuel efficient vehicles is recommended as the proposed depreciation cost limit .

8 Increase depreciation cost limit for fleet BEVs

It is recommended that the depreciation cost limit for *employer provided* BEVs be equivalent to Luxury Car Tax threshold for fuel efficient vehicles of $79,659 (inclusive of GST) for the 2021-22 financial year

The current depreciation cost limit of $60,733 (inclusive of GST) for 2021-22 will *only* apply to employer-provided fleet ICEV and HEVs car acquisition in the sector or class of passenger, light commercial vehicles that include panel vans and utilities.[110]

Goods and Services Tax

As a consequence of recommendation 9, then it follows that for Goods and Services Tax (GST), entitlement to claim a refund/credit for acquisition of a BEV, should increase.[111] The maximum of GST credit the business could claim would be one-eleventh of the proposed depreciation car limit of $7,241 ($79,659 x 1/11) for the 2021-22 financial year.[112]

9 Increase GST credit limit for fleet BEVs

It is recommended that the Goods and Services Tax for purchasing an employer-provided BEV be limited to one-eleventh of the increased depreciation cost limit applying to BEVs, for the financial year.

The current 2021-22 depreciation cost limit and associated GST credit – should continue to *only* apply to employer-provided fleet ICEV and HEVs car acquisition in the sector or class of passenger, light commercial vehicles that include panel vans and utilities.

Support for Home Charging fleet BEVs

Fleet manager interviews found most companies have no (ASX 1,3) or low number of workplace charging infrastructure (ASX 4,6,7 and Pte Co1). Only one company was an outlier with 12 charging stations (ASX 2). Additionally, none of the ASX and private companies had plans for large scale charging infrastructure for future uptake of BEVs.

Therefore, impact on the grid from fleets of BEV charging at workplace infrastructure at peak times was not an issue, when there are no or such few BEVs. Klein et al states that "commercial viability of EVs depends on a widespread charging network being in place, but the case for building that network is also dependent on the number of EVs on the road."[113]And investing in workplace charging infrastructure can be "prohibitively expensive" to install; rapid workstations can minimise waiting time for drivers but require large amounts of power and therefore electricity upgrades, which are costly.[114]

Reasons provided by fleet managers for the lack of uptake of BEVs ranged from:

- Current BEVs are not fit for purpose; concerns on battery range and whole of life costings/total cost of ownership (ASX 2)
- At this stage, BEVs have insufficient range and length of time to charge (ASX 6)
- Will consider the technology in 2022, and then will depend on government policy using renewable energy (ASX 5)
- CO_2 reductions would be required and needs to be linked to renewable energy (ASX 6)

108 A New Tax System (Luxury Car Tax) Act 1999, Subdivision 960-M

109 "Battery Electric Vehicle Fleets," NSW Government, 2021, https://energysaver.nsw.gov.au/business/discounts-and-incentives/battery-electric-vehicle-fleets; NSW Dept of Planning Industry and the Environment and AGL, "Battery Electric Vehicle Fleets."; "Zero Emissions Vehicle (ZEV) Subsidy," 2021, https://www.solar.vic.gov.au/zero-emissions-vehicle-subsidy#faqs.

110 Vehicles designed to carry a load of less than one tonne.

111 *A New Tax System* (*Goods and Services Tax*) *Act 1999* (Cth), sections 11-15 and 11-20.

112 GSTA99, section 69-10.

113 Competition Markets Authority, Electric Vehicle Charging Market Study, (UK Government 2021).

114 Marvin Klein, Christine Strauss, and Christian Stummer, *Business information through choice-based conjoint analysis: the case of electric vehicle home charging* (2021).

- Limited parking space (Loc Coun 4)
- Concerns on the volume of infrastructure that will be required, and preference to source energy from green renewables (ASX 6)
- Not many vehicles would utilise a charging infrastructure (Pte Co 1);
- Operating from leased premises meant they have no control (State Government 2)

In the AfMA 2020 survey of business fleets, 177 respondents representing 66,518 vehicles ranked the greatest barriers to increasing EV numbers[115] :

1. Purchase cost of EVs
2. Setting up workplace infrastructure
3. Limited models available
4. Complexity of setting up workplace charging infrastructure
5. Capacity of EV battery to travel distances required
6. Residual/resale value of EVs.

Even with the lack of workplace charging infrastructure, home charging would need to be considered because "over 47% (34,688 fleet vehicles) of passenger car and SUV fleets are home garaged."[116] According to the Electric Vehicle Council, 86% of respondents regarded home charging as the "top priority," highlighting the importance of "convenient access" to charging infrastructure that will influence consumers' attitudes towards electric vehicle purchases.[117] While public fast charging is critical to support EV uptake in Australia, most charging will continue at home, where most cars are parked for the longest period of time.[118] Thus providing an immediate solution to lack of workplace charging infrastructure, that is less expensive and more convenient.

Some ASX fleet managers interviewed stated that most of their fleet vehicles are home garaged work vehicles; two of the three state government's stated 30% to 50% of fleet vehicles are home garaged; for Pte Co 1, majority of fleet vehicles are home garaged. Local councils varied, with two local councils reported all (Loc Coun 2) or majority of fleet vehicles (Loc Coun 3) home garaged.

While Fleet managers seemed opened to home charging, they have not engaged in any discussions about the logistics and costs of installing home charging facilities. They expressed concern about the policies around who bears the infrastructure and energy costs and acknowledged dialogue would be required with employees to support home charging.[119]

Importance of home charging fleet BEVs

The fleet manager interview findings have identified the importance of home charging of work fleet BEVs in Australia. This refers to employer-provided fleet vehicles as many do not return to base as work commences from the employees' home. In effect, the main charging base will be the fleet employee's home.

The finding supports Klein et al, that home charging is the main charging point for EV drivers and states "most studies have not tested the importance of home charging as a "standalone attribute."[120] Scorrano et al finds the availability of home charging at lower prices is important for BEV operating cost related savings in the Total Cost of Ownership, which largely increases BEVs cost competitiveness if drivers can charge at home.[121] In effect, not only is home charging important for energy management reasons, (i.e. peak shaving and distributed consumption) but also to improve BEV cost competitiveness and to gain market acceptance.[122]

The project examines the taxation considerations on who bears the cost of home charging infrastructure and energy costs and proposes short term income tax changes to support home charging. The proposed recommendations will support home charging of BEVs for fleet/tool of trade vehicles, that will provide confidence and certainty for business to transition business work fleets to BEVs.

Home charging for employer provided BEVs

Employer provided business fleets include employee salary packaged vehicles, fleet and pool vehicles. Home charging at its simplest is connecting the EV to a standard household power outlet (Level 1 charging) which provides the equivalent of 100 kilometres of charge in 17 hours.[123] Around 85% of kilometres travelled in Australian passenger vehicles are classified as short-range driving that is generally less than 100 kilometres from home.[124] With BEVs having a range of 350 kilometres means that a home charger will meet the average

115 Australasian Fleet Management Association (AfMA) and AGL, Survey: Electric Vehicles in Business Fleets (2020). The survey represented 177 respondents, representing a total of 66,518 vehicles.

116 Klein, Strauss, and Stummer, Business information through choice-based conjoint analysis: the case of electric vehicle home charging.

117 Electric Vehicle Council, *State of Electric Vehicles* (2020). 1-99: 18

118 Ibid., 42.

119 Race Fleet manager interview, Section 3, 5

120 Klein, Strauss, and Stummer, *Business information through choice-based conjoint analysis: the case of electric vehicle home charging.*

121 Scorrano, Danielis, and Giansoldati, "The Economic case for electric vehicles in public sector fleets: An Italian Case Study."

122 Ibid

123 Senate Committee Australian Government, The Senate Select Committee on Electric Vehicles Report, (2019). Australian Energy Market Commission, 2020 *Retail Energy Competition Review: Electric Vehicles* (Canberra: AEMC, 2020).

124 The Senate Select Committee on Electric Vehicles, submission: Energy Networks Australia, Submission 60.5, p.5

day-to day needs of most Australians, and high-speed charger will not be required.[125]

For salary packaged BEVs, vehicle home charging would be sufficient to meet employee charge requirements for daily travel. Furthermore, such vehicles are mainly for the private use of the employee, and the personal decision to install a Level 2 charger in their private residence should be at the cost of the employee, which can either be directly paid by the employee or added to the price premium of the BEV. In Norway, a country with a significantly higher penetration of EVs, 63% of 11,274 surveyed electric vehicle drivers use Level 1 charging at home.[126]

For BEV work vehicles/tools of trade, fleet employees daily high kilometres travelled would require the installation of a dedicated Level 2 EV charger to achieve faster charging times and to avoid charging at the end of the day, at peak tariff rates.

Cost of installing a Level 2 home charger

Home charging will be available to fleet employees who have off-street parking. To install the fast charger, the employees home dwelling will need to be assessed on its service connection to the network and or capacity of their switchboard.[127]

The costs for installing the infrastructure and charger are shown in the following Table.

Table 3. Cost of Installation and Charger

Costs	$
Electrician to assess dwelling to determine suitability of employee's home or rented residence for installing a Level 2 or Smart Charger and capacity of residential power grids	Cost of assessment
Cost of Level 2 charger and installation	$2,500
Cost of Smart charger and installation	$3,000–$4,000
Removing smart charger	$200

Costs provided by Tim Washington, Chair of EVC, and AGL

The smart charging option would be recommended for home charging of business fleet *work BEVs*. It will be easier to use for the fleet employee, if it is able to communicate with the EV and energy supplier to adjust the time and speed of charging and can automatically react to real-time changes in electricity prices.[128] Not only will significant savings apply by charging BEVs when energy is the cheapest, but grid reliability is supported by managing demand for BEV charging. Additionally, smart chargers can maximise the use of renewable energy available at fleet employee's home. For employers, smart chargers record the time and charge of fleet BEVs that can be sent direct to the employer for reimbursement.

Capital cost of smart charger and installation

The cost to the organisation will be the cost installation of the smart charger ($3000), that can either be treated as a separate asset and written off or included in the price premium of the BEV at the time of acquisition.

For employees terminating employment, the smart charger can either be returned or purchased from the employer. The cost of removing the smart charger for around $170, will be incurred around the time when the work fleet vehicle is returned (by the fleet employee) and will be an operating expense and tax deductible.[129] Alternatively an agreement can be made between the employer and fleet employee for the acquisition of the installed smart charger.

10 Instant asset write off for fleet BEVs' home charging capital costs

It is recommended that for employer-provided *work fleet* BEVs, that private, capital costs of home charging, including installation of charging connections be – eligible for a 100% depreciation concession also known as the 'instant asset write off',[130] and made available until an agreed uptake target has been reached.

125 Ibid. Tesla Owners Club of Australia, Submission 28, p. 7

126 Australian Energy Market Commission, *2020 Retail Energy Competition Review: Electric Vehicles*. Electric Vehicle Council, submission to EV Issues Paper, p.3.

127 Australian Energy Market Commission, *2020 Retail Energy Competition Review: Electric Vehicles*.

128 Competition Markets Authority. *Electric Vehicle Charging Market Study:* UK Government, 2021. 87

129 Jesco d'Alquen, AGL, discussed on 20 September 2021

130 *Income Tax* (*Transitional Provisions*) *Act 1997* (Cth), Subdiv 40-BB; and *ITAA 97*, section 328-181.

Energy cost of home charging

The smart chargers can record home charging details of the fleet BEV, which is then sent direct to the organisation for reimbursement. The cost of home-charging energy is a private cost, but should be tax deductible.[131]

11 Travel between home and work for fleet BEV home charging

It is recommended that *travel* between work and home in employer-provided *fleet* BEVs, that require charging at the employee's place of residence, be tax deductible.

Generally, pool or shared BEV vehicles (usually kept at the base) will generally have a workplace charging station. For infrequent trips to the employees' home, the BEV can be home charged, if required and the cost of charging can be reimbursed.

12 Tax deductible for reimbursements of home charging pool BEV

It is recommended that *energy* to charge an employer-provided *pool* BEVs at the employee's place of residence, be tax deductible.

131 ITAA 1997, Sec 8-1(1)(b)

7 Modelling of selected tax changes for impact on the total cost of ownership

Overview

Modelling of selected recommendations for FBT and income tax changes have been applied to determine the impact on the Total Cost of Ownership (TCO). Case studies compare a Kona BEV and an equivalent Kona ICEV.

This section presents four cases studies as follows:

- **Case Study 1:** Paired Kona BEV and ICEV under normal market conditions. Scenario 1 applies FBT for 365 days; and Scenario 2 applies FBT for 25% of year.
- **Case Study 2:** Apply an FBT exemption to a BEV and an ICE; and apply both FBT operating and statutory formula methods of calculation to an ICE.
- **Case Study 3:** Apply the instant asset write-off (IAWO) and an FBT exemption to a BEV; and compare to an ICE.
- **Case Study 4:** Apply an FBT exemption, road user charges and a purchase subsidy of $3,000 to a BEV.

This section commences with a literature review at 7.1, and then proceeds to the fleet manger interview data that informed the design of the case studies at 7.2. The case study methodology is then explained at 7.3 followed by the modelling of four case studies at 7.4. This section concludes with the modelling findings and discussion at 7.5.

7.1 Literature on business fleets Total Cost of Ownership (TCO)

The purchase decision for fleet vehicles strongly depends on the total cost of ownership (TCO).[132] Companies focus on TCO for both BEV and ICEVs.[133] That is, the TCO is an important metric that enables a cost comparison between a BEV and a similar ICEV, for the costs of owning a vehicle over a specified period, including capital expenditure, operating costs, and resale value.[134] According to Parker et al comparing the TCO of BEVs and ICEVs has enabled researchers to assess BEV cost-competitiveness under various price, policy, and driving scenarios, evaluate the policy incentives needed to achieve cost parity, and identify the consumer types who would most benefit from BEVs."[135]

However, TCO methodology has not been standardised in the literature.[136] Various vehicle TCO studies can vary, which means that results are misleading and difficult to compare, with little consensus on the TCO value or payback period.[137] Most consider a shorter ownership period of between 3-7 years; some studies only include vehicle purchase and fuel costs, while others include many additional operating and maintenance costs; many assume no residual value; exclude tax costs, others assume fixed depreciation schedules across all vehicle types, while a few look at market based residual value.[138] Although, resale values are an important determinant of net ownership costs.

The price premium of the BEV is perceived as a disadvantage compared to its equivalent ICEV. However, BEVs operating costs are lower than for ICEVs. Company fleet purchase decisions are based on TCO, not purchase price alone. Fleet managers will analyse the TCO for operating and non-operating costs. Generally, for an ownership period, increasing number of US and European studies consider a TCO period over three to six years.[139]

Furthermore, ownership costs are more complicated than purchase prices and fuel savings. Maintenance, insurances, taxes and resale value are also significant costs that vary

132 Karin Hauff, Stefan Pfahl, and Rolf Degenkolb, 'Taxation of Electric Vehicles in Europe: A Methodology for Comparison' (2018) *World Electric Vehicle Journal* 1.

133 NEF Bloomberg, "Hitting the EV Inflection Point", in *Transport & Environment* (Bloomberg, NEF, 2021); ibid.

134 Breetz. Parker N, H.L., Salon,Deborah., Conway Wigginton Matthew., Williams Jeffrey., Patterson Maxx., 'Who saves money buying electric vehicles? Heterogeneity in total cost of ownership' (2021) 96 *Transportation Research Part D*.

135 Ibid

136 Kate Palmer et al., 'Total cost of ownership and market share for hybrid and electric vehicles in the UK, US and Japan' (2018) *Applied Energy*.

137 Hanna L Breetza and Deborah Salon, 'Do electric vehicles need subsidies? Ownership costs for conventional, hybrid, and electric vehicles in 14 U.S. cities' (2018) 120 *Energy Policy* 238.; Inderbitzin Alessandro Wu Geng, Bening Catharina, 'Total cost of ownership of electric vehicles compared to conventional vehicles: A probabilistic analysis and projection across market segments' (2015) 80 *Energy Policy*.

138 Jarvis David Berkeley Nigel, Jones Andrew, 'Analysing the take up of battery electric vehicles: An investigation of barriers amongst drivers in the UK' (2018) 63 *Transportation Research Part D*. Kate Palmer et al., 2018, above

139 P.Z. Levay, Y. Drossinos, and C. Thiel, 'The effect of fiscal incentives on market penetration of electric vehicles: a pairwise comparison of total cost of ownership.'" (2017) 105 *Energy Policy*; Harvey Danny L.D., 'Cost and energy performance of advanced light duty vehicles: Implications for standard sand subsidies' (2018) 114 *Energy Policy*.

across vehicles and can be challenging to project over the ownership lifetime.[140] The TCO and residual values are often the important factors for organisations car purchases, and quantifies the present value of all relevant costs in owning and running a vehicle [141] Resale value for ICEVs are sufficiently known but determining resale values for BEVs is difficult and still controversial when there is no historic resale value, given their recent appearance in the market.[142]

The vehicle ownership period can vary. Parker et al assumes a five-year ownership period.[143] This chapter will compare the Kona BEV to the Kona ICEV using real-life car prices, and model the TCO, under current taxation law, over a three-year period, with no proposed tax changes. Then it will assess the impact on the TCO and the BEV cost-competitiveness by applying proposed tax changes.

Total cost of ownership

The annual cost saving is used to determine the number of years required to offset the higher purchase price of BEVs and hence the period required for cost parity based on the TCO between BEVs and ICEVs.[144] The TCO is divided into operating and non-operating costs.

Operating costs

The operating costs can include the following:

- Fuel costs and energy costs
- Maintenance and repairs
- Tyre replacement
- Servicing
- Insurance.

Annual fuel costs

Fuel costs are usually the largest operating costs. Therefore it is important to use representative real driving fuel consumption. Fuel price is the most variable input and can have a significant impact on the TCO. The higher the fuel price is favourable for the TCO for BEVs. Type of driving can have an impact on the TCO, where BEVs are relatively more efficient in city driving and ICEVs have better fuel economy when driving highways.[145]

Energy cost

Energy costs for EV charging can range from average residential power prices[146], to discounted off peak power rate, access to home charging at low-cost off-peak rates and or access to recharging 'at work' at zero prices.[147]

Repair and Maintenance

Repair and maintenance costs are generally cheaper for BEVs due to less wear on the brakes and fewer moving parts. But higher if the battery replacement cost is included. Though a recent decrease in battery prices has made BEVs more cost competitive.[148] Hao et al, excludes BEV battery replacement, because it is assumed the battery performs well and will last throughout the lifetime of the vehicle.[149]

Scorrano et al finds a cautious assumption for repair and maintenance costs for BEVs being 30% less than the average ICEV because of regenerative braking, no oil change, spark plugs or transmission fuel.[150]

Insurance

Commercial insurance is calculated pre-subsidy.[151]

Stamp Duty, road tax, registration annual fee

The respective stamp duty, road tax, registration fees are shown in Appendix A.

140 Breetz. Parker N, H.L., Salon,Deborah., Conway Wigginton Matthew., Williams Jeffrey., Patterson Maxx., 2021, above

141 NEF Bloomberg, "Hitting the EV Inflection Point," 2021, above.

142 Kate Palmer et al., 2018, above P.Z. Levay, Y. Drossinos, and C. Thiel, 2017, above . Mariangela Scorrano, Romeo Danielis, and Marco Giansoldati, 'The Economic case for electric vehicles in public sector fleets: An Italian Case Study' (2020) 11 *World Electric Vehicle Journal.*

143 Breetz. Parker N, H.L., Salon,Deborah., Conway Wigginton Matthew., Williams Jeffrey., Patterson Maxx., 2021, above

144 Zhe. Liu, Song, Juhyun., Kubal, Joseph., Susarla, Naresh., Knehr, Kevin., Islam Ehsan., Nelson Paul., Ahmed Shabbir., 'Comparing total cost of ownership of battery electric vehicles and internal combustion engine vehicles' (2021) 158(112564) *Energy Policy.*

145 Breetz. Parker N, H.L., Salon,Deborah., Conway Wigginton Matthew., Williams Jeffrey., Patterson Maxx., 2021, above

146 Hanna L Breetza and Deborah Salon, 2018, above

147 Md Arif Hasan et al., 'Costs and emissions: Comparing electric and petrol-powered cars in New Zealand' (2021) 90(102671) *Transportation Research D*; Hanna L Breetza and Deborah Salon, 2018, above

148 Md Arif Hasan et al., 2021, above

149 Hao. Xu, Zhenhong, Lin., Hewu, Wang., Shiqi, Ou., Minggao, Ouyang, 'Range cost-effectiveness of plug-in electric vehicle for heterogeneous consumers: An expanded total ownership cost approach.' (2020) 275 *Applied Energy.*

150 Mariangela Scorrano, Romeo Danielis, and Marco Giansoldati, 2020, above

151 Hao. Xu, Zhenhong, Lin., Hewu, Wang., Shiqi, Ou., Minggao, Ouyang, 2020, above

Non-operating costs

Non-operating costs that include capital expenditure, subsidies or concessions (such as instant asset write off) and resale value at the end of the initial ownership period — reduce the initial cost price of the BEV. It is reasonable to assume that a proportion of the cost savings will be passed on when a vehicle is sold.[152]

Vehicle Purchase cost

The purchase cost includes the MSRP, taxes less purchase subsidies (national and local).[153]

Home charger and installation cost

The expense of a home charger and installation costs adds to the overall cost.[154] Electric vehicle buyers are assumed to purchase a Level 2 home charger that are added to the purchase cost.[155]

Resale value

Hao et al, sets the resale value of ICEVs around 7% of MSRP for ICEVs, and sets resale value of BEVs to zero, because battery capacity of BEVs can drop to below 70% of original capacity.[156] Parker et al, developed a resale value to account for the heterogeneity across vehicles, and given some of the BEVs have not been available for 5 years, the resale value combines depreciation data with rules of thumb.[157]

Low resale values may be a key market barrier to the widespread adoption of new BEVs.[158] As greater number of long range BEVs become available, they may hold value better than ICEVs.[159]

Depreciation

For business fleets, the highest operating cost for BEVs is depreciation and which is more pronounced for BEVs due to the greater initial purchase cost premium but offset by low running costs.[160] Vehicle TCO is highly sensitive to changing depreciation rates as it affects the resale value significantly.[161] BEVs depreciate faster than ICEVs mainly because of technological advancements e.g. battery cost reduction that lead to a decrease in the resale value of earlier variants.[162] Some studies have adopted different depreciation rates in estimating the costs of ownership for different vehicles.[163] For example, greater depreciation rates are adopted for BEVs after isolating the Tesla.[164]

Breetz et al's TCO study found vehicle depreciation is an important factor, where most TCO studies either ignore depreciation or assume constant rates across vehicle types.[165] However depreciation is the largest cost to business fleets, and TCO was highly sensitive to changing depreciation rates.[166] Additionally different depreciation rates are a major determinant of five year ownership costs.[167] For example, in the study the Corolla ICEV retained nearly 45% of its value compared to Prius retained 40% of its value and Leaf retained only 16% of its MSRP after five years. Secondary owners cannot take advantage of tax incentives and may have to replace the battery in a few years, which may cost up to $6,000. Demand for second-hand BEVs is likely depressed by rapid innovation in vehicle and battery technology.[168]

Financial incentives

Palmer et al state financial incentives must be taken into account.[169] Fiscal incentives in Norway made EVs cost competitive to ICEVs.[170]

152 Kate Palmer et al., 2018, above Breetz. Parker N, H.L., Salon,Deborah., Conway Wigginton Matthew., Williams Jeffrey., Patterson Maxx., 2021, above
153 Breetz. Parker N, H.L., Salon,Deborah., Conway Wigginton Matthew., Williams Jeffrey., Patterson Maxx., 2021, above
154 Zhe. Liu, Song, Juhyun., Kubal, Joseph., Susarla, Naresh., Knehr, Kevin., Islam Ehsan., Nelson Paul., Ahmed Shabbir., 2021, above 12
155 Breetz. Parker N, H.L., Salon,Deborah., Conway Wigginton Matthew., Williams Jeffrey., Patterson Maxx., 2021, above
156 Hao. Xu, Zhenhong, Lin., Hewu, Wang., Shiqi, Ou., Minggao, Ouyang, 2020, above
157 Breetz. Parker N, H.L., Salon,Deborah., Conway Wigginton Matthew., Williams Jeffrey., Patterson Maxx., 2021, above
158 Zhaomiao. Guo, Zhou, Yan, 'Residual value analysis of plug-in vehicles in the United States' (2019) 125 *Energy Policy*.
159 Ibid.
160 Kate Palmer et al., 2018, above
161 Ibid. Md Arif Hasan et al., 2021, above
162 Mariangela Scorrano, Romeo Danielis, and Marco Giansoldati, 2020, above
163 Md Arif Hasan et al., 2021, above
164 Zhaomiao. Guo, Zhou, Yan, 2019, above
165 Hanna L Breetza and Deborah Salon, 2018, above
166 Kate Palmer et al., 2018, above
167 ibid
168 Hanna L Breetza and Deborah Salon, 2018, above
169 Ibid.
170 P.Z. Levay, Y. Drossinos, and C. Thiel, 2017, above

Taxes

More recent European TCO studies often include more detailed country specific vehicles taxes.[171] One of the highest costs for BEVs is the fringe benefits tax under the statutory cost method.

Total cost of ownership over annual distances driven

Wu et al, calculated the TCO for various annual distances driven (about 7,500 km, 15,200 km, and 28,400 km).[172]

7.1.5 Findings of the Literature

Hasan et al. note that studies largely reach the conclusion that the TCO of BEVs without subsidies is still greater than that of conventional vehicles.[173] To decarbonise roads, government support needs to address the financial barriers of BEVs greater upfront vehicle cost and phase out the incentives once technology has reached cost parity.[174]

"Despite the variances of data sources and methodologies, a common conclusion drawn from existing TCO studies is that electric vehicles are more expensive than conventional vehicles without federal/state policy supports with a potential to reach cost parity in the near future."[175]

Parker et al states that none of the BEVs would be cost competitive without government subsidies.[176] And BEVs are not cost competitive unless their fuel savings can offset their higher purchase prices, insurance costs, taxes and fees.[177] Other policies and cost incentives play a crucial role in the adoption of new technologies.[178]

7.2 Qualitative findings from fleet manager interviews: BEVs and TCO

In the qualitative fleet manager's interviews discussed in Section 3, none of the ASX listed companies have acquired BEVs. They reported that the TCO for BEVs was more expensive due to capital costs (ASX 4) Most fleet manager interviewees, however, had no TCO data available (ASX 2,3,6,7). Local council and statutory governments interviewees were more aware of BEVs and the savings in terms of operating costs (Stat Govt 1,3. Loc Council 4).

In terms of increasing the uptake of BEVs if the TCO was closer to an ICEV, then fleet managers would be generally supportive. Although, some fleet managers said this was on the proviso that infrastructure was there to support them (ASX 4) and that a fleet vehicle needs to be 'fit for purpose' (ASX 6).

For the BEV resale value, fleet manager interviewees were concerned for varying reasons. For instance, from the cost of replacing the battery (ASX 1,3,6) to the uncertainty of the resale price (ASX 2). It was noted that BEVs have a lower residual price compared to the ICEVs (ASX4); but it was hard to verify without a second-hand market for BEVs (ASX 5).

The majority of interviewees expect fuel savings and CO_2 reduction, but further modelling is required on CO_2 reduction.

171 Ibid. Jarvis David Berkeley Nigel, Jones Andrew, 2018, above

172 Harvey Danny L.D., 2018, above Inderbitzin Alessandro Wu Geng, Bening Catharina, 2015, above

173 Md Arif Hasan et al., 2021, above

174 Ibid

175 Zhe. Liu, Song, Juhyun., Kubal, Joseph., Susarla, Naresh., Knehr, Kevin., Islam Ehsan., Nelson Paul., Ahmed Shabbir., 2021, above

176 Breetz. Parker N, H.L., Salon,Deborah., Conway Wigginton Matthew., Williams Jeffrey., Patterson Maxx., 2021, above

177 Ibid.Mariangela Scorrano, Romeo Danielis, and Marco Giansoldati, 2020, above

178 Kate Palmer et al., 2018, above

7.3 Methodology

Overview

The methodology of estimating TCO for private vehicles was covered in the literature review at section 7.1. In this study, we focus on TCO of a business fleet. In contrast to private vehicles, estimations of the TCO for business fleets should incorporate the prevailing tax environment in the country of study.

The modelling to determine TCO is as follows:

- Case Study 1. Paired Kona BEV and ICEV under normal market conditions.
  - Scenario 1 is FBT for 365 days; and
  - Scenario 2 is FBT for 25% of year.
- Case Study 2. Kona BEV: applying an FBT exemption for BEVs.
- Case Study 3. Kona BEV: applying the instant asset write-off (IAWO) and an FBT exemption.
- Case Study 4. Kona BEV: applying the Victorian subsidy of $3,000 and road user charges, alongside FBT exemption and IAWO.

Discussion of the findings follow the results of this modelling.

Case studies

For the case studies we adjust the TCO estimations to account for the taxation impact applicable to business fleet vehicles in Australia.

The estimation of the TCO for fleets is made using the following formula:

$$TCO = IC + \sum_{t=1}^{T} \frac{AOC_t - ATC_t}{(1+i)^t} + \sum_{t=1}^{T} \frac{FBT_t}{(1+i)^t} - \frac{RV_t - ITE_t}{(1+i)^t}$$

where *IC* is the initial cost of business vehicles, calculated as:

$$IC = VC - DD + DC + SD - SUB + CH$$

in which *VC* is vehicle cost, *DD* is dealer discount, *DC* is dealer delivery charge, *SD* is Stamp Duty, *SUB* is government subsidy, and *CH* is the cost of purchasing and installing home-based charging infrastructure (for a BEV).

In terms of the other parameters of the formula, annual operating cost (AOC_t) can be calculated as follows:

$$AOC_t = RC_t + INS_t + RD_t + MAINT_t + TYR_t + F\&E_t$$

where RC_t is annual car registration fee, INS_t is annual insurance cost, RD_t is annual road tax charge,[179] $MAINT_t$ is annual cost of service and repairs, TYR_t is the annual cost of tyres, and $F\&E_t$ is the annual fuel or energy cost (whichever is relevant).

Annual income tax saving (ATS_t) is a function of the annual operating cost and depreciation as follows:

$$ATS_t = 0.3 \times (AOC_t + Depr_t)$$

where annual depreciation ($Depr_t$) is calculated as 25% of the start-of-year value of the vehicle.

FBT_t represents annual Fringe Benefit Tax expense, calculated using either the statutory or the operating cost methods, RV_t is the resale value of the vehicle, and ITE_t is the applicable income tax deduction for the resold vehicle.

Data and assumptions

In this scoping study, we have undertaken basic estimates of the TCO of both BEV and ICE versions of the Hyundai Kona Elite car, respectively:

- MY21 OS.V4 Kona EV Elite
- MY21 OS.V4 Kona 2.0L MPI 2WD CVT Elite.

We used the findings from the fleet managers' interviews in terms of the average mileage of their vehicles and the typical frequency of fleet replacement to establish informed estimates for the base case scenario and viewed AfMA's fleet managers 'whole of cost calculator'. We sourced data on vehicle purchase prices, maintenance costs and projected resale values from the Hopper Motor Group, Hyundai dealers in Australia, with resale values cross-checked at the leading car research website, RedBook.com.au. The cost of registration and similar inputs were based on the assumption that the vehicle is located in the state of Victoria. For the BEV, we used a notion of 'reasonable compensation to recover electricity costs' for the home charging by employees of the vehicles equivalent to an average flat rate under the Victorian Default Offer. As mentioned earlier, the cost of acquiring and installing a home charger was based on information from AGL Energy.

Table 1. Base modelling assumptions for all vehicles

Parameter	Value
Annual kms travelled	20,000
Average car replacement frequency	3 years
Inflation rate	1.5%
Discount rate	4.25%

To establish a benchmark for further comparative analysis, the estimated the total cost of ownership of the Kona ICEV and its equivalent BEV is provided in Table 2 (Kona ICEV) and Table 3 (Kona BEV).

179 Such as Victorian road user tax of 2.5 c/km.

Table 2. Operating and non-operating cost estimations for the Hyundai Kona ICEV (AUD)

	Year 0	Year 1	Year 2	Year 3
Acquisition cost				
Vehicle price (including options)	29,610			
Stamp Duty	1,268			
Delivery charges	450			
Total acquisition cost	31,329			
Operating costs				
Registration		884	898	911
Comprehensive insurance		1,000	1,015	1,030
Roadside assistance		172	175	177
Fuel costs		1,760	2,060	2,380
Replacement tyres				1,116
Repairs		217	220	223
Servicing		319	324	329
Operating costs total		**4,352**	**4,691**	**6,166**
Non-operation cost estimates				
Depreciation		7,832	5,874	4,406
Income tax (saving)[180]		(3,655)	(3,170)	(3,172)
Total other costs		**4,177**	**2,705**	**1,234**
Annual cost	**31,329**	**8,529**	**7,396**	**7,400**
Estimated future resale value		23,100	20,900	19,400
Estimated future resale value (%)		73.73	66.71	61.92

Sources: Hopper Motors (Hyundai dealer), RedBook.com.au, RACQ, ATO

180 Income tax saving is estimated as 30% of the sum of operating costs and depreciation

Table 3. Operating and non-operating cost estimations for the Hyundai Kona BEV (AUD)

	Year 0	Year 1	Year 2	Year 3
Acquisition cost				
Vehicle price (including options)	61,000			
Rebate	0			
Stamp Duty	2,587			
Registration	0			
Dealer delivery charge estimate	450			
Total car acquisition cost	64,037			
Charging infrastructure – one-off fee	2,300			
Total car and charger cost	**66,337**			
Operating costs				
Registration		884	898	911
Comprehensive insurance		1,000	1,015	1,030
Roadside assistance		172	175	177
Electricity costs estimate – grid		818	818	818
Replacement tyres				740
Repairs		292	296	301
Servicing		180	183	185
Operating costs total		**3,346**	**3,384**	**4,162**
Non-operating cost estimates				
Depreciation		13,803	12,559	9,419
Income tax (saving)		(5,835)	(4,783)	(4,074)
Depreciation of infrastructure		0	0	0
Total non-operating costs[181]		7,968	7,776	5,344
Annual cost	66,337	11,314	11,160	9,507
Estimated future resale value		41,400	39,600	36,500
Estimated future resale value (%)		67.87	64.92	59.84

Sources: Hopper Motors (Hyundai dealer), RedBook.com.au, RACQ, ATO

A comparison of the differences of the above costs and the cost gap of the between the paired Kona ICEV (Table 2) – BEV (Table 3) is provided in Appendix A.

181 Electricity cost is based on the average Victorian Default Offer rate of 24.9c/kWh

7.4 Case Study Modelling

CASE STUDY 1

In the first case study, we consider two operational scenarios for the Hyundai Kona Elite:

- **Scenario 1** – we assume that the vehicle is garaged at home the whole-year-round. The organisation pays fringe benefits tax (FBT) based on the statutory method, with all 365 days considered as 'available for private use' (for example, due to inability to maintain necessary documentary evidence for application of the operating cost method).
- **Scenario 2** – we again assume that the vehicle is garaged at home the whole-year round. However, the organisation is able to maintain the documentary evidence needed to use the operating cost method for FBT, and we assume 25% private use, roughly in line with that suggested by the secondary data.

First, we estimate TCO for the ICEV version of the Kona, followed by equivalent estimations for the BEV version.

Estimation of TOC of Hyundai Kona Elite, ICEV version

Table 4 and Figure 1 present the vehicle ownership costs over a three-year period for Scenario 1 (statutory FBT method). The net annual costs involve five components: a) car acquisition cost; b) operating costs; c) income tax (savings); d) fringe benefits tax, calculated using the statutory method; e) resale value at the end of the ownership period. Using a discount rate of 4.25%, we estimate the present value (PV) of net annual costs, which add up to the TCO for the vehicle over the three-year period of ownership. In this 'extreme' FBT scenario, the TCO is $36,789, to which the acquisition cost contributes $31,329, operating costs contribute $13,934, and FBT contributes $16,235; TCO offsets come from the revenue from vehicle resale of $17,123, and income tax savings of $7,585.

Table 4. Total cost of ownership estimation for the Hyundai Kona ICEV (statutory FBT method, AUD)

Statutory FBT method	Year 0	Year 1	Year 2	Year 3	PV of cost type
Car acquisition cost	31,329				31,329
Operating costs		4,352	4,691	6,166	13,934
Resale value (revenue)				(19,400)	(17,123)
Income tax (saving)[182] Refer to Table 2		(3,655)	(3,170)	*(1,317)	(7,585)
FBT		5,878	5,878	5,878	16,235
Net annual cost	31,329	6,575	7,399	(8,672)	31,329
PV of net annual cost[183]	31,329	6,307	6,808	(7,654)	31,329
Total cost of ownership	**36,789**				**36,789**

A side-by-side comparison of the TCO for the paired ICEV (Table 4) – BEV (Table 6) applying the statutory method of FBT, is shown in Appendix B.

182 Income tax (saving) for Year 3 ($1,317) is based on the estimated Income tax (saving) in Table 2 for Year 3 ($3,172) less the income tax cost of $1,855 on the profit from the vehicle disposal, which is 30% of the difference between revenue from the vehicle disposal and depreciated book value of the vehicle at the end of year 3.

183 Here and following tables 4.25%-discount rate is assumed in line with ATO deeming interest rate in 2021/22 financial year.

Figure 1. Annual costs of ownership of the ICE version of the Hyundai Kona Elite under statutory FBT method

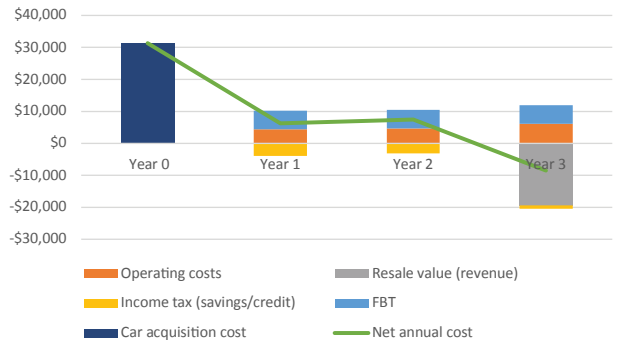


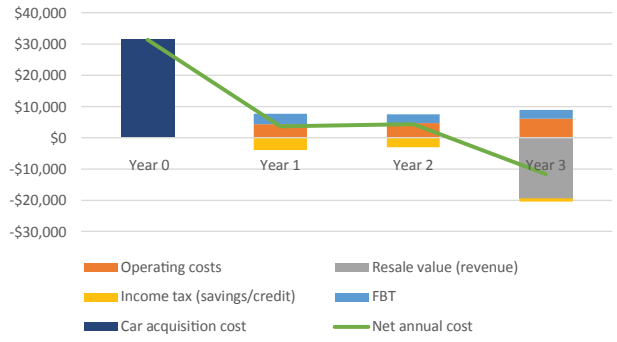
Table 5 and Figure 2 present the vehicle ownership costs over a three-year period for the same vehicle under Scenario 2 (operating cost FBT method with 25% private ownership). The results are similar to those under Scenario 1, except that the applicable FBT is much smaller ($8,017 rather than $16,235). The TCO in Scenario 2 is estimated to be $28,572 for the three-year period.

Table 5. TCO estimation for the Hyundai Kona Elite ICEV (operating cost FBT method with 25% private use, AUD)

Operating cost FBT method	Year 0	Year 1	Year 2	Year 3	PV of cost type
Car acquisition cost	31,329				31,329
Operating costs		4,352	4,691	6,166	13,934
Resale value (revenue)				(19,400)	(17,123)
Income tax (saving) Refer to Table 2		(3,655)	(3,170)	(1,317)	(7,585)
FBT		3,213	2,758	2,716	8,017
Net annual cost	31,329	3,910	4,280	(11,834)	31,329
PV of net annual cost	31,329	3,750	3,938	(10,445)	31,329
Total cost of ownership	**28,572**				**28,572**

A comparison of the TCO between the paired ICEV (Table 5)-BEV (Table 7) for FBT under the operating cost method is shown in Appendix C.

Figure 2. Annual costs of ownership of the ICE version of the Hyundai Kona Elite under operating cost FBT method (25% private use)



Estimation of TOC of Hyundai Kona Elite, BEV version

In this section, we follow a similar approach to the analysis of the previous section. However, for the BEV version we assume home charging of the vehicle, which represents an additional cost. In the base model estimations, we assume that the organisation installs home charging equipment at its expense, the expense being the subject of FBT. The purchase and installation of home charging equipment is not eligible for income tax savings, nor for depreciation deductions.

Table 6 and Figure 3 represent the estimation results for the BEV version of the Kona Elite in the operating environment with the highest value of FBT, calculated using the statutory method (Scenario 1). The largest contributors to the TCO are the costs of car acquisition and home charger installation, together with the FBT. The TCO over three years is $67,513 .

Table 6. TCO estimation for the Hyundai Kona Elite BEV (statutory FBT method, AUD)

Statutory FBT method	Year 0	Year 1	Year 2	Year 3	PV of cost type
Car acquisition cost	64,037				64,037
Home charger	2,300				2,300
Operating costs		3,346	3,384	4,162	9,997
Resale value (revenue)				(36,500)	(32,215)
Income tax (saving)* Refer to Table 3		(5,835)	(4,783)	*(1,601)	(11,411)
FBT (car)		12,016	12,016	12,016	33,188
FBT (home charger)		1,687			1,618
Net annual cost	66,337	11,214	10,617	(21,923)	
PV of net annual cost	66,337	10,757	9,769	(19,350)	
Total cost of ownership	**67,513**				**67,513**

*Note: Income tax (saving) for Year 3 ($1,601) is based on the estimated Income tax (saving) in Table 3 for Year 3 ($4,074) less the income tax cost of $2,473 on the profit from the vehicle disposal, which is 30% of the difference between revenue from the vehicle disposal and depreciated book value of the vehicle at the end of year 3.

Figure 3. Annual costs of ownership of the BEV version of the Hyundai Kona Elite under statutory FBT method

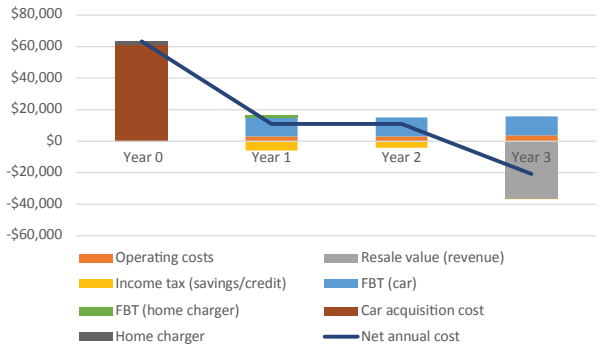


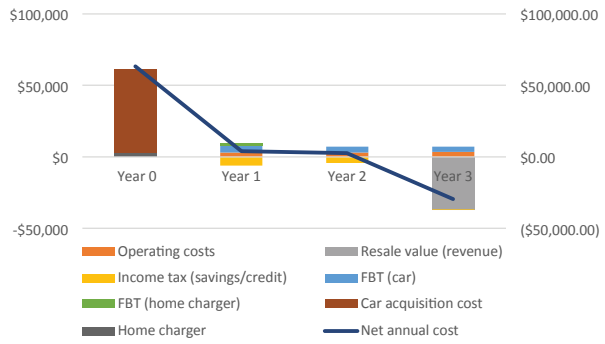
Table 7 and Figure 4 represent the estimation results for the BEV version of the Kona Elite using the operating cost FBT method with 25% private use (Scenario 2). The results are similar to those under Scenario 1, except that the applicable FBT (for car and charger) is much smaller ($13,665 rather than $34,806). The TCO is estimated to be $46,373 for the period of three years.

Table 7. TCO estimation for the Hyundai Kona Elite BEV (operating cost FBT method with 25% private use, AUD)

Operating cost FBT method	Year 0	Year 1	Year 2	Year 3	PV of cost type
Car acquisition cost	64,037				64,037
Home charger	2,300				2,300
Operating costs		3,346	3,384	4,162	9,997
Resale value (revenue)				(36,500)	(32,215)
Income tax (saving)		(5,835)	(4,783)	(1,601)	(11,411)
FBT (car)		5,211	4,234	3,572	12,047
FBT (home charger)		1,687			1,618
Net annual cost	66,337	4,409	2,835	(30,367)	
PV of net annual cost	66,337	4,229	2,608	(26,802)	
Total cost of ownership	**46,373**				**46,373**

A comparison of the TCO between the paired ICEV (Table 5)-BEV (Table 7) for FBT under the operating cost method is shown in Appendix C.

Figure 4. Annual costs of ownership of the BEV version of the Hyundai Kona Elite under operating cost FBT method (25% private use)



The TCOs for the ICE and BEV versions of the Kona under the two FBT scenarios are shown in Table 8. The initial cost premium of $35,008 (car purchase price plus home charger installation) for the BEV Kona is partially offset by its lower operating costs ($3,936 cheaper), higher resale value (by $15,092) and relative income tax savings of $3,826 as a result of higher depreciation. In contrast, the tax treatment of the higher-priced BEV Kona is evident from its significantly higher FBT.

In Scenario 1 (maximum FBT), the difference in applicable FBT for the BEV Kona (covering car and charging infrastructure) is $18,571. This large sum accounts for over half of the $30,724 difference in the TCO under this scenario. In the scenario with a lower FBT liability (operating cost method with 25% private use), the overall difference in FBT is still significant at $5,648, contributing to the $17,801 disparity in TCO relative to the ICE version of the car.

Table 8. Comparative costs of ownership for the Hyundai ICEV and BEV under different FBT scenarios and assumed operating conditions (AUD)

	Statutory FBT			OC FBT		
Cost component (PV of costs over 3 years)	**BEV**	**ICE**	**Difference**	**BEV**	**ICE**	**Difference**
Car acquisition cost	64,037	31,329	32,709	64,037	31,329	32,709
Home charger	2,300		2,300	2,300		2,300
Operating costs	9,997	13,934	(3,936)	9,997	13,934	(3,936)
Resale value (revenue)	(32,215)	(17,123)	(15,093)	(32,215)	(17,123)	(15,093)
Income tax (saving)	(11,411)	(7,585)	(3,826)	(11,411)	(7,585)	(3,826)
FBT (car)	33,188	16,235	16,953	12,047	8,017	4,030
FBT (home charger)	1,618		1,618	1,618		1,618
Total cost of ownership	**67,513**	**36,789**	**30,724**	**46,373**	**28,572**	**17,801**

CASE STUDY 2

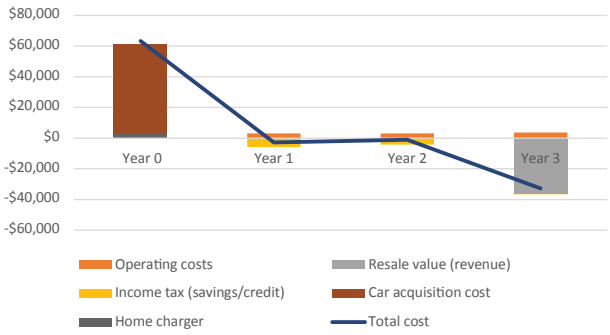
In this case study, we estimate the TCO of the Kona BEV under Recommendation 1, FBT exempt in relation to battery electric vehicles. Thus, we estimate the TCO if no FBT were to be paid, and then compare the outcome with three FBT scenarios for the ICE version of the Kona: a) FBT under the statutory method; b) FBT under the operating cost method, with 25% private use; c) no FBT.

Table 9 and Figure 5 present the estimated costs and total cost of ownership of the BEV Kona if no FBT is applied (either to car or charging infrastructure). The components of the costs are the same as reported in Case Study 1 with one exception: no FBT. The resultant TCO is $32,708.

Table 9. TCO estimation for the Hyundai Kona Elite BEV, no FBT (AUD)

No FBT	Year 0	Year 1	Year 2	Year 3	PV of cost type
Car acquisition cost	64,037				64,037
Home charger	2,300				2,300
Operating costs		3,346	3,384	4,162	9,997
Resale value (revenue)				(36,500)	(32,215)
Income tax (saving)		(5,835)	(4,783)	(1,601)	(11,411)
Net annual cost	66,337	(2,489)	(1,399)	(33,939)	
PV of net annual cost	66,337	(2,387)	(1,287)	(29,955)	
Total cost of ownership	**32,708**				**32,708**

Figure 5. Annual costs of ownership of the BEV version of the Hyundai Kona Elite with no FBT.

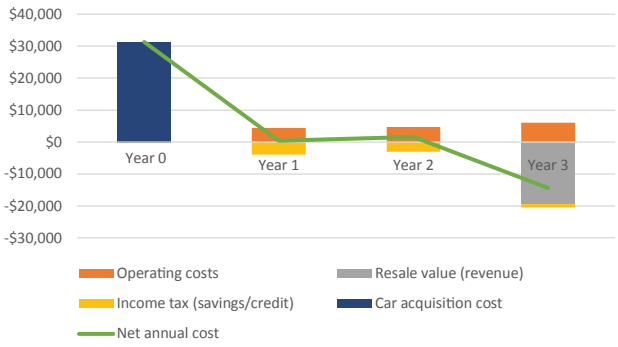


For our comparative analysis, the estimations have to include the TCO for the ICE version of the Kona if no FBT is applied. That is possible for business fleet vehicles that claim zero private use and are therefore not subject to FBT. Table 10 and Figure 7 report the relevant results. The TCO is $20,555. It differs from the modelling in Case Study 1 for the ICE vehicle only in the amount of FBT paid.

Table 10. TCO estimation for the Hyundai Kona Elite ICEV, no FBT (AUD)

No FBT	Year 0	Year 1	Year 2	Year 3	PV of cost type
Car acquisition cost	31,329				31,329
Operating costs		4,352	4,691	6,166	13,934
Resale value (revenue)				(19,400)	(17,123)
Income tax (saving)		(3,655)	(3,170)	(1,317)	(7,585)
FBT					
Net annual cost	31,329	697	1,521	(14,550)	
PV of net annual cost	31,329	668	1,400	(12,842)	
Total cost of ownership	**20,555**				**20,555**

Figure 6. Annual costs of ownership of the ICE version of the Hyundai Kona Elite with no FBT



Having derived the TCO for the BEV Kona with no FBT applied, the cost competitiveness of the proposed tax policy changes can be examined. As is evident from Table 11, the tax reform would bring the three-year TCO of the BEV Kona down to $32,708. At this cost, the BEV is now cost-competitive vis-à-vis an ICE Kona, for which business fleet owners have to pay full FBT. However, it remains around $4,000 more costly to own relative to an ICE Kona where the fleet owner is subject to the lower FBT rate based on the operating cost method with 25% private use, and for business fleet owners who do not incur FBT, the cost difference in terms of TCO remains even larger, at over $12,000. The difference in initial purchase price of over $30,000 for the BEV is not fully offset by its lower operating costs, better resale price or the lower income taxes paid.

Table 11. Comparative costs of ownership for Hyundai Kona BEV vis-à-vis ICEV Kona under various FBT regimes and operating conditions (AUD)

Cost component	BEV no FBT	ICEV statutory FBT	ICEV op cost FBT	*ICEV no FBT
Car acquisition cost	64,037	31,329	31,329	31,329
Home charger	2,300			
Operating costs	9,997	13,934	13,934	13,934
Resale value (revenue)	(32,215)	(17,123)	(17,123)	(17,123)
Income tax (saving)	(11,411)	(7,585)	(7,585)	(7,585)
FBT		16,235	8,017	
Total cost of ownership	**32,708**	**36,789**	**28,572**	**20,555**

*Note: Refers to ICEV pool vehicles and work fleet vehicles subject to no FBT

CASE STUDY 3

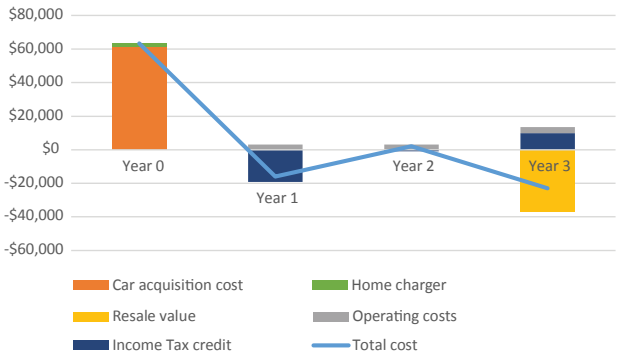
In Case Study 3, the impact of an instant asset write-off (IAWO) being applied to the BEV is tested. This tax change is modelled on the assumption of no FBT for the BEV. The aim is to estimate an incremental impact for this policy. As expected, the potential impact of the IAWO is smaller than from no FBT. Nevertheless, it drives the TCO of the BEV Kona down to $31,695). Table 12 and Figure 8 present the annual cost structure for the vehicle under this scenario.

Table 12. Total cost of ownership estimation for the Hyundai Kona Elite BEV, no FBT, instant asset write-off (AUD)

Instant asset write-off (car and charger)	Year 0	Year 1	Year 2	Year 3	PV of cost type
Car acquisition cost	64,037				64,037
Home charger	2,300				2,300
Operating costs		3,346	3,384	4,162	9,997
Resale value (revenue)				(36,500)	(32,215)
Income tax (saving)*		(20,905)	(1,015)	9,701	(12,424)
Net annual cost	66,337	(17,559)	2,369	(22,636)	
PV of net annual cost	66,337	(16,843)	2,180	(19,979)	
Total cost of ownership	**31,695**				**31,695**

*Note: Instant asset write off has been applied to the full cost of the BEV and charger. Income tax (saving) for the year 1 consists of 30% of operating costs ($1,004) and 30% of the written off value of the car and charger ($19,901). Income tax (saving) for year 2 is 30% of operating costs only. Income tax (saving) for the final year (Year 3) is estimated as 30% of the operating costs ($1,249) minus 30% of vehicle disposal revenue of $10,950.

Figure 7. Annual costs of ownership of the BEV version of the Hyundai Kona Elite in the scenario of no FBT and instant asset write-off



IAWO reduces the TCO of the BEV version of the Kona Elite to $31,695 as a result of bringing forward tax savings. As is evident from Table 13, IAWO allows the TCO gap relative to the ICE version of the car under the operating cost FBT regime to be reduced to around $3,000. However, the difference relative to the ICE version in which no FBT is incurred remains relatively large at over $11,000, which suggests that further measures might be needed to bring these cost differentials down.

Table 13. Comparative costs of ownership of Hyundai Kona BEV under instant asset write-off and no-FBT proposal and Kona ICEV under various operating conditions (AUD)

Cost component	BEV, no FBT	ICEV, statutory FBT	ICEV, op cost FBT	*ICEV, no FBT
Car acquisition cost	64,037	31,329	31,329	31,329
Home charger	2,300			
Operating costs	9,997	13,934	13,934	13,934
Resale value (revenue)	(32,215)	(17,123)	(17,123)	(17,123)
Income tax (saving)	(12,424)	(7,604)	(7,604)	(7,604)
FBT		16,235	8,017	
Total cost of ownership	**31,695**	**36,770**	**28,553**	**20,536**

*Note: Refers to ICEV pool vehicles and work fleet vehicles subject to no FBT

CASE STUDY 4

Thus far in the modelled case studies, no subsidies have been assumed. However, the Victorian state government offers a $3,000 subsidy for BEV purchase, as well as a $100 registration discount, although this is partially offset by road-user charges. In this final case study, the incremental impact of this Victorian government policy is examined. Table 14 shows the associated estimations. The three-year TCO in Victoria is reduced to $29,173 by these policies. Now, the TCO for the BEV Kona is only around $600 more than the TCO for the ICE version of the vehicle with 25% private use and applicable FBT ($28,553, see Table 13), although there is still a premium of nearly $9,000 in the TCO relative to an ICE version to which no FBT applies ($20,536, see Table 13), which may put off business fleet owners when it comes to purchasing the BEV version of the Kona for a pooled business fleet.

Table 14. Total cost of ownership estimation for the Hyundai Kona Elite BEV, no FBT, instant asset write-off with Victorian government subsidies and road-user charges

Instant asset write-off (car and charger)	Year 0	Year 1	Year 2	Year 3	PV of cost type
Car acquisition cost (includes subsidy)	61,037				61,037
Home charger	2,300				2,300
Operating costs		3,246	3,182	3,858	9,447
Resale value (revenue)				(36,500)	(32,215)
Income tax (saving)		(19,975)	(955)	9,793	(11,396)
Net annual cost	63,337	(16,729)	2,228	(22,849)	
PV of net annual cost	63,337	(16,047)	2,050	(20,167)	
Total cost of ownership	**29,173**				**29,173**

Additionally, the NSW, Victoria and South Australia State Governments and the ACT exempt stamp duty for BEVs (Appendix D) which would also be an additional indirect subsidy in reducing the purchase cost of the BEV.

7.5 Modelling Findings and Discussion

1 FINDINGS: CASE STUDY 1

Current Fringe Benefit Tax arrangements have a strong negative impact on the attractiveness of Battery Electric Vehicles for business fleets in Australia

Case Study 1 found that business fleet owners have increased fringe benefit tax up to $16,953 higher (in present value terms) than business fleet owners of ICE vehicles for an identical Hyundai Kona Elite model (see Table. 8). This tax inequality significantly and negatively affects total cost of ownership of BEVs for business fleets.

2 FINDINGS: CASE STUDY 1

Battery Electric Vehicles offer substantial savings in terms of operating costs over three-year period. However, these savings are insufficient to close a substantial price gap of new BEVs and ICEVs.

BEV Hyundai Kona Elite offers $3,936 in savings of operating costs over three years (in present value terms). However, acquisition cost of the car and charger for BEV Kona versus ICEV Kona is far higher at $35,008 (see Table 8).

3 FINDINGS: CASE STUDY 2

FBT exemption for BEVs has capacity to improve attractiveness of the BEV for some business fleet owners.

Case Study 2 found business fleet owners using the FBT statutory formula method, and exempting FBT for BEV would make them price competitive against equivalent ICEV. Total Cost of Ownership of BEV Kona will be $4,081 cheaper (in present value terms) over three-years than for FBT paying ICEV Kona (see, Table 11).

For business fleet owners who use the operating cost method and pay lower FBT (in our example we assume 25% private use), a BEV Kona will still be more expensive albeit by much smaller amount of $4,136.

4 FINDINGS: CASE STUDY 2

For the businesses with vehicles not subject to FBT, the Total Cost of Ownership difference BEV Kona and ICEV Kona is significant, albeit much smaller than the difference in acquisition costs.

Case Study 2 found $12,153 difference in the Total Cost of Ownership for BEV ($32,708) and ICEV ($20,555) Hyundai Kona. The difference is much smaller than the acquisition costs difference of $35,008 (due to lower operating cost, higher resale price and some income tax savings), but still substantial. Thus, business fleets with no private use would need other incentives to switch to the battery electric vehicles.

5 FINDINGS: CASE STUDY 3

Instant Asset Write-Off has some capacity to reduce further the Total Cost of Ownership for Battery Electric Vehicle.

Case Study 3 found the Instant Asset Write-Off would reduce Total Cost of Ownership by further $1,013 (Table 12 and 13). However, the gap between the Kona BEV with IAWO, and Kona ICEV for pool ICE vehicles that are exempt from FBT or ICE vehicles with low to zero private use, the cost gap would remain at over $11,000.

6 FINDINGS: CASE STUDY 4

State Government subsidies play a positive role in improving attractiveness of BEVs. However, the current purchase price subsidy in Victoria ($3,000), is insufficient to fully close the gap in total cost of ownership.

Case Study 4 found that the impact of current measures in Victoria is equal to $2,522 reduction on Total Cost of Ownership over three-year period (in present value terms) (see, Table 13 and 14). This measure combined with no FBT and Instant Asset Write-Off for BEVs would bring the total cost of ownership for BEV Kona close to the parity with the total cost of ownership of ICEV subject to operating cost FBT with 25% private use (with the gap of $620). However, the difference for non-FBT paying businesses (pooled and other zero private use vehicles) would remain significant at $8,637.

Appendix A

Table 2 and Table 3. TCO applied to the Kona BEV-ICEV under **normal market conditions**

Expenses	Kona ICEV	Year 1	Year 2	Year 3	Total (3 years)	Kona BEV	Year 1	Year 2	Year 3	Total (3 years)	Cost Gap
Non-operating: Acquisition cost											
Vehicle price (including options)	29,610					61,000					
Stamp Duty	1,268					0					
Delivery charges	450					2,587					
Charging infrastructure						2,300					
Total Acquisition cost	**31,328**					**66,337**					**(35,009)**
Operating costs											
Registration		884	898	911	2,693		884	898	911	2,693	
Comprehensive insurance		1,000	1,015	1,030	3,045		1,000	1,015	1,030	3,045	
Roadside assistance		172	175	177	524		172	175	177	524	
Fuel costs/electricity		1,760	2,060	2,380	6,200		818	818	818	2,453	3,746
Replacement tyres				1,116	1,116				740	740	
Repairs		217	220	223	660		292	296	301	889	
Servicing		319	324	329	971		180	183	185	548	
Operating costs total		**4,352**	**4,691**	**6,166**	**15,210**		**3,346**	**3,384**	**4,162**	**10,893**	**4,317**
Non-operating costs											
Depreciation		7,832	5,874	4,406	18,112		13,803	12,559	9,419	35,780	
Income Taxes saving		(3,655)	(3,170)	(3,172)	(9,996)		(5,835)	(4,783)	(4,074)	(14,692)	
Total costs		4,177	2,705	1,234	8,115		7,968	7,776	5,344	21,089	
Annual cost		8,529	7,396	7,400	23,325		11,314	11,160	9,507	31,981	
Estimated future resale value		**23,100**	**20,900**	**19,400**			**41,400**	**39,600**	**36,500**		
Estimated future resale value		**73.73%**	**66.71%**	**61.92%**			**67.87%**	**64.92%**	**59.84%**		

Sources: Hopper Motors (Hyundai dealer), redbook.com.au, RACQ, ATO

Appendix B

Tables 4 and 6. TCO estimations for Kona ICEV compared to Kona BEV – FBT **statutory formula method.**

Statutory Method

	Kona ICEV					Kona BEV					Cost gap
Expenses	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**PV of the cost type**	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**PV of the cost type**	**ICEV less BEV**
Non-operating: Acquisition cost											
Total Acquisition cost	31,329				31,329	64,037				64,037	32,708
Home charger						2,300				2,300	2,300
Operating costs total		**4,352**	**4,691**	**6,166**	**13,934**		**3,346**	**3,384**	**4,162**	**9,997**	**(3,937)**
Non-operating costs											
Resale value (revenue)				($19,400)	($17,123)				(36,500)	(32,215)	(15,092)
Income tax saving		(3,655)	(3,170)	(1,317)	(7,585)		(5,835)	(4,783)	(1,601)	(11,411)	
FBT (car)		5,878	5,878	5,878	16,235		12,016	12,016	12,016	33,188	16,953
FBT (home charger)							1,687			1,618	
Net annual cost	31,329	6,575	7,399	(8,672)		66,337	11,214	10,617	(21,923)		
Present Value of net annual cost	31,329	6,307	6,808	(7,654)		66,337	10,757	9,769	(19,350)		
Total cost of ownership	**36,789**				**36,789**	**67,513**				**67,513**	

PV: present value

Appendix C

Tables 5 and 7. TCO estimations for Kona ICEV compared to Kona BEV – **operating cost method.**

Operating Cost Method

	Kona ICEV					Kona BEV					Cost gap
Expenses	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**PV of the cost type**	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**PV of the cost type**	**ICEV less BEV**
Non-operating: Acquisition cost											
Total Acquisition cost	31,329				31,329	64,037				64,037	32,708
Home charger						2,300				2,300	
Operating costs total		**4,352**	**4,691**	**6,166**	**13,934**		**3,346**	**3,384**	**4,162**	**9,997**	**(3,937)**
Non-operating costs											
Resale (revenue)				(19,400)	(17,123)				(36,500)	(32,215)	(15,092)
Income Taxes saving		(3,655)	(3,170)	(1,317)	(7,585)		(5,835)	(4,783)	(1,601)	(11,411)	(3,826)
FBT (car)		3,213	2,758	2,716	8,017		5,211	4,234	3,572	12,047	4,030
FBT (home charger)							1,687			1,618	1,618
Net annual cost	31,329	3,910	4,280	(11,834)		66,337	4,409	2,835	(30,367)		
Present Value of net annual cost	31,329	3,750	3,938	(10,445)		66,337	4,229	2,608	(26,802)		
Total cost of ownership	**28,572**				**28,572**	**46,373**				**46,373**	

Appendix D

Electric Vehicle Incentives in State and Territory Governments[184]

State/ territory	Stamp duty	Rebate/Subsidy	Registration	Road tax
NSW	Nil, applies to new used EV and hydrogen fuel cells < $78,000 (inc GST)	From 1 September 2021 $3,000 rebate for BEV, hydrogen fuel cell if $68,750 (incl GST) for first 25,000 new vehicles purchased.		Applies from 1 July 2027 or when EVs make up 30% of new car sales, whichever comes first.[185]
Victoria	Electric vehicles are exempt from the "luxury vehicle" rate of stamp duty, paying flat rate of $8.40 per $200 market value. Compared to $18 rate for polluting vehicles. Only if vehicle is worth more than $68,740.	Subsidy of $3,000 for EVs under $68,740 (incl GST) for first 20,000 EVs purchased, and further 2600 EVs (April 2022).	$100 annual discount on vehicle registration.	1 July 2021 EV drivers charged a 2.5c per kilometre tax.
South Australia	NA	$3,000 rebate on the first 7,000 BEVs under $68,750 (Incl GST).	NA	July 2022 2.5c per kilometre and 2c for hybrid drivers.
Tasmania	Two-year waiver on both new and second hand electric vehicles.			
Western Australia	NA	$3,500 rebate for ZEV to value of $70,000 from 10 May 2022.	NA	Delay until 2027
Queensland	Reduced stamp duty on electric and hybrid vehicles: $2 per $100 up to $100,000 and $4 per $100 value thereafter. Compared to up to $6 per $100 for other vehicles.	After 1 July 2022, $3,000 rebate for ZEVs under $58,000 (incl GST).	NA	NA
ACT	Nil on Electric Vehicles	Loan: up to $15,000 to cover cost of buying an EV.	Two years free registration for ZEV.	
Tasmania	From 1 July 2021, 2-year stamp duty waiver for EVs.	NA		

184 Australian College of Road Safety, "Electric Vehicles in Australia: What approach is your state taking" sighed 3.10.2021, https://acrs.org.au/newsroom/electric-vehicles-in-australia-what-approach-is-your-state-taking/#:~:text=Stamp%20Duty%20%E2%80%93%20%240%20stamp%20duty%20charged%20on%20new%20and%20used,priced%20below%20%2468%2C750%20including%20GST.

185 Josh Taylor and Adam Morton, "NSW waves stamp duty on EVs and spends $171m on chargers throughout the state" https://www.nsw.gov.au/initiative/nsw-governments-electric-vehicle-strategy/road-user-charge#:~:text=The%20NSW%20Government%20is%20establishing,vehicle%20sales%2C%20whichever%20comes%20first 4/10/21

Appendix E: Estimating the impact of switching to BEVs on greenhouse gas emissions.

Using the methodology provided by Australian Government (2021) *National Greenhouse Gas Accounts*, we estimate the impact of switching each individual ICE version of Hyundai Kona Elite with BEV equivalent.

The following formula is used in our estimations:

$$E_{ip} = Q_i \times EC_i \times EF_{ijoxec}$$

Where:

- E_{ip} is the emissions of gas type (j), (carbon dioxide, methane or nitrous oxide, from petrol (p) (CO_2-e kgs).
- Q_i is the quantity of fuel type (i) (kilolitres) combusted for stationary energy purposes.
- EC_i is the energy content factor of fuel type (i) (gigajoules per kilolitre) for stationary energy purposes.
- EF_{ijp} is the emission factor for each gas type (j) (which includes the effect of an oxidation factor) for petrol (i) (kilograms CO_2-e per gigajoule).

Emission of Hyundai Kona ICE version

Input data:

According to Table 3 of the *National Greenhouse Gas Accounts ECp for petrol is 34.2 GJ/kL*.

EF_p = 71.22 kilograms CO_2-e/GJ

$$Q_p = \frac{D_v \times C_v}{100}$$

Where:

- D_v is average distance travelled assumed to be 20,000km per year and Cv is the average fuel consumption is 6.2l/100km.

The calculated annual emissions for the ICE version of Kona is **3,104.3kg** of CO_2-e.

Emission of Hyundai Kona BEV version

The estimations of emissions from BEV version of the Kona depends on the electricity generation mix. The calculation of the annual emissions per BEV vehicle can be calculated:

$$E_{ie} = D_v \times VE_i \times EF_{ij}$$

Where:

- E_{ipi} is the emissions of gas type (j), (carbon dioxide, methane or nitrous oxide, from electricity (e) (CO_2-e tonnes) in state (i).
- D_v is average distance travelled per year, assumed to be 20,000km.
- VE_i is GVG Energy Consumption value per vehicle, which is 143Wh per km for BEV Kona Elite.
- EF_{iei} is the emission factor for each gas type (j) for electricity in state (i) (grams CO_2-e per Wh) sourced from Table 46 of the *National Greenhouse Gas Accounts*.

As EF_{iei} varies by state, we report the outcome in each State/territory of Australia.

Table 15. Estimated emissions and emissions savings from BEV Kona per State/Territory

State	Estimated Emission per km	Annual Emissions (kg CO_2-e)	Potential saved emissions per year (kg CO_2-e)
NSW/ACT	122	2,431.0	673
VIC	143	2,860.0	244
QLD	132	2,631.2	473
SA	51	1,029.6	2,075
WA	99	1,973.4	1,131
Tas	23	457.6	2,647
NT	83	1,658.8	1,445
Avg	**116**	**2,316.6**	**788**

Summary

Converting ICEV to an equivalent BEV has the capacity to reduce GHG emissions in Australia. The potential saving is on average 788kg per vehicle in Australia.

The potential reductions in emissions depends on the energy mix of the specific State/Territory. The most savings would come from the states with the greenest energy mix, such as Tasmania and South Australia. The trend is that the energy mix is getting greener all across Australia.

AGL and AfMA estimate that by 2030, the forecast is for 84,539 corporate fleet vehicles. Currently 47% (34,688 fleet vehicles) are home garaged. The uptake of BEVs from ICEVs for home garaged vehicles (34,688 vehicles), will have the following projected impact: total avoided petrol cost (@$1.70/litre) savings of $38,274 ($000/yr.); compared to total cost charging at home $18,982 ($000/yr); means a total cost saving in fuel spent of $19,291 ($000/yr). The total load reduction if powered by renewables and charged off-peak is projected at 114.47 MW; avoided emissions per vehicle of 1,581 kg CO_2/yr.; and the total CO_2 emissions avoided of 54,845 t CO_2/year for home garaged vehicles.

8 Recommended FBT reforms for cars based on review of overseas jurisdictions: longer term

8.1 Approach

The methodology or approach for this section has the objective of presenting recommendations for long-term Fringe Benefits Tax (FBT) reforms. The approach includes an overview of countries with the highest uptake of business fleets. The selected overseas jurisdictions have been limited to the UK, Norway, Netherlands and Germany because of their success in the uptake of BEVs to date.

Company Car Tax (CCT) in the selected countries is an equivalent of Australia's FBT for car benefits. Employees private use of a company car is taxed in the selected countries as a 'benefit in kind.' This section examines CCT policy designs and tax treatment of the 'benefit in kind' in the selected countries and draws a comparison to Australia's FBT.

The relevant literature is discussed with the legislation or regulations and uses case studies to demonstrate the effect of company car tax policy in the selected countries and to Australia's FBT. The section concludes with recommended FBT reforms.

8.2 Overview of countries with highest uptake of business fleets

Companies play an important role in the transition of electrifying corporate fleets with 57% of electric vehicles acquired by business and 43% acquired for private use.[186] Lopez claims that "company cars are a huge driver of the new car market in Europe and after a new car is added to the corporate fleet, it will be sold off in only three to four years, as a relatively new car on the second-hand market."[187]

The Company Car Tax (CCT) policy reviewed for the following European countries show a high uptake of new electric passenger car registrations by companies in 2020.

Table 1. Highest share of EVs by business buyers in 2020[188]

Passenger vehicles	Germany %	Netherlands %	Norway %	United Kingdom %
New electric passenger car registration by company	49	73	34	67
PHEV registration of total new electric company car registrations	64	14	46	39

186 Saul Lopez, *Company cars: How European governments are subsidising pollution and climate change*, Transport & Environment, (Belguim, 2020).

187 Lopez, *Company cars: How European governments are subsidising pollution and climate change.*

188 Lopez, *Company cars: How European governments are subsidising pollution and climate change.*

The highest share of new electric passenger car registration by companies was in Netherlands (73%) followed by United Kingdom (67%) in 2020. With 52% being for PHEVs, and the highest registered in Germany (64%) and in Norway (46%).[189] It is the uptake of BEVs with zero emissions that will lower CO_2 emissions. For PHEV's company cars, the fuel consumption and tailpipe CO_2 emissions during real-world driving are higher because PHEVs tend to be charged less frequently and driven longer distances than for private users.[190]

Di Foggia finds that the "role corporate fleets play in decarbonisation deserves more attention because vehicle fleets are one of the largest sources of greenhouse gas emissions for many companies, but their electrification of their fleet remains slow."[191] The majority of electric passenger cars on European roads were concentrated in Germany, Norway, Netherlands, France, and the United Kingdom, with a combined share of 70% of Europe's electric passenger car fleet.[192]

Regulatory CO_2 emission standards accelerates the uptake of BEVs

The European Commission refers to taxation instruments as 'demand-side' measures which can be adopted as fiscal incentives to reduce CO_2 emissions. Policies can include exempting or lowering taxes on BEVs or penalising the usage of ICEVs with higher taxes.[193] These 'demand-side' measures are the "responsibility of the Member States which play a role in the European Union CO_2 emission reduction target, and regulatory CO_2 emission standards" through complementary measures to encourage the demand for, and the uptake of low carbon vehicles.[194]

European Union Regulatory CO_2 emission standards phased in 2020

On 1 January 2020, the European Commission regulatory standards came into force, adopting more stringent EU (fleet-wide) CO_2 emission targets for new passenger cars of 95g CO_2/km and 147g CO_2/km for Vans.[195] The regulation sets EU fleet-wide CO_2 emission targets applying from 2020, 2025 and 2030.[196] The European Commission requires stricter CO_2 emission performance standards from car manufacturers.[197]

Many European countries recorded a "high uptake of electric cars from January 2020 as the above tighter CO_2 emission standards for new passenger cars kicked in."[198] The European Commission reported that as the new target started applying in 2020, the average CO_2 emissions from new passenger cars registered in Europe decreased by 12% and the share of electric cars tripled.[199]

189 Bieker Georg Wappelhorst Sandra, *The uptake of plug-in hybrid electric vehicles in Europe's company car fleets: Trends and policies*, The International Council on Clean Transportation (2021), https://theicct.org/blog/staff/phev-europe-company-cars-apr2021.

190 ibid

191 Giacomo Di Foggia, "Drivers and challenges of electric vehicles integraton in corporate fleet: an empirical survey," *Research in Transportation Business and Management* (2021).

192 Wappelhorst Sandra, *The uptake of plug-in hybrid electric vehicles in Europe's company car fleets: Trends and policies.*

193 P.Z. Levay, Y. Drossinos, and C. Thiel, "The effect of fiscal incentives on market penetration of electric vehicles: a pairwise comparison of total cost of ownership."," *Energy Policy* 105 (2017).

194 Gena. Gibson, Kollamthodi, Sujith., Kirsch, Felix .,Windisch, Elisabeth., and Charlotte. Brannigan, White,Ben., Bonifazi,Eugenia., Korkeala, Outi., Skinner, Ian, *Evaluation of Regulations 443/2009 and 510/2011 on CO_2 emissions from light-duty vehicles Final Report* (European Commission, 2015). 155

195 European Commission, "Reducing CO_2 emissions from passenger cars." Available on https://ec.europa.eu/clima/policies/transport/vehicles/cars_en On17 April 2019, the European Parliament and Council adopted Regulation (EU) 2019/631 setting the new regulation to apply on 1 January 2020.

196 European Commission, "CO_2 emission performance standards for cars and vans," in *Regulation (EU) 2019/631*, ed. European Commission (European Union, 2019). https://ec.europa.eu/clima/policies/transport/vehicles/regulation_en.

197 "On the electrification path: Europe's progress towards clean transportation," European Alternative Fuels Observatory, International Council on Clean Transportation, 2021, accessed 21.9.2021.

198 Sandra Wappelhorst, *Small but mighty: The Netherlands leading role in electric vehicle adoption*, The International Council on Clean Transportation (2021), https://theicct.org/blog/staff/netherlands-ev-leader-feb2021.

199 European Commission, "CO_2 emission performance standards for cars and vans," news release, 18.10.2021, 2021,

8.3 Review of Legislation/Regulations and Case Studies

This section examines the effectiveness in the policy design of the national company car taxation policies of the UK, Netherlands, Norway and Germany in accelerating the uptake of BEV's in corporate fleets. The analysis informs the recommended proposals to the future reform of the FBT system in Australia.

The Australian Government report ("*Improving the efficiency of new light vehicles, Draft Regulation Impact Statement*) released in December 2016[200]stated that new light vehicles sold in the European Union were more efficient than those sold in Australia, because the adoption of regulated standards played an important role in improving efficiency of new light vehicles sold.[201] That without regulatory CO_2 emission standards in Australia "it is likely global vehicle manufacturers will continue to ultimately choose a range of vehicles from their global portfolio that will maximise their profit and the most cost effective in the Australian market."[202]

Moreover, the Climate Change Authority found in 2019, the variants of models in Australia are often less efficient than the same model sold in other markets. That the most efficient variants of some models available in Australia consume about 20% more fuel on average than the most efficient variant of the same make and model available.[203] Therefore, the case studies consider the impact of no regulatory emission standards may have on the cost gap between paired BEVs ICEVs.

United Kingdom: company car tax

The private use of a company car (and van) by employees is taxed as a "benefit in kind" and taxable to the employees at their marginal tax rate.[204]

The company car taxation introduced in April 2002 sets the company car tax rates based on the list price of a car (including any extras, accessories or options). The company car tax rates from 2020 – 2025 is based on CO_2 emissions ratings (g/km) of the car and its fuel type (petrol/diesel/alternative fuels) as shown in Table 2. For company car drivers and fleet operators choosing an electric car with zero emissions from 6 April 2020, there will be zero tax rate on Benefit in Kind applying in 2020-2021 income tax year, increasing to 1% in the 2021-2022 income tax and 2% in the 2022-23 income tax year.[205] The rates will be frozen until 2024-25. The zero rate applies to hybrids and PHEVs with emissions ranging from 1-50g/km and a pure electric range of over 130 miles. The tax rates increase progressively based on CO_2 emissions, with the highest tax rate of 37%.[206]

200 Department of Infrastructure and Regional Development Australian Government, Ministerial Forum on Vehicle Emissions, "Improving the efficiency of new light vehicles, Draft Regulation Impact Statement," (2016). 1-109, 10;

201 Australian Government, Improving the efficiency of new light vehicles, Draft Regulation Impact Statement, Ministerial Forum on Vehicle Emissions, (2016) 1-109, 19; Gibson and Brannigan, *Evaluation of Regulations 443/2009 and 510/2011 on CO_2 emissions from light-duty vehicles Final Report*.

202 Australian Government, "Improving the efficiency of new light vehicles, Draft Regulation Impact Statement." 1-109: 24

203 Climate Change Climate Change Authority, "Policies for reducing light vehicle emissions," (2019), https://www.climatechangeauthority.gov.au/reviews/light-vehicle-emissions-standards-australia/policies-reducing-light-vehicle-emissions. (2019)

204 Ibid

205 ACEA, *Average CO_2 emissions from new passenger cars, by EU country* (ACEA, 2021), https://www.acea.auto/figure/average-co2-emissions-from-new-passenger-cars-by-eu-country/.

206 Ibid

Table 2. UK company car tax rates

		Cars registered from 6 April 2020				
CO_2 g/km	Electric range miles	2020–21 %	2021–22 %	2022–23 %	2023–24 %	2024–25 %
0	N/A	0	1	2	2	2
1-50	>130	0	1	2	2	2
1-50	70-129	3	4	5	5	5
1-50	40-69	6	7	8	8	8
1-50	30-39	10	11	12	12	12
1-50	<30	12	13	14	14	14
51-54		13	14	15	15	15
Then 1% increase for each 5g/km band up to the below						
160-164		35	36	37	37	37
165-169		36	37	37	37	37
170+		37	37	37	37	37

* Fleet News, UK company car tax rules: 2020-2025, https://www.fleetnews.co.uk/fleet-faq/what-are-the-current-bik-bands-/3/

An additional 4% applies for diesels up to a maximum of 37%. Diesel plug-in hybrids are classified as alternative fuel vehicles and 4% diesel supplement does not apply to these vehicles. Generally, there is no VAT (20%) due on the private use of a company car and is not added to the list price. [207]

Benefit in kind taxed at employee's tax rate

The value of the "benefit in kind" is taxed at the employee's marginal tax rate, whether you are a 20%, 40%- or 45%-income taxpayer.[208]

Example of UK company car tax and benefit in kind

The "benefit in kind' for the Kona BEV is compared to its equivalent Kona ICEV in the following Table.

Table 3. Case study applies UK company car tax and benefit in kind

	Kona BEV209 $60,500			Kona ICEV210 $31,600		
Year	Tax rate	Benefit in Kind $	Marginal tax rate @ 40%	Tax rate	Benefit in Kind $	Marginal tax rate @ 40%
2021	0%	0	0	31%	9,796	3,918
2022	1%	605	242	32%	10,112	4,044
2023	2%	1,210	484	33%	10,428	4,171

The Kona electric car with zero emissions, would have a company car tax rate of 0% for the 2020-2021 income tax year, and there will be no personal tax payable by the employee. While the equivalent Kona ICEV with CO_2 emissions of 144 g/km, would have a company car tax percentage of 31% (based on CO_2 emissions) from April 2020.[211] If this is multiplied by the list price for the car of $31,600, the benefit in kind value for the 2020-2021 income tax year would be $9,796. Assuming the employee has a 40% marginal tax rate, then $3,918 would be tax payable.

207 PriceWaterhouse, *Global Automotive Tax Guide 2020* (PWC, 2020). 480

208 ACEA, *Average CO_2 emissions from new passenger cars, by EU country*. 342

209 MY21 OSV4 Kona EV Elite

210 MY21 OSV4 Kona 2.01 MPI 2WD CVT Elite. Petrol 6.2 L/100km or 143.84 g/km CO_2, company car tax is 31%

211 ACEA, *Average CO_2 emissions from new passenger cars, by EU country*. 342

A UK survey of fleet managers response to the 0% to 1% company car tax for BEVs and the related benefit in kind, being taxed at the employees marginal tax rate, has been positive, revealing that one in three UK fleet managers expect half of their company car fleet to be electric by 2025, and seven in ten fleet managers are preparing to buy an electric car within two years.[212] Tim Anderson, Head of Transport at Energy Saving Trust said: "The lower 'benefit in kind' rates will enable company car drivers to enjoy very low tax rates and accelerate the transition to clean transport."[213] The reform has been effective, and contributed to the significant increase in the uptake of BEVs in 2020. For example, in 2020, the demand for BEVs grew by 185.9% with 108,205 BEVs sold in the year. When combined with PHEVs, the majority of the registrations (68%) were for company cars.[214]

The Netherlands: company car tax

Company car tax applies in the Netherlands when a company car is available to an employee for their private use. The private use of the company car, is described as an 'addition', that must be added to the employee's wages.[215] The 'addition' only applies if the private use of the company car exceeds 500 kilometres per calendar year.[216] The general "addition" tax percentage is 22% of the list price of the car.[217]

Prior to 2021, the 'addition' tax was 8% for the first €45,000 ($71,216 AUD) of the vehicle's purchase price.[218] In January 2021, for EV owners, the 'addition' tax is reduced by 10% from 22% to 12% for the list price of the EV's to €40,000 ($63,733 AUD) and then the 'addition' tax of 22% applies for the value above €40,000. The discounted rate will increase to 16% from 2022- 24, and 17% for 2025, and will be removed from 2026 onwards[219] as shown in the following Table.

Table 4. The Netherlands 'addition tax' for private use of fully electric company cars

Addition	2021	2022	2023	2024	2025	2026
Fully electric (EV)	12%	16%	16%	16%	17%	22%
Max. from list price (Euro)	40,000	35,000	30,000	30,000	30,000	N/A

The change in the above threshold and 'addition' tax rate for BEV's led to a historic uptake of 72% share of new electric passenger car registrations, with 69% BEVs and 3% PHEVs.[220] And with the change on 1 January 2021, the 'addition tax 'decreased to 12% and threshold decreased from €45,000 ($71,216 AUD) to €40,000 ($63,733 AUD) lead to a sharp downfall in sales of 11% (3% BEVs and 8% PHEVs), showing the effect of how tax changes can have on the uptake of the BEVs.[221]

Employee contribution

Employee's contribution towards the private use of the car can be deducted from the 'addition' calculated for the private use of the car.[222]

212 "New survey reveals one In three fleet managers will electrify at least half of their UK fleet by 2025," Go Ultra Low, 2020, accessed 07/07/2021, https://www.goultralow.com/news/new-survey-reveals-one-in-three-fleet-managers-will-electrify-at-least-half-their-uk-fleet-by-2025/.

213 Ibid.

214 "350% spike in sales in December rounds off 'bumper year' for BEVs," 2021, accessed 06/01/2021, https://www.current-news.co.uk/news/350-spike-in-sales-in-december-rounds-off-bumper-year-for-bevs.

215 Tax and Customs Administration, *"Private use of company car"* (2021) https://www.belastingdienst.nl/wps/wcm/connect/bldcontenten/belastingdienst/business/payroll_taxes/you_are_not_established_in_the_netherlands_are_you_required_to_withhold_payroll_taxes/when_you_are_going_to_withhold_payroll_taxes/private_use_of_company_car1 4/10/21

216 Ibid.

217 Dutch Tax Office, 'Car and Transport' (2021) <https://www.belastingdienst.nl/wps/wcm/connect/nl/auto-en-vervoer/content/ik-ben-ondernemer-en-rij-in-een-auto-van-de-zaak-hoe-zit-het-met-privegebruik>. The "list price" is the Dutch catalogue price of the car inclusive of VAT, inclusive of accessories fitted to the car by the dealer.

218 Wappelhorst, *Small but mighty: The Netherlands leading role in electric vehicle adoption.*

219 Ibid.

220 Ibid.

221 Ibid.

222 Tax and Customs Administration The Netherlands Government, *Private use of company car* (5/10/2021 2021), www.belastingdienst.nl/wps/wcm/connect/bldcontenten/belastingdienst/business/payroll_taxes/you_are_not_established_in_the_netherlands_are_you_required_to_withhold_payroll_taxes/when_you_are_going_to_withhold_payroll_taxes/private_use_of_company_car1.

Case study example of "addition tax' applying to private use of company car

The Netherlands CCT "addition tax' is applied to the example of the Kona BEV (list price of $60,500) and equivalent Kona ICEV (list price of $31,600) in Table 5, and compared to the FBT payable in Australia, under the statutory formula method . Though the following limitation is acknowledged when comparing the following Kona BEV to its equivalent Kona ICEV.

Limitation to the case study

It is unlikely that the Kona ICEV with CO_2 emissions of 144g/km would have been available for sale in The Netherlands. The Netherlands had the lowest weighted average of CO_2 emissions for new cars sold in the EU of 82.3g CO_2/km, less than the new EU regulatory CO_2 emissions standards of 95grams/km introduced in 2020.[223] In effect, the CO_2 emissions of the Kona ICEV is 74% higher than the average CO_2 emissions of 82.3g of CO_2/km of vehicles sold in The Netherlands.[224] However the Kona ICEV with CO_2 emissions of 144g/km is a vehicle sold in Australia and is compared with the equivalent Kona BEV.

Table 5. Case study compares the Netherland's Company Car Tax to Australia's Fringe Benefits Tax (FBT) statutory formula for private use of company car

	The Netherlands Company Car Tax		Australia FBT Statutory Formula	
Details	**KONA BEV**	**KONA ICEV 144g CO_2/km**	**KONA BEV**	**KONA ICEV 144g CO_2/km**
List price	$60,500	$31,600	$60,500	$31,600
"Addition" 12% (2021) for first $60,500	$7,260			
"Addition" 22% for ICEV		$6,952		
Assume: 40% employee average rate of tax	$2,904	$2,780		
Fringe benefits tax			$13,013[225]	$6,796

Assuming an employee uses a company car for private purposes; drives more than 500km in the year; and the Kona BEV list price of $60,500 (AUD), is less than the benchmark of $63,733 (€40,000). The 'addition' to be included in the employees' wages is $7,260 which is subject to the employees' marginal tax rate. Assuming a marginal tax rate of 40%, the employee will pay $2,904 (AUD) per annum, for driving a BEV company car for private use. Under the same tax system, the employees' tax payable for a Kona ICEV, will be $2,780, which is close in price parity to the Kona BEV.

When compared to the Australian FBT policy measure (statutory formula method), the FBT payable for the employee's salary packaged arrangement for the BEV, of $13,013 is 77.6% higher than the CCT paid in the Netherlands of $2,904.

The case study supports the proposed recommendations to reform the Statutory Formula method, and address the wide cost gap between paired BEV-PHEV resulting from Australia's lack of regulatory CO_2 emission standards.

The reduced "additions tax" was effective in offering strong incentives to reduce the cost for buyers and owners of an EV. Especially true for BEVs, which are the focus of the governments "zero-emission transport strategy."[226] In 2020, sales of BEVs hit a record of 71,000 BEV, accounting for 20% of total passenger registrations, an increase of 14.5% than 2019 BEV sales, and 4% were PHEVs.[227] The financial incentive measures were effective in lowering the sales price of the BEVs.[228] For companies, the government's policies were the relevant factor in the uptake of BEVs with 74% of companies deciding in favour of BEVs in the first half of 2020 and 90% in the second half of 2020.[229]

223 Commission, "CO_2 emission performance standards for cars and vans."

224 ACEA, *Average CO_2 emissions from new passenger cars, by EU country.*

225 FBTAA Sec 9, BEV FBT payable = $66,550 (GST incl) x Statutory fraction of 20% x Type 1 Gross up factor 2.0802 * FBT 47% = $13,013; ICEV FBT payable = $34,760 (GST incl) x Statutory fraction of 20% x Type 1 Gross Up factor 2.0802 * FBT 47% = $6,796

226 Wappelhorst, *Small but mighty: The Netherlands leading role in electric vehicle adoption.*

227 Ibid.

228 Ibid.

229 Ibid.

Norway: company car tax

The private use of a company car provided by the employer is a taxable benefit. The rate of tax will vary depending on the age of the car, type of car and list price.

The rate of tax is 30% on the car's list price up to NOK 325,400 ($52,190 AUD) and 20% on any excess list price.[230] For electric cars, the basis for calculation is 60% of the listed price, reduced to 45% if the electric car is older than three years as of January 1 of the income year.[231]

Table 6. Norway – taxable benefit for the private use of company car

Age of car/kilometres or kilometres of business travel exceed the following:		Taxable value – reduce list price by	Tax rate	List price up to	Tax rate on amount > List price
1st year	NA	NA	30%	NOK325,400 ($52,190AUD)	20%
January 1 of income year: Car is > 3 years or	>40,000km	75%	30%	NOK325,400 ($52,190AUD)	NA
January 1 of income year: ICEV > 3 years	>40,000km	56.25%	30%	NOK325,400 ($52,190AUD)	NA
Electric cars	N/A	60%	30%	NOK325,400 ($52,190AUD)	NA
January 1 of income year: Electric cars >3 years	N/A	45%	30%	NOK325,400 ($52,190AUD)	

* The Norwegian Tax Administration, "Car – rates for company cars (standard rules)" (2021) https://www.skatteetaten.no/en/rates/car-rates---company-cars

Case example of private use of company car

The application of Norway's CCT tax measure on the private use of company cars is applied to the example of the Kona BEV (list price of $60,500) and equivalent Kona ICEV (list price of $31,600) in Table 7.

Limitation to the case study

It would be unlikely that the Kona ICEV (in Table 7), with average CO_2 emissions of 144g/km would have been available for sale in Norway. The country recorded the lowest weighted average of CO_2 emissions for new cars of 38.2g CO_2/km in 2020. This means the KONA ICEV CO_2 emissions of 144g/km is 73% higher than the country's average CO_2 emissions of 38.2g/km. The Kona ICEV with CO_2 emissions of 144g/km is sold in Australia and compared with its equivalent Kona BEV.

Table 7. Case study compares Norway's Company Car Tax to Australia's Fringe Benefits Tax (FBT) statutory formula for private use of company car

	Norway Company Car Tax		Australia FBT Statutory Formula	
Details	**KONA BEV**	**KONA ICEV 144g CO_2/km**	**KONA BEV**	**KONA ICEV 144g CO_2/km**
List price	$60,500	$31,600	$60,500	$31,600
VAT 25%	Exempt	$39,500		
Discount	60%	N/A		
List/reduced list price	$36,300	N/A		
Taxable benefit (30%)	$10,890	$11,850		
Assume: 40% employee average rate of tax	$4,356	$4,740		
Fringe benefits tax			$13,013	$6,796

230 The Norwegian Tax Administration, "Car – rates for company cars (standard rules)" (2021) https://www.skatteetaten.no/en/rates/car-rates---company-cars/ 4/10/2021

231 Ibid.

The calculation of the BEVs taxable benefit of $10,890 will be included in the employee's assessable income, and assuming an average tax rate of 40%, the tax payable on the benefit will be $4,356, compared to the Australian FBT payable of $13,013, which is subject to a flat rate of tax of 47%. Thus again, supporting the argument that the Australian FBT for salary packaged arrangements are a disincentive for the uptake of BEVs by employees, compared to the equivalent ICEV Kona FBT tax payable of $6,796. However, the company car tax instrument in Norway is not as generous as in the Netherlands where the BEV tax payable is $2,904 compared to $4,356 for an employee in Norway.

Norway has been described as the "case study for the effectiveness of tax incentives for EVs, where around half of the cars sold annually in Norway are EVs, thanks to generous tax and other incentives."[232] Sales of BEVs made up 54.3% of all new cars sold in 2020, up from 42.4% in 2019 and 17.1% in 2015. Further, it was the first time that BEV sales had "broken the 50% market" and had outsold the combined volume of models containing combustion engines for a year. [233] Norway is "definitely on track to reach the 2025 target" for all new passenger cars and light vans sold being zero-emission by 2025.[234]

Germany: Company Car Tax

A company car available for employee's private use constitutes a taxable 'benefit in kind' in the hands of the employee. The value of the private use is calculated based on the driver's logbook to determine the ratio between business and private use.[235] The total costs of the use will then be divided according to the ratio between business and private journeys. [236]

Alternatively, a simplified method can be used, where a monthly benefit in kind can be calculated based on 1% flat-rate of tax on the gross list price for the company.[237] Around 25% of fleet vehicles are used privately and are therefore subject to BIK.[238]

Germany's company car tax applies for employees privately using a company car, with the employee being taxed for the 'benefit in kind'. Preferential tax rates apply for BEVs and PHEVs, with the following discounts or tax reduction:

- January 2019, only half of the gross catalogue price will serve as a taxation base, (including hybrids).[239]
- January 2020 – 31 December 2021, EVs (PHEVs with less than 50g CO_2) received a 75% discount on the Benefit in Kind amount, which was from 50% in 2019.[240] Private use of BEVs and PHEVs company cars with a list price above €60,000 ($94,961 AUD), are taxed at only 0.5% of the list price of the car per month (or 6%). In comparison, ICEVs are taxed at 1% of the list price per month.[241]
- 1 January 2021 to 31 December 2024, the electrical range for PHEVs will increase to 60km; and from 1 January 2025, it will increase to 80km. [242]
- For BEVs with a gross list price of up to €60,000 ($94,961 AUD) "is taxed only at 25% of the list price per month (or 3% pa)."[243]

Impact on uptake of EVs from changes to the taxation instrument

The change in the BIK discount for EVs (BEVs and PHEVs) in 2020, benefited all German manufacturers into offering PHEVs to business fleets as much they can. It was found that this measure had a more 'notable effect' than a purchase grant.[244] This is supported in Table 1, where Germany had the highest uptake of PHEVs of 64%, which impacted significantly on the PHEVs market share in 2020 increasing to 6.9% from a 1.2% market share in 2019.

232 Holtsmark Bjart Camara Youssouf, Misch Florian, "Electric Vehicles, Tax Incentives and Emissions: Evidence from Norway," *IMF Working Paper* (2021).

233 Victoria Klesty, "Electric cars rise to record 54% market share in Norway in 2020," *Reuters* 2021, https://www.reuters.com/article/us-autos-electric-norway-idUKKBN29AoZT.

234 "Norway is electric," Ministry of Transport, 2021, accessed 4/10/2021, 2021, https://www.regjeringen.no/en/topics/transport-and-communications/veg/faktaartikler-vei-og-ts/norway-is-electric/id2677481/.

235 PriceWaterhouseCoopers, *Global Automotive Tax Guide* 2020.

236 Ibid.

237 "EV and EV Charger Incentives in Europe: A complete guide for businesses and individuals," 2021, accessed 10.8.21, 2021, https://blog.wallbox.com/ev-incentives-europe-guide/#index_0.

238 Data Force, "Transport & Environment Company Car Report," (2020). https://www.transportenvironment.org/sites/te/files/publications/2020_10_Dataforce_company_car_report.pdf. 45

239 European Automobile Manufacturers Association, ACEA Tax Guide, 2018, "Overview on Tax Incentives for Electric Vehicles in the EU." European automobile Manufacturers Association. https://www.acea.auto/fact/overview-electric-vehicles-tax-benefits-purchase-incentives-in-the-european-union/

240 Lopez, *Company cars: How European governments are subsidising pollution and climate change*; Wallbox, "EV and EV Charger Incentives in Europe: A complete guide for businesses and individuals."

241 Wappelhorst Sandra, *The uptake of plug-in hybrid electric vehicles in Europe's company car fleets: Trends and policies.*

242 European Automobile Manufacturers Association, *ACEA Tax Guide, 2021*, 103; Wallbox, 7/10/2021, 2021, https://blog.wallbox.com/ev-incentives-germany/

243 Ibid.

244 Lopez, *Company cars: How European governments are subsidising pollution and climate change.*

Case example of private use of company car

The application of the above tax instrument on private use of company cars is applied to the example of the Kona BEV (list price $60,500) and equivalent Kona ICEV (list price of $31,600) in Table 8. The value of the benefit will be taxed at 25% for the EV, as shown in Table 8.

Table 8. Case study compares Germany's Company Car Tax to Australia's Fringe Benefits Tax (FBT) statutory formula for private use of company car

	Germany Company Car Tax		Australia FBT Statutory Formula	
	KONA BEV	KONA ICEV 144g CO_2/km	KONA BEV	KONA ICEV 144g CO_2/km
List price	$60,500	$31,600	$60,500	31,600
BEV – taxed at 0.25% of list price per month. (3% pa)	$1,815			
ICEV – taxed at 1% per month or 12% pa		$3,792		
Assume: 40% employee average rate of tax	$726	$1,516		
FBT payable			$13,013	6,796

The employee will be taxed for the car 'benefit in kind' of $726 for the BEV, and $1,516 for the equivalent Kona ICEV. The tax for the car benefit is less for the Kona BEV than for the paired Kona ICEV. While in Australia, the Kona BEV bears the highest FBT of $11,830 compared to the lower FBT tax for the paired Kona ICEV of $6,159. In effect the (FBT) tax for the Kona BEV was 94% higher than under the German company car tax policy. The differences in the policies, supports the arguments that Australian FBT statutory formula method is a disincentive for the uptake of BEVs and should be reformed.

Comparative analysis of countries company car tax policy

The analysis in Table 9, shows how the different taxation systems and tax rates in jurisdictions can differ for the 'benefit in kind' and tax payable for the same paired BEVs-ICEVs. According to Hauff et al, business and private use can be differentiated, providing large tax advantages for low emission vehicles, that arise from company car taxation for the 'benefit in kind' of privately using a company car.[245] The case study shows the uptake of electric vehicles can be "strongly influenced by vehicle taxation." [246]

The CCT for the selected overseas jurisdictions are examined in Table 9, are applicable to September 2021.

Table 9. Case study: review of select overseas jurisdictions' company car tax compared to Australia's fringe benefits tax (statutory formula)

Details	Policy design	Payer and rate of tax	Tax payable		FBT for Kona BEV higher than CCT for Kona BEV %
			KONA BEV	KONA ICEV 144g CO_2/km	
List price			$60,500	$31,600	
Australia (*FBT Statutory formula*)	Statutory formula method: GST inclusive cost x statutory fraction (currently 20%) x Grossed up Type 1 factor 2.0802	Employer FBT rate: 47%	$13,013	$6,796	
UK (*Company car tax*)	CCT based on cars list price x tax rate based on cars CO_2 emissions Tax rate is progressive: BEV (0% CCT in 2020; 0% CCT in 2021) ICEV: 2021: 31% applied to Kona, 37% is the highest tax rate for CO_2 emissions exceeding 170g/km	Employee Personal rate of tax Assume 40%	Nil	$3,918	100%
The Netherlands (*Company car tax*)	CCT based on *reduced fee* of EV's list price to €40,000 ($63,733 AUD). *Reduced fee:* 2020 (8%); 2021 (12%) ICEV based on standard fee of 22%	Employee Personal rate of tax Assume 40%	$2,904	$2,780	77.6%
Norway (*Company car tax*)	CCT based on car's list price reduced by 60% x 30% tax rate	Employee Personal rate of tax Assume 40%	$4,356	$4,740	66.5%
Germany (*Company car tax*)	BEV special rate: CCT at 0.25% of the list price per month (3% pa) ICEV rate: CCT at 1% of the list price per month (12% pa)	Employee Personal rate of tax Assume 40%	$726	$1,516	94.4%

The above jurisdictions company car tax in Table 9, highlights that the Australian FBT statutory formula method is a financial disincentive and an impediment to the uptake of BEV. When compared with the BEV Kona tax payable for the above selected overseas jurisdictions, the FBT payable under the Statutory Formula method was 100% more than in the UK; 94% more than in Germany, 77.6% more than in the Netherlands, and 66.5% more than in Norway. Despite the wide cost gap between the paired BEV-ICEV of $28,900, the above jurisdictions' company car tax, was significantly less than the FBT payable under the Statutory Formula method.

245 Karin Hauff, Stefan Pfahl, and Rolf Degenkolb, "Taxation of Electric Vehicles in Europe: A Methodology for Comparison," *World Electric Vehicle Journal* (2018).

246 Ibid

Furthermore, the reforms to the CCT in the selected jurisdictions resulted in the highest uptake of BEVs in 2020 and shows that incentives can play a crucial role in the market share of EVs[247] as follows:

There are significant differences in the FBT/CCT tax design and level of tax between the selected overseas jurisdictions and Australia's statutory formula method, which need to be addressed for future FBT reform are:

1. The tax payable on the car fringe benefit at the flat rate tax of 47% is regressive and unequitable between employees. By contrast, overseas jurisdictions tax treatment for the taxable value of the 'car fringe benefit' be added to employee's wages and taxed at their marginal tax rate. This tax treatment meets the tax system criterion of fairness and equity between taxpayers in different income positions. The taxation policy should be neutral and not distort the choice or ability of taxpayers to salary package a BEV.

   To reform the FBT Statutory Formula method so the taxable value of the car benefit is added to employee's wages and then taxed at the employee's marginal tax, in place of employers paying the FBT at the flat rate of 47%, would require the repeal of non-cash car benefits under *FBTAA86* (Cth).

   Therefore, an alternative proposal is to reform the FBT tax rate based on the vehicles CO_2 emissions, (in Statutory formula and Operating cost methods) as per Recommendation 13.

2. Reduced tax rates of CCT applied to BEVs compared to the equivalent ICEV. For instance, the Netherlands applied a low tax of 12% on the list price of the BEV and Germany applied a special rate tax of 3% to accelerate the uptake of BEVs.

   The UK rates for the CCT (paying 0% CCT in 2020, and 1% CCT in 2021) had an effect of reducing the tax on a BEV to nil in 2020, compared to the higher tax of up to 37% for the ICEVs, based on the vehicles CO_2 emissions.

   For the Netherlands, Germany and the UK, the CCT rate was significantly reduced, which varied between countries: in the UK tax rate was based on the vehicles CO_2 emissions of 0% (2021), Germany cut the tax rate for BEVs to a low 3%, with both countries having the lowest CCT tax rates.

   The Netherlands applied a lower rate of tax of 12% compared to the standard rate of 22%. Though the tax rate was not low enough, resulting in the KONA BEV's 'benefit in kind' being higher than its paired KONA ICEV, because of the Case Study's limitation. That is, the policy instrument may not be effective in offsetting the low price of KONA BEV as shown in Table 9. Thus, modelling tax rates for any proposed reform is important to ensure the policy proposal is effective in influencing the uptake of BEVs.

   After considering the above, the policy measure of a special FBT statutory fraction rate for BEVs is proposed in Recommendation 14.

3. Norway's tax policy discounted the BEVs list price by 60% and then applied a tax rate of 30%.

   Under this policy, the taxable value of the 'benefit in kind' was the highest than in the other selected countries.

   This alternative of discounting the FBT base value of a BEV is proposed in Recommendation 15.

Case study limitations in the analysis of company car tax policy

The example of the Kona BEV and Kona ICEV has been applied in the case studies for review. Limitations in the case studies are acknowledged, given the Kona ICEV's average CO_2 emissions of 144g/km exceeds the weighted average emissions, for vehicles sold in the selected countries: Norway of 38.2g/km; the Netherlands of 82.3g/km; the United Kingdom of 111g/km and Germany of 113.6g/km.[248] The stringent regulatory CO_2 emission standards adopted in the EU aim to "reduce CO_2 at the source" by restricting the importation and sale of high CO_2 emitting vehicles.[249] Thus, it is unlikely that the Kona ICEV is sold in the above countries under review. However, the Kona ICEV is sold in Australia, being the equivalent for the Kona BEV, is applied in the case study.

Future Research

Modelling is one of the tools to determine the above policy options. The FBT changes should ensure the in the Total Cost of Ownership is acceptable for organisations with business fleets. Future research will be required.

247 Levay, Drossinos, and Thiel, "The effect of fiscal incentives on market penetration of electric vehicles: a pairwise comparison of total cost of ownership."."

248 ACEA, *Average CO_2 emissions from new passenger cars, by EU country*.

249 Gibson and Brannigan, *Evaluation of Regulations 443/2009 and 510/2011 on CO_2 emissions from light-duty vehicles Final Report*.

8.4 Recommendations for FBT reform for cars based on review of overseas jurisdictions:

The following recommended FBT reforms are longer term proposals that are based on the review of overseas jurisdictions company car tax policy and tax rates, that the literature reviewed found to be effective in addressing the BEV adoption.

13 FBT tax rate for car fringe benefits be based on CO_2 emissions

It is recommended that the FBT rate of 47% for car fringe benefits be lowered on a scale that aligns to vehicles with low CO_2 emissions. The aim is to incentivise low CO_2 emission vehicles.

The tax rate scale should apply until there is BEV/ICEV price parity, or when acceptable BEV targets are reached.

14 Special FBT 'statutory fraction' for fleet BEVs

It is recommended that a special statutory fraction apply to BEVs. The statutory fraction, currently 20% (*statutory formula: 20% x car base value x no of days available privately x gross-up factor*) should be a lower fraction to accelerate the uptake of BEVs.

The BEV's taxable value can then be taxed as proposed in Recommendation 13.

The reform is to apply until there is BEV/ICEV price parity, or when acceptable BEV targets are reached.

15 Discount FBT 'car base value' for BEV fleets (alternative to recommendation 14)

It is recommended that the BEV's base value factor in the Statutory Method be discounted (*statutory formula: 20% x car base value x no of days available privately x gross-up factor*). The aim is to incentivise low CO_2 emission vehicles.

The BEV's taxable value can then be taxed as proposed in Recommendation 13.

The reform is to apply until there is BEV/ICEV price parity, or when acceptable BEV targets are reached.

ACEA. *Average CO_2 Emissions from New Passenger Cars, by Eu Country.* (ACEA: 2021). https://www.acea.auto/figure/average-co2-emissions-from-new-passenger-cars-by-eu-country/.

Association, European Automobile Manufacturers. *Tax Guide.* European Automobile Manufacturers Association (European Automobile Manufacturers Association, 4/10/2021 2021). chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwww.acea.auto%2Ffiles%2FACEA_Tax_Guide_2021.pdf&clen=3809074&chunk=true.

Australian Government, Department of Infrastructure and Regional Development, Ministerial Forum on Vehicle Emissions. "Improving the Efficiency of New Light Vehicles, Draft Regulation Impact Statement." (2016): 1-109.

Authority, Climate Change. "Policies for Reducing Light Vehicle Emissions." (2019). https://www.climatechangeauthority.gov.au/reviews/light-vehicle-emissions-standards-australia/policies-reducing-light-vehicle-emissions.

9 Recommended income tax reforms for cars based on review of overseas jurisdictions: longer term

9.1 Approach

The methodology or approach for this section has the objective of presenting recommendations for long-term income tax changes. The approach includes an overview of the relevant literature that is discussed with the selected overseas policy and legislation or regulation. The overseas jurisdictions have been limited to UK, Norway, Netherlands, Germany because of their success in the uptake of BEVs to date and the polices are a realistic reference point for Australia. The section concludes with two recommended income tax changes.

9.2 The Legislation/Regulations and Literature

European Green Deal

In July 2021, the European Commission adopted a set of proposals to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels.[250] Known as the European Green Deal, it sets the goal of making Europe the first climate neutral continent by 2050.[251] In relation to transport, "a combination of measures is required to tackle rising emissions in road transport by introducing "stronger CO_2 emission standards for cars and vans" which will accelerate the transition to zero-emission mobility by requiring average emissions of new cars to come down by 55% from 2030 and 100% from 2035 compared to 2021 levels.[252]

To support these proposed standards, Member States will be required to expand charging capacity in line with zero emission car sales by 2035, with the European Commission proposing the revised "Alternative Fuels Infrastructure Regulation" in 2021.[253] The regulations require installing fuelling points at regular intervals every 60 kilometres for electric charging every 150 kilometres for hydrogen refuelling.[254] Member States need to set up national policy frameworks to establish a market for alternative fuels to address the Commission's evaluation of Member States low infrastructure and inconsistency in policy.[255] The proposal on the deployment of alternative fuels infrastructure regulation will include:

"…. availability of tax incentives to promote means of transport using alternative fuels and relevant infrastructure."[256]

Accelerating EU regulatory CO_2 emission standards

The European Parliament and Council more stringent EU (fleet-wide average emission) target for new cars of 95g CO_2/km was phased in on 1 January 2020.[257] The EU fleet-wide CO_2 emission targets for the years 2025 and 2030 for new passenger vehicles have been set from 2021 starting points:

- Cars: 15% reduction from 2025 and 37.5% reduction from 2030[258]

The proposed Alternative Fuels Infrastructure Regulation will require the above reduction of CO_2 emissions in new passenger vehicles to reduce emissions by at least 55% by 2030, compared to the previous 40% reduction target. [259] To achieve EU's Green Deal target, the uptake of zero emission vehicles and the related public infrastructure will need to "accelerate significantly" to reduce transport emissions by 90% by 2050.[260]

250 European Commission, Regulation of the European Parliament and of the Council on the deployment of alternative fuels infrastructure and repealing Directive 2014/94/EU of the European Parliament and of the Council, (European Commission, 2021).

251 "European Green Deal: Commission proposes transformation of EU economy and society to meet climate ambitions," European Commission, 2021, accessed 5/10/2021, 2021, https://ec.europa.eu/commission/presscorner/detail/en/IP_21_3541.

252 Ibid

253 Commission, Short Regulation of the European Parliament and of the Council on the deployment of alternative fuels infrastructure and repealing Directive 2014/94/EU of the European Parliament and of the Council.

254 Ibid.

255 Ibid.

256 Ibid.

257 European Commission, "Reducing CO_2 emissions from passenger cars." Available on https://ec.europa.eu/clima/policies/transport/vehicles/cars_en On17 April 2019, the European Parliament and Council adopted Regulation (EU) 2019/631 setting the new regulation to apply on 1 January 2020.

258 European Commission, "CO_2 emission performance standards for cars and vans (2020 onwards)" sighted https://ec.europa.eu/clima/policies/transport/vehicles/regulation_en on 8 December, 2020. For period 2020-24 Regulation (EU) 2019/631 confirms targets set under Regulations (EC) No 443/2009 and (EU) No 510/2011,

259 Commission, Short Regulation of the European Parliament and of the Council on the deployment of alternative fuels infrastructure and repealing Directive 2014/94/EU of the European Parliament and of the Council. 95

260 Niese Nathan Arora Aakash, Dreyer Elizabeth, Waas Albert, Zie Alex, "Fast Enough," *Boston Consulting Group* (2021), file:///Users/s341244/Downloads/bcg-why-electric-cars-cant-come-fast-enough-apr-2021-r.pdf. Commission, Short Regulation of the European Parliament and of the Council on the deployment of alternative fuels infrastructure and repealing Directive 2014/94/EU of the European Parliament and of the Council. 105

EU regulatory CO_2 emission standards phased in January 2020

Supply-side measures

EU regulatory CO_2 emission standards are 'supply-side' measures imposed on car manufacturers to meet the targeted average CO_2 emissions, and requires increasing the supply of EVs. Penalties are imposed on car manufacturers who fail to meet the standards.[261] Over the years, regulated CO_2 emission standards were found to play an important role in improving efficiency of new light vehicles sold in the EU.[262] The phasing in of the new regulatory standards target of 95g of CO_2/km in 2020, has effectively accelerated the uptake of BEVs in Norway, the Netherlands, UK, and Germany.

By contrast, the Australian Government proposed to introduce supply-side, regulatory emission standards in December 2016, which were to have been phased in from 2020 to 2025.[263] The proposed regulatory standards were abandoned, allowing lower priced, high CO_2 emitting vehicles (that are unable to be sold in their country of manufacture) to be sold in Australia. This research has shown the widening the cost gap between paired BEVs and equivalent ICEVs than would otherwise apply in countries with regulatory standards.

Without supply-side measures, car manufacturers are discouraged to supply BEVs in Australia because the cost-gap between paired BEVs-ICEVs is too wide. For example, the general manager of Volkswagen Group Australia, Michael Bartsch, said that global head office will not agree to supply EV's in Australia, because "Australia has some of the lax environmental standards in the world" and is a "third world dumping ground in terms of automotive technology."[264] Consequently, the absence of regulatory emission standards limits the supply and range of BEVs. For example, in 2020 there were 37 models of electric vehicles compared to 130 models available in the UK as shown in Appendix C. This limits the choice for business buyers who may not find the 'best fit' BEV in the appropriate vehicle segment for their fleet work fleets/ tools of trade.

Demand-side measures

The European Commission called for 'demand-side' policy measures, including taxation measures, (which were the responsibility of the Member States) to encourage buyer 'demand for cars that emit less CO_2 emissions'.[265] Demand measures were to support car manufacturers to meet 'supply side' targets. EU demand-side policy measures are imposed at the time of purchase, known as 'financial purchase incentives', which narrows the gap between the total operating costs of a BEV and that of an ICEV, such as exempting VAT and vehicle purchase tax (stamp duty) for BEVs at the time of acquisition.[266] Additional economic mechanisms reduce the price gap, such as rebates, income tax credits, purchase tax exemptions, subsidies, grants and disincentives, and can be paired with non-financial incentives, like special lane access for plug-in electric vehicles (PEVs).[267]

'Demand-side' taxes and incentives to encourage uptake of BEVs (refer to Appendix A)

The combination of 'demand-side policy measures' to encourage the uptake of BEVs varies between countries as shown in Appendix A.

Subsidies

Subsidies offered by countries can vary as shown in Appendix A.

Germany offers generous purchase grants to all buyers of BEV €9,000 ($14,134AUD) and PHEVs €6,750 ($10,601AUD) for vehicles priced up to €40,000 ($62,821AUD) which are equally funded by the government and the car manufacturer, known as an innovation premium.[268] The Netherlands BEV subsidies to business are €5,000 ($7,852 AUD) and for private buyers are €4,000 ($6,290).

The UK, offers subsidies to consumers, known as a Plug-in Car Grant to 35% of the cost of an EV, maximum of £3,000 ($5,560 AUD) with emissions less than 50g/km and cost less than £50,000 ($92,647). Business purchase subsidies available for vans up to £8,000 ($14,823 AUD). Norway offers no subsidies.

261 Regulations 443/2009 and 510/2011 on CO_2 emissions from light-duty vehicles. If the average CO_2 emissions of a manufacturer's fleet exceed its target in a given year, the manufacturer has to pay an excess emissions premium for each car registered. From 2019 on, the penalty will be €95 for each g/km of target exceedance.

262 Gena. Gibson, Kollamthodi, Sujith., Kirsch, Felix .,Windisch, Elisabeth., and Charlotte. Brannigan, White,Ben., Bonifazi,Eugenia., Korkeala, Outi., Skinner, Ian, *Evaluation of Regulations 443/2009 and 510/2011 on CO_2 emissions from light-duty vehicles Final Report* (European Commission, 2015).

263 Department of Infrastructure and Regional Development Australian Government, Ministerial Forum on Vehicle Emissions, "Improving the efficiency of new light vehicles, Draft Regulation Impact Statement," (2016). 1-109, 10. with the release of the Vehicle Fuel Efficiency Draft Regulatory Impact Statement, modelling three standards 105/119/135 grams of CO_2 per kilometre,

264 James Purtill, "Australians want to buy electric cars, but car makers say government policy blocks supply," *ABC Science* (Australia) 2021, https://www.abc.net.au/news/science/2021-04-20/australians-want-to-buy-electric-cars-what-is-stopping-us/100071550.

265 Gibson and Brannigan, *Evaluation of Regulations 443/2009 and 510/2011 on CO_2 emissions from light-duty vehicles Final Report*. 34

266 Georgina Santos and Huw Davies, "Incentives for quick penetration of electric vehicles in five European countries: Perceptions from experts and stakeholders," *Transportation Research Part A* 137 (2020).

267 Scott Hardman, "Understanding the impact of reoccurring and non financial incentives on plug-in electric vehicle adoption – A review," *Transportation research Part A* 119 (2019).

268 "European Union Tax Incentives," 2021, https://www.eafo.eu/countries/european-union/23640/incentives.

Value Added Tax

Select countries, BEVs are not subject to VAT.

Vehicle purchase tax/Stamp duty

Both Norway and the Netherlands penalise ICEVs heavily through the vehicle purchase tax (stamp duty) by applying progressive high rates of taxes based on CO_2 emissions and include other pollutants, such as NOx, to discourage the supply and sale of high CO_2 emitting ICEVs.[269]

Annual charge for registration (ownership tax or motor vehicle tax)

Depreciation or capital allowances

For depreciation (known as capital allowances), business buyers in UK are eligible for a 100% tax deduction on a car £40,000 ($74,000) which amounts to a tax relief of £7,600 (14,060). The Netherlands, offers an Environmental investment allowance (MIA) of up to 36% of amount invested in the EV providing it is on the Environmental List 2020.

Non-financial benefits

All select countries have non-financial benefits.

Role of taxation policy in the uptake of BEVs for business fleets

For the company car market, Lopez stated that the key driver of vehicle choice is vehicle taxation. That is governments should reform benefit-in-kind taxation of company cars, vehicle purchase taxes, VAT, and depreciation write-offs to "guide corporate fleets towards 100% zero-emission vehicles."[270] Hence, reforming company car taxation policies is a powerful tool to increase electric vehicle uptake.[271]

Appendix A shows how taxation policy measures can vary between countries, and the uptake of BEVs will depend on the combination of policy chosen, the design of the policy instrument, the level of taxes on CO_2 emissions, whether the rates are progressive, limited to CO_2 emissions, incentives, disincentives, and choice of non-financial incentives. For example, Norway has the highest market share of BEVs, offers no direct subsidies, but exempts vehicle purchase taxes (stamp duty) and VAT for all buyers of BEVs. The offer of grants or subsidies are often time limited or subject to conditions or capped, forcing policymakers to quantitatively limit their offers.[272]

The challenge for policy makers is to determine the combination of "demand-side" policy measures that will support "supply-side" regulatory CO_2 emissions targets. The success of these policy measures is seen through the selected countries' (UK, Norway, Netherlands, Germany) market share of BEVs as shown in the following Table.

269 P.Z. Levay, Y. Drossinos, and C. Thiel, "The effect of fiscal incentives on market penetration of electric vehicles: a pairwise comparison of total cost of ownership."," *Energy Policy* 105 (2017).

270 Saul Lopez, *Company cars: How European governments are subsidising pollution and climate change*, Transport & Environment, (Belguim, 2020).

271 Ibid.

272 Theo Lieven, "Policy measures to promote electric mobility – a global perspective," *Transport Research Part A: Politics and Practice* 82 (2015).79

Table 1. Market share of BEV and PHEV – in Norway, Netherlands, United Kingdom and Germany

	Norway			Netherlands			United Kingdom			Germany		
Details	**2020**	**2019**	**2015**	**2020**	**2019**	**2015**	**2020**	**2019**	**2015**	**2020**	**2019**	**2015**
Ave emissions	38.2g	59.9g	99g	82.3g	98.4g	101g	111g	127g	121g	113.6g	131.2g	127g
BEV &PHEV (%)	74.3	55.9	22.4	25.0	15.1	9.7	10.7	3.1	1.1	13.6	3.0	0.7
BEV (%)	54.3	42.4	17.1	21.0	13.9	0.8	6.6	1.6	0.4	6.7	1.8	0.4
PHEV (%)	20.0	13.5	5.3	4.0	1.2	8.9	4.1	1.5	0.7	6.9	1.2	0.3

For average CO2 emissions https://www.acea.be/uploads/publications/ACEA_Pocket_Guide_2017-2018.pdf

European vehicle market statistics: https://theicct.org/sites/default/files/publications/ICCT_EU_Pocketbook_2020_Web_Dec2020.pdf

V Klesty, Reuters, Norway in 2020: https://www.reuters.com/article/us-autos-electric-norway-idUKKBN29A0ZT

The most effective combination of policies is Norway with an uptake of 74% of BEVs and PHEVs as shown in the above Table. Norway has an exceptionally high VAT rate, making VAT-exempt BEVs cost competitive compared to ICEV. The exemption has a significant impact on EV sales.[273] Levay et al, state the more expensive a BEV is, the higher the absolute savings from the tax exemptions or a flat VAT and vehicle purchase tax.[274] In Norway, the majority of political parties support the notion that it should always be "economically beneficial to choose zero and low emission cars over high emission cars", and for high taxes for high emission cars and lower taxes for low and zero-emission cars. The high taxes on ICEVs financed the incentives for zero-emission cars without any loss in revenues.[275]

The Netherlands is the leading EV market in European Union, with its combined policy measures, successfully increasing the country's plug in electric vehicles (BEVs and PHEVs) of total vehicle sales from 15.1% in 2019 to 25% in 2020.

Future research is required in determining what combination of policy taxation measures, level of taxes, subsidies and non-financial measures are effective in accelerating the uptake of BEVs.

'Demand-side' taxes and incentives to encourage charging infrastructure (refer to Appendix B)

To meet the European Green Deal, Member States are required to expand charging capacity in line with zero emission car sales,[276] as well as the revised "Alternative Fuels Infrastructure Regulation".

The problem is scaling up infrastructure which requires significant investment, when numbers of EVs and charging points are both relatively low.[277]

The approaches to '*demand-side' taxes and incentives to encourage charging infrastructure* vary between countries, as shown Appendix B:

- Tax incentives for capital allowances and environmental investment allowances for EV charging equipment.
- Tax benefits for business for investing in installation of EV chargers.
- Tax exempt employee 'benefits in kind'
- EV charging infrastructure support packages
- Workplace charge points subsidy
- Home charging grant

273 Levay, Drossinos, and Thiel, "The effect of fiscal incentives on market penetration of electric vehicles: a pairwise comparison of total cost of ownership."."

274 Ibid.

275 "Norwegian EV policy," Norsk elbiforening, 2021, accessed 17.10.2021, https://elbil.no/english/norwegian-ev-policy/.

276 European Commission, Short Regulation of the European Parliament and of the Council on the deployment of alternative fuels infrastructure and repealing Directive 2014/94/EU of the European Parliament and of the Council.

277 Ibid. 41

9.3 Recommendations

It is proposed that the Australian government support be provided in the form of direct subsidies to employers, or alternatively tax rebates to fleet employees, for the installation of charging infrastructure in fleet employees home for *fleet/ tool of trade* BEVs.

The proposal for providing tax rebates to employees for the costs of installing a Level 1 or 2 charger would most likely apply to employees of salary packaged BEVs who may not be reimbursed for costs by their employer.

Modelling would be required, on the caps and value of the subsidy/rebates, number of subsidies/rebates, and further conditions.

Alternatively, financial support be provided for installation of EV charging to all buyers of BEVs, through government subsidies, but that option is outside the scope of this project. Many overseas jurisdictions offer subsidies for EV charging infrastructure, as discussed above.

16 Subsidy to fleet employers for installation of home charging infrastructure

It is recommended for government to encourage the home charging of employer-provided BEVs (*fleet/ tool of trade*), by providing financial support in the form of subsidies to employers for installation of EV charging infrastructure. Subsidies received would be taxable income to the employer.

Modelling would be required to determine subsidy caps, number of subsidies allocated, rebate dates, and conditions of payment.

17 Rebates to fleet employees for installation of home charging infrastructure

It is recommended for government to encourage the home charging of employer-provided BEVs (*fleet/ tool of trade/salary package*) by providing financial support in the form of tax rebates to fleet employees for the installation of EV charging infrastructure.

Modelling would be required to determine rebate caps, tapering of rebates to target low-to-middle income employees, rebate dates, and conditions of payment.

Appendix A

Overseas jurisdictions: taxes and incentives to encourage uptake of BEVs

	United Kingdom	Norway[278]	The Netherlands	Germany[279]
Population[280]	66 million	5.3 million	17.2 million	83.0 million
Passenger cars[281]	34,887,915	2,700,000	8,373,244	47,095,784
Target: BEVs	£290 budget dedicated to boosting use of low emission vehicles	100% BEVs by 2025	Budget €250 million ($392 AUD) to stimulate EV driving; 400,000 BEVs on roads by 2030	10 million EVs by 2030
AFFORDABILITY: Demand -side measures incl. subsidies, concessions and tax deductions				
Point of purchase EV subsidies: consumers • New EV • Used EV	Consumers can apply for: Purchases grant (Plug-in Car Grant) 35% cost of the cost of an EV max of £3,000 ($5,560 AUD) with emissions less than 50g/km and cost less than £50,000 ($92,647)[282]	No subsidies	Since July 2020 €17.2 ($27 AUD) million provided for subsidy to individuals: €10m ($16 AUD) for new electric cars and €7.2m ($11 AUD) for used cars. €4,000 ($6,290 AUD) new EV €2,000 ($3,145 AUD) used EV Conditions: for subsidy BEVs original price between €12,000 and €45,000 Purchased from car dealer Car will be held for at least 3 years	Purchase subsidies Vehicles priced up to €40,000 ($62,821AUD) BEV€9,000 ($14,134AUD) PHEV €6,750 ($10,601AUD) Vehicles priced up to €65,000 ($102.085) • BEV €7,500 ($11,779 AUD) • PHEV € 5,625 ($8,834 AUD) *The cost of these bonuses is equally shared between the government and the manufacturer.[283]
Point of purchase EV subsidies: commercial	Purchase subsidies for vans up to £8,000 ($14,823 AUD)[284]		Emission-free Commercial vehicles subsidy scheme (SEBA) 10% of list price when purchasing or leasing new EV (capped €5,000 ($7,852 AUD)	
Point of purchase VAT for business paid at the time of purchase and might be credited back to the company/business depending on the country.[285]	VAT 20% VAT exempt Under consideration: consumer VAT exemption.[286]	VAT 25% on all motor vehicles. BEV's exempt.[287]	VAT 25% companies exempt, unless private use of company car.[288]	VAT 19% applies on sale of new vehicles.[289] Paid on purchase of commercial vehicle and totally deductible.[290]

278 Wallbox, "EV and EV Charger Incentives in Europe: A Complete Guide for Businesses and Individuals," https://blog.wallbox.com/ev-incentives-europe-guide/#index_0.

279 Global Fleet, "Overview of incentives for EV charging in Europe," *Global Fleet*, 2 March 2021, https://www.globalfleet.com/en/new-energies/europe/features/overview-incentives-ev-charging-europe?t%5Bo%5D=EVBox&curl=1.

280 European Alternative Fuels Observatory, "European Union Tax Incentives."

281 Ibid

282 Bieker Georg Wappelhorst Sandra, *The uptake of plug-in hybrid electric vehicles in Europe's company car fleets: Trends and policies*, The International Council on Clean Transportation (2021), https://theicct.org/blog/staff/phev-europe-company-cars-apr2021.

283 European Alternative Fuels Observatory, "European Union Tax Incentives."

284 Ibid

285 DataForce, *Company Car Report* (2020), https://www.dataforce.de/en/e-mobility-2021/?utm_referrer=https%3A%2F%2Fwww.google.com%2F.

286 "Business buyers in pole position on Race to Zero as consumers stuck on the grid for electric vehicle adoption," SMMT, 2021, accessed 25.3.2021, 2021, https://www.smmt.co.uk/2021/03/business-buyers-in-pole-position-on-race-to-zero-as-consumers-stuck-on-the-grid-for-electric-vehicle-adoption/.

287 European Automobile Manufacturers Association, "ACEA Tax Guide," (2021).

288 International Council on Clean Transportation, *European Vehicle Market Statistics Pocketbook 2020/21* (2021) https://theicct.org/publications/european-vehicle-market-statistics-202021.

289 European Automobile Manufacturers Association.

290 Ibid.

	United Kingdom	Norway[278]	The Netherlands	Germany[279]
Point of purchase Stamp duty (vehicle purchase tax) • BEVs • PHEVs	BEV exempt Excise duty on registration (form of vehicle purchase tax) based on CO_2 emission bands: 13 bands with different rates	BEV exempt ICEV- high progressive taxes based on CO_2 emissions, NOx emissions, and vehicle weight and scrap fee.	Till 2024: BEV's exempt PHEV 50% discount 2025: BEVs pay fee of €360 ($565) PHEVs: Tax based on CO_2	No purchase tax
Annual charge Registration (ownership tax) Or Motor Vehicle Tax (MRB)	BEV is exempt[291] MRB is fixed: petrol £140, diesel £159	BEV exempt	Till 2024: BEV fully exempt PHEV: 50% disc on MRB 2025: BEV pay only 25% on MRB PHEV: pay 75% of tax 2026: BEV full MRB applies PHEV: full MRB applies ICEV > 12yrs old, another 15% on top of ownership tax.	BEV of fuel cell vehicles (registered between 2011-2030) have a 10 yr exemption from tax.[292]
Tax deductions – Capital allowance/ Investment allowance Or a writing down allowance,	Capital allowances on electric vehicles with CO_2 emissions of 0g CO_2/km in April 2021 eligible for 100%– first year capital allowances for electric vehicles used in your business [293]. "On a car costing around £40,000 ($74,000) amounts to a tax relief of £7,600 (14,060)		Environmental investment allowance (MIA) investment deduction of up to 36% of amt invested in the EV and is on the Environmental List 2020	
Excise Duty or road tax	Road tax based on CO_2 emissions and vehicle cost < £40,000 ($74,003 AUD) Exempt for BEVs[294]	Road tax 75-90% tax cut for both BEV and PHEV	Exempt[295]	Exempt[296]
Other exemptions	Congestion charge exemptions for BEVs of £11.50 ($21 AUD) per day per vehicle between 07:00 and 18:00, Monday to Friday.			
Non-financial benefits	UK government plans to give EVs special green number plates.[297] Free and discounted parking in many towns and cities,	EV owners ½ price or less on ferries, public parking, and tolls roads. Exemptions from toll road fees, ferry road fees, and parking fees, depending locality[298]	Allow BEVs in bus lanes	Free parking Reserved parking spots Bus lane use.
Banning combustion fuelled vehicles	100% zero emissions by 2035 for vehicles costing less than 40,000 ($74,003 AUD)[299]	2025	From 2030, only emission-free vehicles allowed to be registered	Germany pushes back to ban combustion fuelled vehicles by 2035.[300]

291 International Council on Clean Transportation, *European Vehicle Market Statistics Pocketbook 2020/21* (2021) https://theicct.org/publications/european-vehicle-market-statistics-202021.

292 Wappelhorst Sandra, "Germany's vehicle tax system: Small steps towards future proof incentives for low emission vehicles," *International Council on Clean Transportation* (28/09/2021 2020), https://theicct.org/blog/staff/germany-vehicle-tax-system-sept2020.

293 Wappelhorst Sandra, *The uptake of plug-in hybrid electric vehicles in Europe's company car fleets: Trends and policies.*

294 Edf energy, "Company car tax on electric cars," 2021, accessed 7/07/2021, https://www.edfenergy.com/electric-cars/tax-road-company. Currency conversion on 14/10/2021 One pound sterling = $1.85 AUD

295 Marina. Siebenhofer, Ajanovi, Amela., Hass Reinhard, "How policies affect the dissemination of electric passenger cars worldwide," *Energies* 14, no. 2093 (2021).

296 Siebenhofer, "How policies affect the dissemination of electric passenger cars worldwide."

297 "EV and EV Charger Incentives in Europe: A complete guide for businesses and individuals," 2021, accessed 10.8.21, 2021, https://blog.wallbox.com/ev-incentives-europe-guide/#index_0.

298 Wallbox, "EV and EV Charger Incentives in Europe: A complete guide for businesses and individuals."

299 Wappelhorst Sandra, *Update on government targets for phasing out new sales of internal combustions engine passenger cars*, International Council on Clean Transportation (International Council on Clean Transportation, 6/10/2021 2021), chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Ftheicct.org%2Fsites%2Fdefault%2Ffiles%2Fpublications%2Fupdate-govt-targets-ice-phaseouts-jun2021_0.pdf&clen=1621160&chunk=true.

300 "France, Germany push back against EU banning combustion cars by 2035," 2021, accessed 12.10.2021, https://europe.autonews.com/environmentemissions/france-germany-push-back-against-eu-banning-combustion-cars-2035.

Appendix B

Overseas jurisdictions: taxes and incentives to support BEV charging infrastructure

	United Kingdom	Norway[301]	The Netherlands	Germany[302]
Total number of public chargepoints	24,445	12,300	43,730	32,704
Public chargepoints per 100,000 people	36	228	248	39
Rapid chargepoints (22–100kW) per 100,000 people	6.1	36.6	2.5	1.3
Ultra-rapid chargepoints (110kW+) per 100,000 people	0.7	9.2	2.5	0.9
Target: number of chargers (EV charging infrastructure)	3,000 new rapid charge points by 2024 (£70m). Charging Infrastructure Investment Fund £400m ($741m AUD) managed and invested on a commercial basis by private sector partners who will pay for half of the fund (£200m).	10,000 public charging points and more than 1500 cars can fast charge at the same time Begun to replace petrol pumps with EV chargers Fast charging stations every 50km on main roads	200 000 by 2025 Can request a free public charging points to be installed 58,000 public and semi-public EV charging points Has the highest number of charging points for BEV per 100km[303]	1 million charging stations to support 10 million EVs by 2030. Federal Ministry of Transport and Digital Infrastructure is providing 1 billion EUR to develop 50,000 charging points (20,000 fast charging points).
Tax incentives Business can access 100% first year allowance for EV charging equipment	*Capital allowances* under Sec 45EA Capital Allowances Act, provides a 100% first-year allowance on electric charging equipment to 31 March 2023.[304]		*Environmental investment allowance* (*MIA*) *investment* – deduction up to 36% of amount invested in charging point. Refers to a 36% investment allowance (MIA) of your capital outlay from taxable profit. Refers to costs such as: purchase costs; production costs; medication costs/cost of purchasing new components and cost of environmental consultancy (only for SMEs).[305]	
Tax benefits for business Depreciation or allowance when investing in installation of EV chargers	100% first year allowance for expenditure incurred for electric charge points. Extends the current 100% first year allowance for expenditure incurred on charge point equipment. Allowance introduced on 23 November 2016 expires on 31 March 2023.[306]		Random depreciation of environmental investments (VAMIL) for investing in installation of chargers: depreciation 75% of investment costs of a charging point.	

301 Wallbox, "EV and EV Charger Incentives in Europe: A Complete Guide for Businesses and Individuals."

302 Global Fleet, "Overview of incentives for EV charging in Europe."

303 Sandra Wappelhorst, *Small but mighty: The Netherlands leading role in electric vehicle adoption*, The International Council on Clean Transportation (2021), https://theicct.org/blog/staff/netherlands-ev-leader-feb2021.

304 Ibid.

305 Global Fleet, "Overview of incentives for EV charging in Europe."

306 "EV charging infrastructure incentives in Europe 2021," EVBOX, 2021, accessed 11.10.2021, https://blog.evbox.com/ev-charging-infrastructure-incentives-eu.

	United Kingdom	Norway[301]	The Netherlands	Germany[302]
Tax deductions for employees driving company cars				Tax reductions for individuals who drive company cars and charge them at home can benefit from a tax reduction and can claim during in their annual tax returns.[307] There are separate grants for regional commercial EV charging incentives[308]
Tax exempt employee 'benefits in kind' employees charging at employers'	Workplace electric vehicle charging- benefit in kind *exemption*. i.e. employees charging their VBEV at work are not liable to pay tax on the value of the electricity used[309]			Employees *exempt* from declaring cash benefit in ITR Employers offering free charging of EVs will not be taxed until 2030
Incentives EV Charging infrastructure	Road to Zero Strategy £290m ($537m AUD) improving charging infrastructure		The electric vehicle charging infrastructure incentives are *mostly provided for private companies*. For individuals, residents in most regions can request the installation of a public charging port near their place of residence or "*work free of charge*"[310]	€130 billion package, , €2.5 billion will be spent on battery cell production and expansion on charging stations by 2030 All gas stations also offer EV charging.
Workplace chargepoint Grant	Workplace Chargepoint grant: cover 75% of purchase and installation, up to a max of £350 m ($648 AUD) per socket, up to a maximum of 40 sockets			Euro 3500 ($5,476) on purchase and installation of an EV charger (Fed and State inc); 400 Euro ($625) on purchase and installation of EV charger (local incentives)
Home charging grant EV home charging schemes grant to residents and company	Home Charge Scheme (OZEV) Individual and company buyers of eligible EVs receive grant Up to 75% capped at £350 m ($648 AUD) installation and one charger			All German residents can apply for a €900 ($1,408) incentive per charging point for purchase and installation of an EV charger[311]

Wallbox https://blog.wallbox.com/ev-and-ev-charging-incentives-in-the-uk-a-complete-guide/

307 EVBox, "EV charging infrastructure incentives in Europe 2021."

308 Ibid.

309 UK Office for low Emission Vehicles, Tax benefits for ultra low emission vehicles, (UK Office for low Emission Vehicles, 2021).

310 EVBox, "EV charging infrastructure incentives in Europe 2021."

311 Ibid.

Appendix C

Electric vehicle sales in 2020

Table 1. Electric vehicle sales 2019 and 2020

Electric vehicles	Average emissions (g/km)	No of vehicles 2019	2020
Tesla	0	2,950	3,430
Battery electric vehicles	0	1,523	1,778
Plug in Hybrid Electric Vehicles	51	1,402	1,692
Total		5,875	6,900
Total light vehicle sales			**579,003**

* National Transport Commission, Carbon dioxide emissions intensity for new Australia Light Vehicles 2020

Table 2. BEV sales by model in 2020

Battery electric vehicles available in 2020 BEVs > 50 vehicle sales	Segment	Total BEV sales
BMW i3s	Light passenger	52
Hyundai IONIQ	Small passenger	344
Hyundai KONA	SUV Small	488
Jaguar I-PACE	SUV Large	70
Mercedes-Benz Cars EQC 400 4M	SUV Medium	163
Mini Cooper	Light	94
Nissan LEAF	SUV Small	380
Renault ZOE	SUV Small	77

* National Transport Commission, Carbon dioxide emissions intensity for new Australia Light Vehicles 2020

In 2020, there were 37 models of electric vehicles (BEV, PHEV, HEV) sold, compared with 33 models in 2019 (excluding Tesla models).

In the United Kingdom, more than 130 plug-in cars and vans were available, includes superminis, large family cars, hatchbacks, SUVs, executive models and medium sized vans.[312] Volkswagen is planning over 70 new models by 2030.

312 "Electric car market statistics," Next green car, 2021, accessed 19.10.2021, https://www.nextgreencar.com/electric-cars/statistics/.

10 Future Research

Future research

The results of this fast-track project have provided the basis to address the following areas in future research:

1. **FBT changes: short-term**
2. **Income tax changes: short-term**
3. **FBT reform: long-term**
4. **Income tax: long-term**
5. **Home charging issues short and long-term**
6. **Quantitative surveys of fleet managers and fleet employees**
7. **Total Cost of Ownership: modelling**

1 FBT changes: short-term

Immediately follow up FBT short-term recommendations 1 to 5. It would include engagement with government policy decision-makers. Preparations for engagement would include modelling for short term FBT changes proposed. For example, modelling for Recommendation 2 to reduce the statutory formula flat rate of 20% from 1% to 5%.

2 Income tax changes: short-term

Immediately follow up income tax short-term recommendations 6 to 12. It would include engagement with government policy decision-makers. Preparations for engagement would include modelling for income tax changes. For example, modelling for Recommendation 6 to limit the instant asset write solely to BEVs in the car asset class.

3 FBT reform: long-term

Review of overseas jurisdictions on car benefits, identified that the FBT car benefits is impediment to the uptake of BEVs. Planned engagement with government policy decision-makers would commence.

Preparations for engagement would include modelling for FBT reforms with respect to the following:

- FBT rate for car fringe benefits be based on CO_2 emissions, Recommendation 13.
- Special statutory formula fractions for BEVs, Recommendation 14.
- Statutory formula method: discount base value of BEV, Recommendation 15.

4 Income tax: long-term

Future research is required to inform government and other stakeholders on the need for BEV and home charging support, through subsidies and rebates. Market forces alone will be unable to deliver the level of home charging that will be required to meet the emission reductions targets by 2030. The necessary research captured by income tax long-term Recommendation 16 on subsidies, and Recommendation 17 on rebates.

Future research would examine the importance and effectiveness of tax incentives, tax allowances, deductions, exemptions and subsidies for business. The fast track identified the tax policies and subsidies referred in Section 9, (shown in Appendix B).

Future modelling could include:

- caps and value of proposed home charging subsidy/ rebates, number of subsidies/rebates, and conditions.
- determine rebate caps, tapering of rebates to target low-to-middle income employees, start and end dates of rebates provided.

5 Home charging issues short- and long-term

The research on overseas jurisdictions referred to regulations on the choice of smart chargers and installation by reputable providers. The process of charging can be complex and difficult for consumers.

Future research would entail an investigation into the role of regulation on the choice of smart chargers and installers in Australia. Modelling would be required to determine charging equipment an installation rebate caps, tapering of rebates to target low-to-middle income employees, start and end dates of rebates provided, and conditions of payment.

6 Quantitative surveys of fleet managers and fleet employees

The primary objective of the (preliminary) employer and employee surveys was to investigate: 'What are employer and employee's attitudes towards, and barriers and enablers with regards to adopting home charging of fleet vehicles?'

Future research will be undertaken to administer the quantitative surveys of fleet employer and fleet employee to a wide sample of respondents. The results, for example, should help determine the necessary support for transitioning employee garaged fleet BEVs to home charging. For this transition to occur, employers and employees must be informed and confident with the installation and operation of charging system and who will incur the related home energy costs.

In terms of scope and boundaries of the surveys (both employer and employee survey), qualitative research (focus groups or interviews) with participating organisations and fleet employees could be conducted for identifying wider ranges of complex drivers and barriers as well as providing a deeper understanding of the enablers and barriers at organisational level (or employer level) and employee level respectively. This could inform a revision of the survey for our target audience of fleet business organisation (or employer) and employees.

In a next stage of this project, we recommend conducting an additional systematic literature review focused on business sustainability and/or business models for sustainability at organisational level that have been successfully applied in similar research settings. The fleet employer survey could be revised accordingly to further strengthen its theoretical basis and applications that allow for more advanced development of modelling of organisational changes. We also recommend seeking additional literature review focused on behavioural models and frameworks for fleet employees. The fleet employee survey could be revised accordingly.

In a future phase of this project, we recommend exploring the findings between the employer survey and employee survey by conducting a gap analysis. Once we identify the gaps between the employer groups and employee groups about key aspects of the survey (e.g., home charging of fleet vehicles, tax benefits, business sustainability, corporate social responsibility, etc.), we can conduct much deeper analysis how to reduce and/or fill the gaps by utilising analytic applications such as the analytic hierarchy process (AHP) or Delphi method.

7 Total Cost of Ownership: modelling

For this fast-track project, only basic modelling was conducted. The further analysis should be undertaking to measure the impact on total cost of ownership of:

1. Vehicle holding period,
2. Annual driving range,
3. Regional versus metropolitan travel.

As many inputs in the models are uncertain (such as resale value), the sensitivity analysis of the inputs is important. Future sensitivity analysis would use Monte-Carlo simulations and help to check the robustness of findings in the additional modelling.

11 Literature Review

This literature review has informed the construction of fleet manager interview questions; the fleet manager and fleet employee (preliminary) survey questions and fringe benefits tax and income tax recommendations.

State and Territory Governments' EV policies

South Australia, New South Wales, Western Australia and Tasmania, have active or budgeted policies to directly support uptake of electric vehicles. territories. By contrast, Victoria introduced an EV road user charge in 2021. More details follow below.

South Australia is investing up to $13.4 million to leverage approximately $25 million of private investment for a state-wide EV charging network. Priority areas are fast charging stations across selected sites including shopping centres and town centres in metropolitan, regional and remote areas. Rapid and ultra-rapid powered highway charging stations are expected to provide up to 100-350 kilometres of range extension in 10 minutes.[313] The SA government is currently calling for proposals from charge point operators to apply for grant funding to develop sections of the network. The project years will be 2022 to 2024.

NSW supports BEVs, PHEVs and FCEVs through stamp duty exemptions for new cars under $78,000 from September 2021; as well as cash rebates of $3,000 for 25,000 new EV buyers. NSW also considered an EV road user charge (similar to Victoria), but decided to postpone an any implementation until either 2027 or when new EVs make up 30 per cent of new vehicle purchases. There is investment in charging infrastructure on major NSW highways, and commuter corridors; and the current NSW 2021-22 budget provides for additional charging infrastructure in areas with limited off-street parking, in commuter car parks and in regional tourist areas. The NSW government budget contains targets to electrify its fleet. It claims EVs will comprise 50 per cent of new government passenger fleet vehicles by 2025-26.[314]

WA supports EVs through an electric vehicle fund of $20 million. Key areas of proposed action include the creation of an electric vehicle charging infrastructure network north from Perth to Kununurra, along the southwest coast to Esperance and east to Kalgoorlie.[315] Tasmania announced an Electric Vehicle ChargeSmart Grants program, providing $600,000 for electric vehicle fast charging stations in regional areas and at key tourism destinations.[316]

Victoria introduced a road user charge to be levied on plug-in-type electric and hydrogen vehicles (ZLEVs) from July 2021.[317] Direct EV assistance to owners of ZLEVS is a $100 registration concession as well as a $3,000 ZEV purchase subsidy for 20,000 vehicles purchased on or after 2 May 2021.[318] The state has an EV policy roadmap, and is calling for businesses and other organisations to install electric vehicle charging stations across the state, with $5 million in funding to expand Victoria's network of fast-chargers.[319]

The ACT claims to have Australia's most generous financial incentives for the purchase and registration of zero emission vehicles (ZEVs). They have a two-year waiver of registration and interest free loans (up to $15,000) for ZEVs to help cover its purchase price, which applies to acquisitions on or after 24 May 2021.[320] Queensland and Northern Territory offer reduced registration for EVs.[321] Australian states and territories do not subsidise EV home charging equipment, although indirectly some states have rebates for solar panels.[322]

313 Renewables SA, <http://www.renewablessa.sa.gov.au/> and SA Building What Matters <https://www.buildingwhatmatters.sa.gov.au/projects/south-australias-electric-vehicle-charging-network.>.

314 NSW< https://www.budget.nsw.gov.au/sites/default/files/2021-06/4.%20Review-BP1%20Budget%202021-22.pdf

315 State Electric Vehicle Strategy for Western Australia, <https://www.wa.gov.au/sites/default/files/2020-11/State_Electric_Vehicle_Strategy_for_Western_Australia_0.pdf> p.10. Hon. Amber-Jade Sanderson and Hon. Bill Johnston MLA, 'WA accelerates towards longest EV fast charging network, August 2021', Media Release. WA Government, <https://www.mediastatements.wa.gov.au/Pages/McGowan/2021/08/WA-accelerates-towards-longest-EV-fast-charging-network.aspx>.

316 Tasmanian Government , <https://www.premier.tas.gov.au/site_resources_2015/additional_releases/tasmanias_electric_vehicle_future_charging_ahead>. August 2021.

317 Victoria, <https://www.vicroads.vic.gov.au/registration/registration-fees/concessions-and-discounts/hybrid-vehicle-registration-discount https://www.energy.vic.gov.au/renewable-energy/zero-emissions-vehicles>. Victoria Road User Charge, < https://www.vicroads.vic.gov.au/registration/registration-fees/zlev-road-user-charge>. https://www.drive.com.au/news/victoria-passes-road-user-tax-for-electric-vehicle-owners-industry-reacts/.

318 Victorian Department of Environment Land Water and Planning, *Victoria's Zero Emissions Vehicle Roadmap* (2020). <https://www.energy.vic.gov.au/__data/assets/pdf_file/0014/521312/Zero-Emission-Vehicle-ZEV-Roadmap-FINAL.pdf>.

319 Hon. Dan Andrews, Premier of Victoria "Getting More Electric Vehicle Chargers Across Victoria", (2021). <https://www.premier.vic.gov.au/getting-more-electric-vehicle-chargers-across-victoria>. Media Release, 24 June 2021.

320 ACT Government, <https://www.environment.act.gov.au/cc/zero-emissions-vehicles>.

321 Queensland, <https://www.qld.gov.au/transport/projects/electricvehicles/hitting-the-road>; and NT, <https://nt.gov.au/driving/rego/fees/registration-fees#electric_vehicle>.

322 See Solar Victoria <https://www.solar.vic.gov.au/solar-panel-rebate>.

Table 1 below shows additional polices set by the states and territories in relation to electric vehicles. It is noted that the Commonwealth government has policy reports that cover electric vehicles that include the 'Future Fuels Strategy Discussion Paper' and the 'Retail Energy Competition Review: Electric Vehicles' and 'The Plan to Deliver Net Zero'.[323]

Table 1. Polices of the States and Territories: electric vehicles

JURISDICTION	ACT	NSW	VIC	QLD	SA	TAS	WA	NT
Strategy			ZEV Roadmap supported with $100m funding towards rebates, charging infrastructure, EV procurement and an electric bus trial [324]	EV strategy 2017[325]	$18.3m EV Action Plan[326] Climate Change Strategy under development by the Premier's Climate Change Council, including a focus on transport emissions[327]	EV Working Group: Developing a coordinated approach to support uptake of EVs in Tasmania[328]	EV strategy 2020[329]	EV strategy 2021[330]
Fuel efficiency standards	✗	✗	✗	✗	✗	✗	✗	
Sales targets	Intends to make 90% of all new cars sold in the ACT zero-emissions within 10 years[331] Plans to phase out all fossil fuels by 2045[332] May bring forward its bus electrification targets [333]	100% bus and government fleet targets [334] All NSW agencies – 30% new passenger vehicles to be electric or hybrid by 2023[335] Whole-of-government EV Strategy, backed by $500m in funded actions. [336] Announced strategy to increase EV sales to 53% by 2030[337]	Sales target of 50% EV sales by 2030 establishing an external panel to advise it on the necessary steps to achieving this target. [338] Funding a commercial EV manufacturing facility in Morwell, commencing operations in 2021, manufacturing around 2,400 vehicles per year[339]	✗	Desire for 50% all new vehicle sales be electric by 2030 and 100% new sales electric by 2035 [340]	Smarter Fleets Program: Supporting State and Local Government fleets to prepare for EV uptake[341] has set a 100% electric government fleet target by 2030[342]	Announced a fleet procurement target. [343]	✗

323 Dept of Industry Science Energy and Resources, "Future Fuels Strategy: Discussion Paper. Powering Choice", ed. Dept of Industry Science Energy and Resources (Canberra 2021); Australian Energy Market Commission, *2020 Retail Energy Competition Review: Electric Vehicles* (AEMC, 2020); Department of the Prime Minister and Cabinet (Australia), *The Plan to Deliver Net Zero. The Australian Way. Released 26 October 2021* (Commonwealth of Australia, 2021).

324 Electric Vehicle Council, "State of Electric Vehicles", (2021).

325 Ibid.

326 Ibid.

327 Australian Energy Market Commission, 2020, above

328 Ibid.

329 Ibid.

330 Electric Vehicle Council, "State of Electric Vehicles," 2021, above.

331 Daniel Braid, '$15,000 interest free loans available for EV buyers in ACT', *AFMA*, 19 November 2020 https://afma.org.au/15000-interest-free-loans-available-for-ev-buyers-in-act/.

332 Ibid.

333 Electric Vehicle Council, "State of Electric Vehicles," 2021, above.

334 Ibid.

335 Australian Energy Market Commission, 2020, above

336 Electric Vehicle Council, "State of Electric Vehicles," 2021, above.

337 Ibid.

338 Ibid.

339 Australian Energy Market Commission, 2020, above

340 Electric Vehicle Council, "State of Electric Vehicles," 2021, above.

341 Australian Energy Market Commission, 2020, above

342 Electric Vehicle Council, "State of Electric Vehicles," 2021, above.

343 Australian Energy Market Commission, 2020, above

JURISDICTION	ACT	NSW	VIC	QLD	SA	TAS	WA	NT
Procurement targets (government fleet purchasing)	All newly leased passenger fleet vehicles will be zero emissions vehicles from 2020–21 (where fit for purpose) [344] Government fleet procurement targets [345]	Transition to EVs where feasible; target for fully electric fleet by 2030	400 vehicles in VicFleet to be replaced by zero-emissions vehicles by 2023	Increase the number of electric vehicles in its fleet from 18 in 2018 to 288 by 2022, 25% by 2025-26	Require new government fleet vehicles to be plug-in electric models where fit-for-purpose and cost effective	100% electric vehicles by 2030	25% by 2025-26	✗
Government investment/ grants for charging infrastructure	$2.66m	$176m	$22.65m	$10m	$13.4m	$1.2m	$20m	$-
No. charges	DC 5 sites 10 charges Stand 28 sites 48 charges	DC 78 sites 181 charges Stand 426 sites 836 charges	DC 46 sites 115 charges Stand 316 sites 607 charges	DC 57 sites 84 charges Stand 234 sites 402 charges	DC 14 sites 27 charges Stand 144 sites 256 charges	DC 16 sites 18 charges Stand 63 sites 82 charges	DC 26 sites 33 charges Stand 184 sites 272 charges	DC 2 sites 2 charges Stand 14 sites 28 charges
Infrastructure deployment targets	✗	$171 million for co-funding infrastructure[346] Developing an Electric Vehicle Infrastructure and Model Availability Program[347]	Investment in ultra-rapid and fast chargers at 7 locations[348]	Expand its Electric Vehicle Super-Highway. [349] Invested $2.5 million in Tritium[350] (company specialising in DC fast charging for electric vehicles)	Focus on co-funding for charging infrastructure[351]	EV ChargeSmart Grants Program: Funding to support state wide EV charging network (fast, destination and workplace chargers) [352] Committed $600,000 for more public charging infrastructure [353]	Announced intention to develop a state charging network[354]	Announced intention to invest in charging infrastructure[355]
Building readiness requirements	Amend the Parking and Vehicle Access General Code to promote uptake of zero-emissions vehicles[356]	Regulations to require new buildings and precincts are constructed and wired to be 'EV ready' (no date given) [357]	Considering non-statutory measures to future-proof buildings while the National Construction Code is reviewed[358]	✗	✗	✗	Supports amendments to National Construction Code to include requirement new buildings are EV-ready[359]	✗

344 Ibid.

345 Electric Vehicle Council, "State of Electric Vehicles," 2021, above.

346 Ibid.

347 Australian Energy Market Commission, 2020, above

348 Ibid.

349 Electric Vehicle Council, "State of Electric Vehicles," 2021, above.

350 Australian Energy Market Commission, 2020, above

351 Electric Vehicle Council, "State of Electric Vehicles," 2021, above.

352 Australian Energy Market Commission, 2020, above

353 Electric Vehicle Council, "State of Electric Vehicles," 2021, above.

354 Australian Energy Market Commission, 2020, above

355 Electric Vehicle Council, "State of Electric Vehicles," 2021, above.

356 Electric Vehicle Council, "State of Electric Vehicles", (2020).

357 Ibid.

358 Ibid.

359 Ibid.

Selected Countries and EVs: income tax, Fringe benefits tax and other taxes

The Norway, Netherlands, Germany and the UK provide some insights into EV concession provisions in income tax, fringe benefits tax and other car taxes. These OECD jurisdictions have been selected because the efficacy of their tax concession policies as demonstrated by lower vehicle CO_2/km emissions in Table 2, below. These countries have GDPs per capita that are comparable to Australia.

Table 2. Selected Countries: population, CO_2 emissions, EVs and GDP

	Comparator countries				
	Norway	**Netherlands**	**Germany**	**UK**	**Australia**
Population	9.9	17.2	80.5	65.1	**25.5**
Ave g CO_2/km, 2019	59.9	98.4	131.2	127.7	**185.0**
EV uptake, 2020	74.8%	25.0%	13.5%	11.3%	**~**
GDP per capita in USD	$72,100	$53,900	$53,209	$44,300	**$50,400**

Norway allows costs related to the business-use of vehicles to be income tax deductible.[360] The private use of employer-provided vehicles known as *company car tax* applies. The tax basis is the 'taxable value' of the vehicle. There are specific concessions for new EVs, whereby the taxable value is reduced by 60% on price of car, but capped at 314,400 Krone (AU$50,200). In Norway, for EVs older than 3 years, the taxable value is reduced by 45%.[361] Also annual Motor Vehicle Tax and the Road User tax for EVs is lower.[362] However, the two most generous measure with the greatest impact on EFV uptake is the registration tax (Skatteetaten) exemption for EVs and the 25% VAT exemption for EVs.[363]

The Netherlands allows costs related to business-use vehicles to be income tax deductible. For an employer-provided vehicle, the value of any private use is taxed in the hands of the employee if the annual travel exceeds 500km. The tax base is the annual car registration cost, car price and level of CO_2 emissions. For example, in the year 2020, if emissions are 0g /km, then tax applies on 8% of the car price to 45,000 Euro (AU$71,500) – plus registration.[364] Dutch car registration and road taxes (called BPM) are based on CO_2 emissions, but ZEVs are exempt.[365] For charging stations set up companies and public entities, there are deductions of up to 36 percent and investment allowances of up to 74% for purchase and installation.[366]

Germany allows costs related to business-use vehicles to be income tax deductible. EVs have additional income tax concessions for depreciation and lease costs.

In Germany for an employer-provided vehicle, the value of any private use is taxed in the hands of the employee. It is called a car 'benefit in kind'. From 2019, the value of the car benefit was halved by 50% for EVs. From 2020 the tax rate was reduced for BEVs. From 2022, only EVs with minimum range of 60kms will be eligible for the concessions.[367]

As for other German car tax concessions, ZEVs are exempt from the car registration (Kraftfahrzeugsteuer) until 2030.[368] Until 2025 an environmental bonus will be paid for the acquisition of BEVs and FCEVs, which is funded by manufacturer (50%) and the federal government (50%); and up to 2030 for ZEVs for commercial deliveries.[369] Grants are now available to offset the installation costs of publicly accessible charging stations and associated grid connection costs. German residents can apply for a 900 Euro grant for the purchase and installation of a charging station for their home.[370]

The UK allows costs related to business-use vehicles to be income tax deductible. Another income tax concession is the 100% depreciation for 0g/km CO_2 emitting vehicles.[371]

360 PriceWaterhouse, *Global Automotive Tax Guide 2020* (PWC, 2020), p.322.

361 Ibid. PWC, p.323.

362 Institute for Energy Research, *Norway's Electric Vehicle Market* (2019). <https://www.instituteforenergyresearch.org/international-issues/norways-electric-vehicle-market/#:~:text=Norway's%20government%20decided%20to%20keep,parallel%20with%20the%20market%20development>.

363 Bevan Shields, 'A-ha! How one nation powered a revolution', *The Age* 2021. Cites source of QFV Norwegian Road Federation.

364 PriceWaterhouse, 2020, above ; ibid. 9, p.301. See also <https://www.belastingdienst.nl/wps/wcm/connect/bldcontenten/belastingdienst/business/payroll_taxes/you_are_not_established_in_the_netherlands_are_you_required_to_withhold_payroll_taxes/when_you_are_going_to_withhold_payroll_taxes/private_use_of_company_car1>.

365 ACEA, *The Automobile Industry Pocket Guide 2020-2021* (European Automobile Manufacturers Association, 2020).

366 Global Fleet, 'Overview of incentives for EV charging in Europe', *Global Fleet*, 2 March 2021 https://www.globalfleet.com/en/new-energies/europe/features/overview-incentives-ev-charging-europe?t%5Bo%5D=EVBox&curl=1.

367 Wallbox, *EV Incentives* (2020) <EV & EV Charger Incentives in Europe: A Complete Guide for Businesses & Individuals (wallbox.com) >.

368 PriceWaterhouse, 2020, above 9, p.159.

369 Wallbox, *The Ultimate Guide to EV Incentives in Germany* (2020). < https://blog.wallbox.com/en/the-ultimate-guide-to-ev-incentives-in-germany/>.

370 Global Fleet, "Overview of incentives for EV charging in Europe," 2021, above 15.

371 PriceWaterhouse, 2020, above 9, p.478.

In the UK for an employer-provided vehicle, the value of any private use is taxed in the hands of the employee and called an 'in kind benefit'. Businesses that buy EVs can write down 100% of the purchase price against their corporation tax liability if the vehicle emits no more than 50g/km CO_2.[372] The flow on impact for the employee, for the 2020/2021 tax year, is that private use of a company car with emissions of 0g CO_2/km are not taxed for the in-kind benefit during the same period.[373]

Other UK car tax concessions include BEVs valued at less than £40,000 are exempt from the annual road tax; and EVs and cars with less than 75g/km qualify for a discount from London's Congestion Tax. There is a phase-out of the sale of new petrol and diesel cars and vans brought forward to 2030. For companies there is a voucher-based scheme that covers up to 75 percent of purchase and installation costs for up to 40 charging stations, as well as tax benefits. For private individuals, grants cover up to 75 percent of the purchase and installation costs of a charging station.[374]

Acquisition Barriers

There are many acquisition barriers for the uptake of electric vehicles and some barriers are not just limited to Australia. The literature covers the barriers of high purchase price, lack of trust in environmental advantages, range anxiety, lack of supply, lack of awareness education and government policy inadequacy.

A. High purchase price

The upfront cost of an EV is a significant and obvious barrier. Indeed, more weight seems to be given to upfront purchase price than that total cost of ownership[375] (TCO) which can be lower. Purchase price parity with ICEVs will eventually occur due to falling battery prices and the development of optimised platforms however before that is reached financing tools or government incentives would be required to increase EVs acquisition uptake[376]. Government policies can go either way, either begin taxing internal combustion engine vehicles (ICEV) more or subsidise EVs, but the purchase price difference between the two must become smaller to increase uptake[377] notwithstanding lower TCO. Indeed, it has been found that "incentives positively influences the likelihood that private motor vehicle customers will buy an EV the next time they buy a car"[378]. Although if EV purchase intention is *solely* driven by motivation towards economic benefits arising from *incentive* policies, large-scale adoption of EVs would not endure after subsidies phase out, such as in Denmark and Georgia of US[379] and therefore until purchase price parity is achieved other policies may also needed.

B. Lack of trust in environmental advantages

With some consumers, businesses and governments, there is a lack of trust in the environmental advantages of EVs[380] stemming from whether the source of energy for recharging is "green" and the environmental impact of batteries.

Source of energy for recharging

Whilst in Norway, almost 100% of all electricity production energy comes from renewable sources, that is not *currently* the case in most other jurisdictions. The Future Fuels Strategy notes that in many regions in Australia, charging a BEV or PHEV can produce significant emissions if charged from a grid where the energy provider is generating power from fossil fuel power plants[381]. This however is not the case if EV owners recharge their vehicles off household solar power during the day. Secondly, the energy supply industry is transforming power generation to greener supplies, with fossil fuel generating facilities being progressively phased out. As such EVs environmental benefits and perceptions will change as renewable source electricity production increases.

Batteries

How batteries are made, what they are made of, and whether they are reused or recycled affect the sustainability of EVs. In particular, lithium is currently a crucial component of these batteries and lithium mining can create threats to ecosystems and impact biodiversity by contamination. Environmental benefits will be gained through technology advancement in this area too including with other alternatives such as Graphene Supercapacitors, Solid State Batteries, Hydrogen Fuel Cell, Redox Flow Batteries and Aluminium Graphite Batteries[382].

372 Ibid.

373 The ICCT, < https://theicct.org/blog/staff/phev-europe-company-cars-apr2021>.

374 Global Fleet, "Overview of incentives for EV charging in Europe," 2021, above 15.

375 Electric Vehicle Council, "Submission to the Australian Government on the Future Fuels Strategy discussion paper 2021", (2021).

376 NEF Bloomberg, "Hitting the EV Inflection Point", (Transport and Environment, 2021).

377 Lance Noel et al., 'Policy mechanisms to accelerate electric vehicle adoption: A qualitative review from the Nordic region' (2018) 94 *Renewable and Sustainable Energy Reviews*; Lance Noel et al., 'Willingess to pay for electric vehicles and vehicle to grid applications: A Nordic choice experiment' (2019) 78 *Energy Economics*.

378 Gail H Broadbent, Graciela Metternicht, and Danielle Drozdzewski, 'An Analysis of Consumer Incentives in Support of Electric Vehicle Uptake: An Australian Case Study' (2019) 10 *World Electric Vehicle Journal* 1.

379 Bai X Zhang X, Shang J., 'Is subsidized electric vehicles adoption sustainable: consumers' perceptions and motivation toward incentive policies, environmental benefits, and risks.' (2018) (192) *Journal of Cleaner Production*.

380 Mehmet Efe Biresselioglu, Melike Demirbag Kaplan, and Barbara Katharina Yilmaz, 'Electric mobility in Europe: A comprehensive review of motivators and barriers in decision making process' (2018) 109 *Transport Research Part A*.

381 Rob Langridge, "FCAI Submission to Future Fuels Strategy Discussion Paper", (2021).

382 *Is Lithium Mining Bad For the Environment? – Greenomania*

C. Range anxiety

"Range anxiety" is caused by the "lower driving range, higher recharging duration, and lack of charging infrastructure"[383] and is a major impediment to EV uptake.

Lack of (fast) charging infrastructure

Some studies have noted fast charging opportunity (public charging stations on major roads) was "the crucial element for the development and adoption of EVs"[384], even though charging at home or work may be the preferred method for many EV drivers[385] due to the lower cost and convenience. Whether a need, a peace of mind for first-time buyers or both, experts agreed that public fast charging stations have a specific target and travel pattern, with most people using them infrequently for longer trips or emergencies[386], and with a smaller demographic of users having a reliance on them for which home charging is not available due to on street parking or tenancy.

Other studies indicate that infrastructure investment would incentivise customers to buy an EV more than lowering vehicle price[387]. Particularly for private purchasers, Government incentives will not be as effective as they otherwise might be unless customer anxieties are addressed simultaneously. "It is recommended that infrastructure investments occur before purchase price parity of EVs with ICEVs is reached, as it is at that point when the EV market will likely accelerate and appeal to the masses."[388] Whilst the current public infrastructure deployment may not be large enough to be noticed by potential mainstream consumers[389] there are also public charging concerns with free parking not sustainable[390] and charge point congestion or "hogging" with untimed chargers[391].

D. Lack of supply

For Australia, more affordable EVs are simply not coming to the market. One study noted that in the UK there were 29 models cheaper than $60,000 compared to only 4 such models in Australia[392]. Both VW and Kia in particular have been noted to either not be sending their top selling mid-range BEV vehicles or would delay their entry to the Australian market[393] as they are not able to make a profitable return, which would require sales of 3,000 to 5,000 electric vehicles[394].

Profitability is important for any business and an acquisition barrier which may be less obvious is that there is an industry that is trying to protect their ICEV investments due to a lack of suitable business models and practices and production methods tailored for EVs[395].

For consumers, the role of brand perception is also relevant here given some consumers exhibit loyalty by preferring the brand they have experience with[396]. Therefore, if their preferred brand is not supplying EVs they will not be willing to acquire one.

E. Lack of awareness education

The progress of EV uptake is also being limited by a lack of sustained promotion and awareness-raising around EVs[397]. Providing relevant up-to-date information positively affects buyer attitudes[398] and advertising EV's environmental benefits will attract promotion-focused adopters[399]. Education of businesses and fleet management companies to explain the benefits of EVs is also crucial[400]. Awareness of the TCO of a vehicle rather than just the purchase price will also break down barriers particularly if accessible financing arrangements are available. OEMs and policymakers may also want to better advertise the potential quickness of DC charging[401]. One paper

383 Peynan Ashkrof, Gonçalo Correia Homem de Almeida, and Bart Van Arem, 'Analysis of the effect of charging needs on battery electric vehicle drivers' route choice behaviour: A case study in the Netherlands' (2020) 78 *Transportation Research Part D* 102206.

384 Ibid.

385 Ibid.

386 Lance Noel et al., 2019, above

387 Gail H Broadbent, Graciela Metternicht, and Danielle Drozdzewski, 2019, above

388 Ibid.

389 Patricia Lavieri and Carmen Bas Domenech, "Electric Vehicle Uptake and Charging A Consumer-focused review", (Australia: Energy Networks Australia, 2021).

390 Gerardo Zarazua de Rubens et al., 'The market case for electric mobility: Investigating electric vehicle business models for mass adoption' (2020) 194 *Energy* 1.

391 Patricia Lavieri and Carmen Bas Domenech, "Electric Vehicle Uptake and Charging A Consumer-focused review," 2021.

392 Electric Vehicle Council, "Submission to the Australian Government on the Future Fuels Strategy discussion paper, 2021.

393 Ibid.

394 Prafula Pearce, *Overcoming the challenges and barriers to purchasing low-emission vehicles*, vol. 24 (Tax Institute, 2020).

395 Mehmet Efe Biresselioglu, Melike Demirbag Kaplan, and Barbara Katharina Yilmaz, 2018.

396 Zoe Long et al., 'What does Tesla mean to car buyers? Exploring the role of automotive brand in perceptions of battery electric vehicles' (2019) 129 *Transportation Research Part A* 185.

397 Eoin O'Neill et al., 'Barriers to electric vehicle uptake in Ireland: Perspective of car-dealers and policy-makers' (2019) *Case Studies on Transport Policy* 118.

398 Gail H Broadbent, Graciela Metternicht, and Danielle Drozdzewski, 2019.

399 Bai X Zhang X, Shang J., 2018.

400 Rob Langridge, "FCAI Submission to: Future Fuels Strategy discussion paper," 2021.

401 Lance Noel et al., 2018.

suggest that education is the real issue, with "mainstream consumers underestimate vehicle range and overestimate need for public charging ("78% of Victorian households could charge only at home.")[402]. As consumers become more familiar with and educated about EVs and get accustomed to charging practices[403] the less they perceive public charging infrastructure and EV range as a purchase barrier"[404].

F. Government policy inadequacy

Lack of regulatory CO_2 emission standards and federal government long term policy on the uptake of EV's, creates uncertainty for the demand for EVs for car manufacturers.[405] Car manufacturers are instead prioritising supply of low and zero emission products to markets where governments have implemented clear policy direction, creating an environment that encourage consumers and businesses to want to purchase these products.[406] Further, there is a need to supply markets when European governments plan to phase out ICEV sales completely. There are new passenger vehicle CO_2 emissions targets and compliance requirements for manufacturers with considerable penalties and fines to the manufacturer should targets not be met.[407]

Fleet EV uptake barriers

Government and business fleets make up around 50% of annual new vehicle sales in Australia[408] and Europe[409].

Fleet electrification commitments have environmental, economic, health and reputational benefits for government and businesses, demonstrate national appetite for electric vehicles to carmakers, support growth of a second-hand market for electric cars and can provide necessary motivation for the increased provision of charging infrastructure.[410] Further, due to their relatively low operating costs and higher annual mileage than privately used vehicles[411], electric vehicles are currently feasible for government and business fleets.[412] General barriers to the uptake of EVs as fleet vehicles are as follows:

A. Financial concerns

- Depreciation patterns assumed do not match the buyers' perspective, due to too little experience with battery life and durability[413]
- Second hand market prices for BEVs[414]
- A misalignment related to the expected investment payback period has also been observed [415]
- Comparatively high costs (particularly for smaller organisations with a large car pool) is a main drawback [416]
- Lack of purchase subsidies and tax incentives[417].
- Costs of ownership were the most important vehicle selection considerations[418]
- Elevated price point of electric vehicles [419]

402 C4NET Centre for New Technologies, 'Electric Vehicle Charging: the consumer prespective.' (paper/s presented at the Webinar, Online webinar, 2021).

403 Bai X Zhang X, Shang J., 2018.

404 C4NET Centre for New Technologies, 2021.

405 Mariangela Scorrano, Romeo Danielis, and Marco Giansoldati, 'The Economic case for electric vehicles in public sector fleets: An Italian Case Study' (2020) 11 *World Electric Vehicle Journal*; Rob Langridge, "FCAI Submission to Future Fuels Strategy Discussion Paper," 2021, above.

406 Rob Langridge, "FCAI Submission to Future Fuels Strategy Discussion Paper," 2021, above.

407 NEF Bloomberg, "Hitting the EV Inflection Point," 2021.

408 Rachel Lynskey et al., "Moving to zero accelerating the transition to zero-emissions transport", in *ClimateWorks Australia* (Clayton: ClimateWorks Australia, 2020).

409 Toon Meelen, Brendan Doody, and Tim Schwanen, 'Vehicle-to-Grid in the UK fleet market: An analysis of upscaling potential in a changing environment' (2021) 290(125203) *Journal of Cleaner Production*.

410 Rachel Lynskey et al., "Moving to zero accelerating the transition to zero-emissions transport," 2020, above.

411 Joachim Globisch, Elisabeth Dutschke, and Martin Wietschel, 'Adoption of electric vehicles in commercial fleets: Why do car pool managers campaign for BEV procurement?' (2018) 64 *Transportation Research Part D*.

412 Rachel Lynskey et al., "Moving to zero accelerating the transition to zero-emissions transport," 2020, above.

413 Anastasio Tsakalidis et al., 'Electric light commercial vehicles: Are they the sleeping giants of electromobility' (2020) 86(102421) *Transport Research Part D* 1.

414 Ibid.

415 Giacomo Di Foggia, 'Drivers and challenges of electric vehicles integraton in corporate fleet: an empirical survey' (2021) *Research in Transportation Business and Management*.

416 Joachim Globisch, Elisabeth Dutschke, and Martin Wietschel, 2018, above

417 Georgina Santos and Huw Davies, 'Incentives for quick penetration of electric vehicles in five European countries: Perceptions from experts and stakeholders' (2020) 137 *Transportation Research Part A*.

418 Stephen Skippon and Jim Chappell, 'Fleets motivations for plug-in vehicle adoption and usage: U.K. case studies' (2019) 71 *Transportation Research Part D* 67.

419 Maddy Bravery, 'New survey reveals one In three fleet managers will electrify at least half of their UK fleet by 2025', Go Ultra Low, UK, 07/07/2021 https://www.goultralow.com/news/new-survey-reveals-one-in-three-fleet-managers-will-electrify-at-least-half-their-uk-fleet-by-2025/.

B. Range anxiety

Battery range

- Ranges being inadequate for the given use patterns given higher annual mileage than privately used vehicles[420]
- limited driving range is a main drawback[421]
- Managers' views that the models available were only viable for short urban routes[422]

Infrastructure

- recharging infrastructure not yet being fully deployed;[423] with lack of chargepoints[424] or lack of dense, visible charging infrastructure which is needed to provide assurance of having reliable, compatible, and constantly accessible charging points[425]
- Availability, accessibility and costs of infrastructure[426]
- Significant and difficult to anticipate infrastructural costs[427]
- Lack of business charging provision and reliance on public infrastructure[428]
- Lack of home charging with demographic and housing type of fleet drivers[429]
- Electricity capacity issues. In the UK there are strict maximum requirements for the amount of power organisations can draw from the grid[430].
- Grid congestion with home charging[431]
- Provision of charging facilities at employees' homes[432]

C. Lack of technical awareness

- Attitudes of buyers seem to be crucial for whether the question to adopt EVs makes it onto the organisations' agenda. [433]
- A lack of knowledge[434] or awareness regarding technical characteristics of vehicles [435].
- Lack of education, with a need to help Councils understand how to compare total cost of ownership and to provide information on charging infrastructure[436].
- Lack of marketing emphasising the environmental benefits of EVs[437]
- Lack of pilot/trial/demonstrations[438]

D. Organisational

- Lack of demand from employees[439]
- Staff remuneration and employee choice[440]
- In car fleets where users chose their own vehicles, those choices were made at the personal level, but constrained by criteria imposed by the organisation [441]
- Corporate goals such as providing employee benefits and corporate views of personal-level symbolic motivations for car choice [442]
- Strategic-level considerations or commercial strategy[443]
- Operational suitability[444] or fitness for purpose[445]

420 Joachim Globisch, Elisabeth Dutschke, and Martin Wietschel, 2018, above ; Anastasio Tsakalidis et al., 2020, above

421 Joachim Globisch, Elisabeth Dutschke, and Martin Wietschel, 2018, above ; Maddy Bravery, 'New survey reveals one In three fleet managers will electrify at least half of their UK fleet by 2025', above

422 Toon Meelen, Brendan Doody, and Tim Schwanen, 2021, above

423 Anastasio Tsakalidis et al., 2020, above

424 Maddy Bravery, 'New survey reveals one In three fleet managers will electrify at least half of their UK fleet by 2025', above

425 Georgina Santos and Huw Davies, 2020, above

426 Toon Meelen, Brendan Doody, and Tim Schwanen, 2021, above

427 Ibid.

428 Maddy Bravery, 'New survey reveals one In three fleet managers will electrify at least half of their UK fleet by 2025', above

429 Stephen Skippon and Jim Chappell, 2019, above

430 Toon Meelen, Brendan Doody, and Tim Schwanen, 2021, above

431 Stephen Skippon and Jim Chappell, 2019, above

432 Ibid.

433 Joachim Globisch, Elisabeth Dutschke, and Martin Wietschel, 2018, above

434 Pascal Vuichard, 'Electrifying the company car: Identifying hard and soft barriers among fleet managers in Switzerland' (2021) 77 *Energy Research & Social Science* 102098.

435 Giacomo Di Foggia, 2021, above

436 Climate Works, "Electric Vehicle Ready Local Government Fleets", (Clayton, Victoria: Climate Works Australia, 2019).

437 Joachim Globisch, Elisabeth Dutschke, and Martin Wietschel, 2018, above

438 Georgina Santos and Huw Davies, 2020, above

439 Pascal Vuichard, 2021, above

440 Ibid.

441 Stephen Skippon and Jim Chappell, 2019, above

442 Ibid.

443 Pascal Vuichard, 2021, above

444 Stephen Skippon and Jim Chappell, 2019, above

445 Rob Langridge, "FCAI Submission to Future Fuels Strategy Discussion Paper," 2021, above.

E. Supply

- The range of vehicle options for users[446]
- Lack of supply with the primary barrier that restricts adding new vehicle technology into light and heavy-duty vehicle fleets being the lack of a long-term federal emissions policy direction [447]

F. Government Policy

- Lack of government policy incentives[448]
- Car-related policies and taxes are complex and subject to various changes and uncertainties[449]

G. Other

- constraints on consumer borrowing[450]
- prolonged low oil prices[451]

Home Charging

The development of EV charging requires strong support in grid development and renewable energy sources integration. For home charging, it is also very important to develop the design, tools and policies to resolve barriers related to EV charging,[452] and the research reveals a number of these issues.

Charging preference (home, workplace or public)

In Australia preferences for charging locations, with home charging (or overnight charging near home when home charging is not available) being the preferred location. The second most popular charging location is the workplace or other commute related charging points (e.g., public transport hubs, park and ride facilities) followed by other destination charging.[453]

In terms of mainstream consumer opinions, a stated preference survey in the USA shows that 72% of potential EV users indicated that charging a BEV two-times per week overnight would be highly convenient. Charging in a public Level 3 station for 30 minutes once-a-week was perceived as very convenient by only 36% of the potential users.[454] A report on LA notes that most EV charging is likely to continue at home, where it is less expensive and more convenient than public options.[455] In Ireland, home charging is considered the primary method of charging for the majority of EVs and is considered the least expensive form of charging, especially when utilising a night rate. It accounts for around 80% of EV charging sessions and will continue to be the primary method of charging in the future.[456]

A UK review concluded that it is most important to have charging infrastructure at home, followed by the workplace, and then public locations.[457] With 30% of charging events occurring at the workplace for BEV owners.[458]

Overall publicly accessible charging infrastructure is often perceived as complementary to private charging (home or workplace) to alleviate concerns about range anxiety and to facilitate long distance travel.[459] It was however noted in Canada that users are likely to trade residential charging by free destination charging when looking for monetary savings.[460] A European report also noted that the perceived benefit of home charging decreases continuously with faster charging times at public charging stations.[461]

Owners of BEVs with driving ranges greater than 320 kilometres, such as Tesla models, are more likely to only use home charging. Individuals who have solar panels at home are also more likely to rely exclusively on home charging since they have diminished electricity costs.[462]

446 Stephen Skippon and Jim Chappell, 2019, above

447 Rob Langridge, "FCAI Submission to Future Fuels Strategy Discussion Paper," 2021, above.

448 The Oxford Institute for Energy Studies, 'EV uptake in the transport fleet; consumer choice, policy incentives and consumer-centric business models.', 122.

449 Toon Meelen, Brendan Doody, and Tim Schwanen, 2021, above

450 Ibid.

451 Ibid.

452 Tianjin Chen et al., 'A review on electric vehicle charging infrastructure development in the UK' (2020) 8 *Journal of Modern Power Systems and Clean Energy* 193.

453 Patricia Lavieri and Carmen Bas Domenech, "Electric Vehicle Uptake and Charging A Consumer-focused review," 2021, above.

454 Ibid.

455 Anh Bui, Peter Slowik, and Nic Lutsey, "Los Angeles Electric Vehicle Charging Infrastructure Needs and Implications for Zero-Emission Area Planning", (The International Council on Clean Transportation, 2021).

456 Government of Ireland, 'Transport Energy', Department of the Environment, Climate and Communications, Dublin, https://www.gov.ie/en/policy-information/e1539-transport-energy/.

457 George Beard, "Driving forward the electric revolution: considerations for policy", in *EV Uptake in the Transport Fleet: consumer choice, policy incentives, and consumer-centric business models.* (2020).

458 Debapriya Chakraborty, David S Bunch, and Jae Hyun Lee, 'What Factors Drive Commuters' Demand for Electric Vehicle Charging Infrastructure?' (2020) *Institute of Transportation Studies*.

459 International Energy Agency (IEA), *Global EV Outlook 2020: Entering the decade of electric drive?* (IEA, 2020).

460 Patricia Lavieri and Carmen Bas Domenech, "Electric Vehicle Uptake and Charging A Consumer-focused review," 2021, above.

461 Marvin Klein, Christine Strauss, and Christian Stummer, *Business information through choice-based conjoint analysis: the case of electric vehicle home charging* (2021).

462 Patricia Lavieri and Carmen Bas Domenech, "Electric Vehicle Uptake and Charging A Consumer-focused review," 2021, above.

Availability

Research on the travel habits of Victorian found that 78% households could charge only at home.[463] Public accessible charging infrastructure however would need to substitute private charging as the primary charging destination in dense urban areas where multi-unit/apartment complex dwelling is more prevalent, home charging access is scarce and workplace charging is restrictive, or for fleets such as taxis and ride-hailing services (e.g. large charging hubs such as already exist in China).[464]

Grote et al. found that the problem of access to charging infrastructure in residential on-street parking areas is recognised as a barrier to the widespread EV uptake in the UK. This was particularly evident in urban areas where large amounts of on-street parking exists, where a parking space may not be routinely available directly outside their property. Even if such a parking space was available, the safety and security of the charging cable crossing the public footpath from property-to-vehicle would be a concern.[465]

Grote et al. provided potential alternatives such as:

i. using secured matting or a covered duct for the charging cable as it crosses the public footpath from property-to-vehicle;
ii. providing portable charge points wheeled up alongside vehicles and left overnight;
iii. constructing rapid charger (i.e. Direct Current Fast Charger (DCFC) systems) or battery swap stations in the local area (i.e. similar to the existing gas station model);
iv. creating additional off-street parking by paving over front gardens and installing drop-kerbs;
v. utilising any charge points in nearby public or commercial off-street car parks or vehicle depots that are unused overnight;
vi. installing wireless charging via electromagnetic induction pads embedded under on-street parking spaces and in the undersides of vehicles;
vii. encouraging residents to use public destination or workplace charge points instead of home charging

Type of charging

In Europe EVs are capable of charging off standard household power points (level one charging). For a commute around 30km per day, 5 hrs of charging at low power from standard outlet tops up the battery is required. Thus there is no need for expensive wall chargers. In Norway, 63 per cent of surveyed EV drivers use level one charging at home.[466]

In the UK 35% of homeowners can charge at home, but only have one phase.[467] Level 2 public chargers costing up to 15 times more than Level 2 at-home chargers.[468]

According to USA large scale data sets, even though some EV users only have Level 1 charging in their homes, the penetration of Level 2 charging is rapidly increasing as this seems to be users preferred residential option. Workplace and other destination charging also predominantly occur using Level 2 chargers. Level 3 charging is usually associated with public infrastructure and accounts for the smallest share of EV charging in most countries.[469] In the US, one report notes that on average, BEVs charge less than once a day with DC fast charging still used mostly around home, within a radius of less than half the vehicle range from their home location.[470] However in the USA, the consistent increase in sales of Tesla long-range BEVs, and the supercharger network provided by the company, has had a significant impact in increasing public charging and overall Level 3 charging.

In Ireland, the government has set out a hierarchy for the promotion of different types of EV charging, having considered international best practice as well as the best options for Irish consumers whether home charging or street charging.[471]

In Australia, it is expected that as battery prices reduce, EVs will continue to have larger battery capacity, and therefore faster charging infrastructure will be preferred by consumers. This will likely include level 2 at the home and progressively more level 3 chargers in public. These chargers also have differing software capabilities affecting communication abilities between vehicle, charger and across charging networks.[472]

463 C4NET Centre for New Technologies, 2021, above

464 International Energy Agency (IEA), 2020, above

465 Matt Grote et al., 'Locating residential on-street electric charging infrastructure: A practical methodology' (2019) (74) *Transportation Research Part D* 15.

466 Australian Energy Market Commission, 2020, above

467 Tianjin Chen et al., 2020, above

468 Debapriya Chakraborty, David S Bunch, and Jae Hyun Lee, 2020, above

469 Patricia Lavieri and Carmen Bas Domenech, "Electric Vehicle Uptake and Charging A Consumer-focused review," 2021, above.

470 Gil Tal, Vaishnavi Karanam, and Chaitanya Favetti, "Emerging Technology Zero Emission Vehicle Household Travel and Refueling Behavior", ed. Plug-In Hybrid & Electric Vehicle Research Center (Institute of Transportation Studies, 2021).

471 Climate Action & Environment Department of Communications, "Climate Action Plan 2019 (Ireland)", (2019).

472 Australian Energy Market Commission, 2020, above

Government policies

Studies show that infrastructure was as important as price when considering strategies to encourage uptake.[473]

The UK has 3 grant schemes to subsidise installation of private charging infrastructure.[474] Further, the electricity used to recharge a plug-in vehicle at home attracts only 5% level of VAT, much lower than road fuels (20%).

Various policies have been proposed in the US, including free installation of a home charging outlet or charging cards or charging vouchers for users without easy access to home charging.[475]

In Ireland, the EV Home Charger Grant was introduced in early 2018 providing grants of up to €600 towards the purchase and installation of a home charger unit.[476]

In Europe, numerous countries provide incentives mainly consisting of as grants that covers up to a set limit for the purchasing and installation of a charging or a percentage of the total net costs of a charging station. Some European countries limit the access unless the electricity powering the charging station(s) is from a renewable source.[477] Norway noted that incentives need to be tailor-made to different charging patterns given charging takes time and highlights a need to be aware of the diversity in travel patterns and lifestyles: long distance trips, shopping and commuting, or living in a villa or apartment in a rural or urban region.[478]

Investment and Number of Charges

In Australia, it is predicted 3 million EV home chargers will be required by 2030, requiring a $3.2 billion in public and private equity investment.[479]

In California, USA it is reported that it will need approximately 536,000 home chargers by 2030 to accommodate roughly 1.3 million electric vehicles. Workplace charging will need to increase to at least 25,000 chargers by 2030. Home chargers make up 90% of the total charger needs and account for 60% of total EV energy demand. Workplace charging accounts for about 5% of total EV energy demand.

LA is continuing and expanding current programs such as EV-ready building codes, incentives for home and multi-unit dwelling and strategic and targeted deployment of curbside and streetlight chargers in residential areas.[480] One report proposes policy around providing financial aid to building owners with minimum instalment conditions.[481]

Ireland needs to scale to over 1 million home chargepoints in 8 years, to meet the Climate Action Plan 2019 target.[482]

Grid

A media article notes that a car battery will be able to power a house for three days and whilst most charging will be done at home. People will still need to charge their cars while shopping, as well as at work. In other words, EVs might be a way for all of us to get off the grid.[483]

Smart Charging is an intelligent charging of EVs, where charging can be shifted based on grid loads, renewable generation and in accordance with the needs of EV owners. In the UK, there is an EV Bill proposed by the Dept for Transport. It requires that all chargers need to be smart in order to provide for robust charging infrastructure to help mitigate energy crisis brought by EV uptake.[484]

473 C4NET Centre for New Technologies, 2021, above

474 Tianjin Chen et al., 2020, above

475 Patrick Plotz et al., "Real-World Usage of Plug-In Hybrid Electric vehicles Fuel Consumption, Electric Driving and CO_2 Emissions", ed. The International Council on Clean Transportation (2020).

476 Government of Ireland, 'Transport Energy', above

477 https://www.globalfleet.com/en/new-energies/europe/features/overview-incentives-ev-charging-europe?t%5Bo%5D=EVBox&curl=1

478 Lance Noel et al., 2018, above ; Lance Noel et al., 2019, above

479 Climate Works, "Climate Works Australia submission to the Future Fuels Strategy: Discussion Paper 'Powering Choice'", (2021).

480 Anh Bui, Peter Slowik, and Nic Lutsey, "Los Angeles Electric Vehicle Charging Infrastructure Needs and Implications for Zero-Emission Area Planning," 2021, above.

481 Diana Lopez-Behar et al., 'Charging infrastructure for electric vehicles in Multi-Unit Residential Buildings: Mapping feedbacks and policy recommendations' (2019) 126 *Energy Policy*.

482 EV Home Charging – Your Current Options – Irish EV Owners Association – IEVOA

483 Alan Kohler, 'Electric vehicles will tow us forward, despite Scott Morrison', *The New Daily*, 8 February 2020 https://thenewdaily.com.au/finance/2021/02/08/alan-kohler-electric-vehicles/.

484 Tianjin Chen et al., 2020, above

Home Installation

To home charge your EV in Ireland, a wallbox (base line unit) is needed along with a certified installer to ensure that the home electrical system can safely support a device that will draw 32a of power, 7.5 kw, continuously for many hours [maybe 10 hours depending on the size of your battery].[485] The IEVOA (Irish EV Owners Association) provides a breakdown of the home installation process, costs and components.[486]

Employers

A report by the International Council on Clean Transportation notes that because liability issues for home chargers installed by an employer are difficult to handle. Procedures for employees leaving a company are unclear, with user purchase option preferred.[487]

In terms of practical considerations for fleets when developing an at home charging policy for employees, consideration needs to be made around policies for including: [488]

1. **Allowing home charging** particularly given it saves unnecessary trips back to the fleet yard, reduces need for infrastructure investments at the fleet facilities, decreases reliance on public charging, ensures vehicles are charged for the following day and takes advantage of low overnight residential electricity rates.
2. **Setting up home charging** depending on whether an employee has access to off-street parking (such as a garage or driveway), owns their own home, lives in a detached home or a multi-unit dwelling or has sufficient electrical capacity
3. **Cost reimbursement for infrastructure** including electrical work, labour and associated permits, charging station hardware and in some cases charging network fees. Costs will vary depending on home configuration and government home charging incentives may be available to employees. Considerations such as offering a "one-size-fits-all" EV charging program by hiring an electrical contractor to do home assessments and installations providing a uniform program for their employees or taking a flexible approach to accommodate different needs, allowing for a range of charging options, from a 120v or 240v wall receptacle, to various brands of level 2 charging stations, with or without network connectivity.
4. **Cost reimbursement for electricity** a number of options here could be used such as a dedicated meter or sub-meter, networked or smart charging station or the use of telematics. Also need to apply the proper electricity rate to the energy consumed and may depend on what utility service territory the employee resides in, including time-of-use rates as well.

Business Charging Infrastructure

Companies with parking facilities are often willing to have charging points installed mainly because of their corporate social responsibility (CSR), staff EV scheme, the convenience for visitors or even EV fleet requirements of the company.[489]

In the UK and the US, 30% of charging events occur at the workplace for BEV owners.[490]

One review concluded that participants were willing to pay more for a BEV if there was access to charging at work.[491] The trade-off between convenience and monetary savings translated into the substitution of home charging by free workplace charging is also observed in several studies. Another factor that makes workplace charging attractive are the number of chargers available.[492] Workplace and other destination charging also predominantly occur using Level 2 chargers.[493]

485 https://www.irishevowners.ie/ev-home-charging-your-current-options/

486 EV Home Charging – Your Current Options – Irish EV Owners Association – IEVOA

487 Patrick Plotz et al., "Real-World Usage of Plug-In Hybrid Electric vehicles Fuel Consumption, Electric Driving and CO_2 Emissions," 2020, above.

488 Charlotte Argue, 'Charging EVs at home: Key considerations for fleets', 16 June 2021 https://www.geotab.com/blog/charging-evs-at-home/.

489 Tianjin Chen et al., 2020, above

490 Debapriya Chakraborty, David S Bunch, and Jae Hyun Lee, 2020, above

491 George Beard, "Driving forward the electric revolution: considerations for policy," 2020, above.

492 Kathrin Walz, Daniel Contreras, and Krzysztof Rudion, 'Modelling of Workplace Electric Vehicle Charging Profiles based on Trip Chain Generation' (paper/s presented at the IEEE PES Innovative Smart Grid Technologies Europe, 26-28 October 2020 2020).

493 Patricia Lavieri and Carmen Bas Domenech, "Electric Vehicle Uptake and Charging A Consumer-focused review," 2021, above.

Companies can amortise installing of charging infrastructure for a long period of time.[494] In the UK workplace charging has access to a scheme grant of 75% towards cost of installation with a limitation of Mode 1 and 2 using standard wall socket power; so charging slow 3 phase power.[495] In the Netherlands companies can receive an investment deduction of up to 36% of the amount invested into a charging point although doesn't offer any national or local incentives for the purchase and installation of private charging points.[496]

In Australia, the Electric Vehicle Council welcomes the support offered to businesses with commercial fleets to assist with charging infrastructure installation projects. It recommends grant schemes to support facility electricity upgrades for small, medium, and large businesses, with funding determined by metrics as defined through the industry consultation. Currently, the connections process for charging infrastructure providers is costly and time consuming. To support charging infrastructure providers, Distribution Network Service Providers (DNSPs) must implement best-practice connection processes to facilitate timely installation. With a need for a more appropriate tariff structure.[497]

Lack of charging infrastructure in buildings will also create a bottleneck for faster EV adoption.[498]

The use of workplace charging and their effects in grid planning was examined generating charging profiles from trip chains. Variable car park parameters such as working time, distance to work, home charging possibility and charging power and car models were considered to allow a more accurate estimation of employee charging.[499]

Statistics

Articles with statistics relevant to this RACE project and categorised by region, data type and key statistics are presented at Table 3.

Surveys

Articles with surveys relevant to this RACE project and categorised by region, data type and key findings are presented at Table 4.

494 Saul Lopez, "Company cars: How European governments are subsidising pollution and climate change", (Belguim: Transport & Environment,, 2020).

495 Tianjin Chen et al., 2020, above

496 Frank Judell, 'Everything you need to know about EV incentives in The Netherlands', *Wallbox.com*, 25 June 2020 https://wallbox.com/en_us/netherlands-ev-incentives#NationalEVIncentives.

497 Electric Vehicle Council, "Submission to the Australian Government on the Future Fuels Strategy discussion paper 2021," 2021, above.

498 Saul Lopez, "Company cars: How European governments are subsidising pollution and climate change," 2020, above.

499 Kathrin Walz, Daniel Contreras, and Krzysztof Rudion, 2020, above

Table 3. Statistics articles, categorised by region, data type and key statistics[500]

Category	Author	Region	Summary	Key statistics
Sales data	Australian Energy Market Commission (2020)	Global	Global EV sales 2019.	Over 2.1 million EV sales (6% increase).
	Electric Vehicle Council (2021)	Global	Global average EV sales 2020.	4.2% of sales (up 1.7% from 2019).
	Electric Vehicle Council (2021)	Australia	BEV new registrations in Australia in 2020.	BEVs: 5244 at 0.59% market share.
	King, S (2020)	Australia	Queensland's vehicle fleet by fuel type in 2020.	2588 BEVs registered in Qld (0.145% of fleet). BEV fleet increased by over 600% from 2016 to 2020 (from 369 to 2588).
	Langridge, R (2021)	Australia	Sales mix by buyer type in Australia in 2020.	63% of EV sales were private individuals. Fleets – 24%. Government – 13%.
	Dataforce (2020)	Europe	BEV new registrations in Europe in 2020.	5.4% of sales were BEVS (539,000 new EVs registered) (up from 1.9% in 2019).
	Kane, M (2021)	UK	BEV new registrations in the UK in 2020.	BEVs: 108,205 at 6.6% market share (185.9% increase on 2019).
	Kane, M (2021)	Germany	BEV new registrations in Germany in 2021 (YTD).	BEVs: 174,180 at 10.7% market share (185% increase year on year).
	Shahan, Z (2020)	Norway	EVs sales in Norway by model in 2019.	BEVS made up 42% of sales in 2019.
	Kane, M (2021)	Norway	BEV new registrations in Norway in 2020.	BEVs: 76,800 at 54.3% market share (27% increase on 2019).
	Dataforce (2020)	France	BEV new registrations in France in 2020.	BEVs: 111,000 at 6.7% market share.
	Netherlands Enterprise Agency (2021)	Netherlands	BEV new registrations in the Netherlands (2020-2021)	BEVs made up 20.5% of new car sales.
	U.S. Department of Transportation (2021)	US	Annual EV sales in the U.S. from 2000 to 2020.	240,053 EV sales (2020).
Charging infrastructure	Lavieri et al. (2021)	Global	Public charging infastructure data – Globally (2019).	862,000 publicly accessible EV chargers were in operation globally.
	Electric Vehicle Council (2021)	Australia	Public charging infastructure data – Australia (2020).	3,000 public chargers (fast chargers increased by 24% and number of public standard chargers increased by 23%)
	Dataforce (2020)	Europe	Public charging infastructure data – EU (2020).	225,000 public charging points (37% increase from 2019).
	Hall D, Wappelhorst S, Mock P, Lutsey N (2020)	Europe	Data on charging infastructure and EV sales in 17 European countries for 2019.	214,200 public charge points (2019)
	Lavieri et al. (2021)	Australia/US/Norway	Ratio of public charging stations: EVs.	Australia – 1:9/US – 1:20/Norway – 1:20
	Dataforce (2020)	Europe	Ratio of public charging stations: EVs.	Europe – 1:9.4
	Australian Energy Market Commission (2020)	Norway		63% of surveyed EV drivers use level one charging at home.
Company fleets	Dataforce (2020)	Europe	Data on how companies are driving electrification of Europe's passenger car fleet. Higher overall percentage of EVs registered by companies than private individuals. (Data on 21 European countries)	BEVs make up 2.2% of EU27 + UK Corporate fleets.
	Wappelhorst S, Bieker G (2021)	Europe		25.4% of new car registrations were company BEVs in 2020.
CO_2 emissions	Dataforce (2020)	Europe	CO_2 emissions from new cars in 2020.	12.6% decrease (122 g CO_2/km in 2019 to 107 g CO_2/km in 2020).

500 Australian Energy Market Commission, 2020, above ; Electric Vehicle Council, "Submission to the Australian Government on the Future Fuels Strategy discussion paper 2021," 2021, above; Shane King, "Inquiry into Transport Technology", (2020); Rob Langridge, "FCAI Submission to Future Fuels Strategy Discussion Paper," 2021, above; UK Department of Transport, 'Transport and Environment Statistics 2021 Annual Report', Department of Transport; Netherlands Enterprise Agency, "Electric Vehicles Statistics in the Netherlands", (2021); U.S. Department of Transportation, *National Transportation Statistics* (2021); Patricia Lavieri and Carmen Bas Domenech, "Electric Vehicle Uptake and Charging A Consumer-focused review," 2021, above; Dale Hall et al., "European Electric Vehicle Factbook", ed. The International Council on Clean Transportation (2020); Sandra Wappelhorst and Georg Bieker, "The uptake of plug-in hybrid electric vehicles in Europe's company car fleets: Trends and policies", (The International Council on Clean Transportation, 2021); Data Force, "Transport & Environment Company Car Report", (2020).

Table 4. Survey articles, categorised by region, data type and key findings[501]

Author	Region	Summary	Key findings
Kester, J et al. (2018)	Nordic countries	Survey assessing perceptions on EV public policy in the Nordic region (n=227).	The cost differential between EVs and ICEVs was the most commonly mentioned barrier.
Vuichard, P (2021)	Switzerland	Survey of Swiss fleet managers to investigate motivators for and barriers against EV adoption in corporate fleets (n = 30).	The main motivators for introducing EVs were found to be "image gain" and "environmental friendliness". The main barriers were "investment cost", "limited range" and "limited charging infrastructure". In addition, "soft barriers" including "lack of knowledge" and "lack of demand of employees" were important.
Scorrano, M. Danielis, R. Giansoldati, M. (2020)	Italy	TCO of BEVs was compared to an equivalent ICEV in 77 public sector entities in an Italian region.	EVs on average have a higher average TCO/km than ICEVs. (€0.37 vs. €0.31). This result is due to the higher average manufacturer's suggested retail price of the BEVs.
Letmathe, P et al. (2020)	German	Survey of motivators to BEV uptake in the German market.	The risk that ICEVs might be banned from German cities and TCO information disclosure weighted with TCO difference were two factors that had a "strong positive" effect for choosing a BEV rather than an ICEV.
Khan, S et al. (2021)	Canada	Survey of fleet operating entities (FOEs) to model and assess motivations for acquiring EVs.	Four FOE classes were identified, BEV leaning, EV sceptical, EV averse, and ICEV oriented. Purchase price and annual operating and depreciation costs are important factors that influence the acquisition choice decision.
Di Foggia, G (2021)	Italy	Survey of fleet managers to investigate the role of technical and financial information in fleet managers' procurement decision-making (n=293).	A lack of technical information is a factor that negatively affects fleet managers' attitudes towards investments in EVs.
Klein, M et al. (2021)	Germany	Choice-based conjoint analysis used to examine the future market potential of EVs under different technological circumstances.	Without EV improvements in range, charging time, or charging infrastructure, a significant purchase price subsidy would not significantly support BEV uptake. Technological progress in range was found to have the most significant positive impact on EV sales.
Australasian Fleet Management Association (2020)	Australia	Survey of EV adoption within the Australian fleet marketplace.	31% of respondents have EVs, however, EVs make up less than 2% of total respondents fleet (66,518 vehicles). Barriers to EV uptake include EV purchase cost (60% of respondents), cost of setting up workplace infrastructure (45%), and limited choice (34%). 49% of respondents' fleet is home garaged overnight.
Broadbent, G et al. (2019)	Australia	Survey to identify barriers and incentives to EV adoption in Australia.	Infrastructure investment has a stronger positive affect on EV uptake than lowering vehicle price. "The full potential of investment to support increased EV adoption may not be realised if customer anxieties are not primary considerations when designing and implementing policy initiatives." Addressing soft barriers and providing information also positively affects buyer attitudes. "Operational costs, vehicle range and providing experiential information before point of sale, is likely to increase EV uptake."
Globisch, J et al. (2018)	Germany	Survey of fleet managers to determine the factors that influence EV uptake in commercial fleets.	Intrinsic motivation drives initiatives for BEV procurement, "personal enthusiasm of individual (not necessarily high-level) members of the organisation for BEVs seems to be crucial for whether the question to adopt BEVs makes it onto the organisations' agenda."
O'Neill, E et al. (2019)	Ireland	Survey of policy-makers and car dealership representatives to determine barriers to BEV uptake.	Vehicle range was the most commonly cited barrier, "substantial technical progress on battery performance would be required for mass market acceptance" of BEVs.
Ultra (2021)*	UK	Survey on the existing company fleet mix and the main EV purchasing and leasing considerations.	Three main barriers to EV adoption amongst fleet managers, including the elevated price point of electric vehicles (47%), limited charging infrastructure (56%) and limited range (51%).

* Could not locate survey. Summary copy and pasted from Lit Review.

501 Johannes Kester et al., 'Policy mechanisms to accelerate electric vehicle adoption: A qualitative review from the Nordic region' (2018) 94 *Renewable and Sustainable Energy Reviews*; Pascal Vuichard, 2021, above ; Mariangela Scorrano, Romeo Danielis, and Marco Giansoldati, 2020, above ; Peter Letmathe and Maria Suares, 'Understanding the impact that potential driving bans on conventional vehicles and the total cost of ownership have on electric vehicle choice in Germany' (2020) *Sustainable Futures* 100018; Shakil Khan, Hanna Maoh, and Terence Dimatulac, 'The demand for electrification in Canadian fleets: A latent class modeling approach' (2021) 90(102653) *Transportation Research Part D*; Giacomo Di Foggia, 2021, above ; Marvin Klein, Christine Strauss, and Christian Stummer, 2021, above ; Australasian Fleet Management Association (AfMA) and AGL, "Survey: Electric Vehicles in Business Fleets", (2020); Gail H Broadbent, Graciela Metternicht, and Danielle Drozdzewski, 2019, above ; Joachim Globisch, Elisabeth Dutschke, and Martin Wietschel, 2018, above ; Eoin O'Neill et al., 2019, above

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13 Glossary

Battery electric vehicle (BEV): An electric vehicle that exclusively uses chemical energy stored in rechargeable battery packs to power at least one electric motor with no secondary source of propulsion.

Charging: The process of restoring electrical energy in a battery or a battery-operated vehicle by connecting it to a power supply.

Conventional internal combustion engine (ICE) vehicle: A vehicle with only an internal combustion engine system.

Fleet vehicle: A vehicle owned or leased by a business.

Fringe Benefits Tax (FBT): A federal tax imposed on the employer. Specifically on employer-provided non-cash benefits, such as a car, to employees for their private use.

Green Vehicle Guide: The Australian Government website that provides information about the environmental performance of new light vehicles sold in Australia.

Hybrid vehicle: A hybrid vehicle combines a conventional internal combustion engine system with a battery electric propulsion system (hybrid vehicle drivetrain). The batteries in a hybrid vehicle are recharged by its on-board engine and generator only.

Hydrogen fuel cell electric vehicle (FCEV): An electric vehicle that uses electricity from a fuel cell powered by compressed hydrogen, rather than electricity from batteries.

Light commercial vehicle: Motor vehicles constructed to carry goods or specialised equipment that are less than or equal to 3.5 tonnes gross vehicle mass, such as utility vehicles, panel vans, cab chassis vehicles and goods vans.

Light vehicle: A vehicle of up to 3.5 tonnes gross vehicle mass.

Low emission vehicles: Includes battery electric vehicles, plug-in hybrid electric vehicles and hydrogen fuel cell electric vehicles.

Plug-in hybrid electric vehicle (PHEV): A hybrid electric vehicle whose battery can be recharged by plugging it into an external source of electric power, as well as by its onboard engine and generator.

Public charging: Electric vehicle charging at facilities that are available to the general public, as opposed to private charging facilities with limited access.

Salary Packaged Vehicle: A vehicle provided to an employee by the employer as part of their total remuneration package. Typically, the employer pays the FBT.

Salary Sacrifice Vehicle: A vehicle acquired by an employee from the proceeds of their pre-tax salary. Typically, the employee pays the FBT.

Zero emission vehicles: Vehicles that are able to operate with zero tailpipe emissions. Lifecycle emissions depend on the emissions intensity of the electricity or fuel supplied to the vehicle.

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