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ASSOCIATION  
OF AUSTRALIA

# ev

## Zero and low-emission vehicles: Insights from Europe

*MTAA Electric Vehicle Delegation – September 2022*

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*Note and disclaimer. This report includes notes and comments that have been generated by the delegation group. These are not necessarily the views of any person or organisation engaged in the group discussions, but moreso, summary notes taken in a range of meetings and settings.*



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Acronyms	
BEV	Battery Electric Vehicle
EV	Electric Vehicle
ZLEV	Zero and Low Emission Vehicle
NOx	Nitrogen Oxide
CO2	Carbon Dioxide
ICE	Internal Combustion Engine
PHEV	Plug-in Hybrid Electric Vehicle
EU	European Union
UK	United Kingdom
TWh	Terra-Watt Hours
Solar PV	Solar Photovoltaics
OEM	Original Equipment Manufacturer

## Executive Summary

In September 2022, the Motor Trade Association of Australia (MTAA) sent a delegation of State Association CEOs from NSW, SA/NT, Qld, Vic and WA on a study tour to understand the changing landscape that zero and low-emission vehicles (ZLEVs) are likely to bring to the automotive industry in Australia.

The delegation visited automotive industry associations, individual repair shops, dealerships, manufacturers and policy makers across Norway, Sweden, the Netherlands, Germany, and the UK.

The visit was a priority given the Australian Government's target that 89 per cent of new vehicles sold in Australia by 2030 will be electric. Adding to the momentum, the Australian Government released the National Electric Vehicle Strategy Consultation paper on 28 September 2022. The paper raises a range of questions and scenarios through which government, industry and local communities can work collectively on Australia transitioning to a zero emissions fleet.

Decisions on Australia's transition will need to be predicated in the knowledge that those countries leading the uptake of EVs internationally, such as Norway, started their journey over 20 years ago. Australia is around 10 years behind, however with the right framework can rapidly catch up and become a leader in the Asia-Pacific region.

A faster trajectory for Australia will need to be based on a cogent policy framework incorporating:

- reducing emissions across the entire fleet
- CO2 emission standards to encourage cleaner, zero-emission vehicle choices
- comprehensive public and private charging infrastructure
- incentives to address affordability
- support for the motor industry to successfully transition
- improved fuel standards, and
- maximising the use of renewables in charging infrastructure.

A faster transition will need to be built on investment. Norway has been offering incentives since 1990 and is funding the transition through their sovereign wealth fund. This is further supported by Norway's green power generation advantage, that is almost all from wind and water turbines.

EV incentives for car buyers in Norway are slowly being removed, as they are in Sweden and Germany, and this could lead to more drivers just hanging on to their old ICE car longer. Adversely, this could lead to global car fleets getting older and dirtier while resisting the temptation to buy a ZLEV.

Vehicle carbon taxes are being used in some countries to pressure people out of their ICE vehicles but there are tensions for people who can't afford a ZLEV and consequently have little choice than to just hang on to their old clunker. As the actual target is a reduction in emissions to meet the Paris agreement, a strategy is required to ensure ageing vehicles are being maintained to minimise emissions.

Vehicle supply will be a key point in the speed of Australia's transition.

Currently, the ZLEV vehicles that are transported to Australia are low in number and mainly at a price range that is not attractive to many motorists. This is a major limitation that will need to be overcome in Australia. Consequently, the strategy needs to find ways to attract ZLEVs. Put simply, if governments in other countries are incentivising ZLEV vehicles, or creating cheaper running cost regimes, then these markets will be more attractive to car buyers and auto manufacturers.

In the countries visited, the state of the national power grid was central to support any vehicle transition plan. This didn't mean that countries had to wait to start a transition until the power grid and connection points for EVs were all in place, but more so a coherent and funded plan to parallel ZLEV vehicle uptake with infrastructure developments. This was raised repeatedly as a key principle of any plan.

In terms of the public charging network, using existing industry infrastructure was consistently raised. While it is paramount that service stations are included in the EV charging network, so can other automotive locations such as dealerships and independent repairers.

As most people prefer to charge at home, government will need to consider shared costs for infrastructure to support charging availability and grid load balancing such as bi-directional vehicle charging. Bi-directional power is considered a game changer in transitioning drivers into ZLEVs given the capacity to charge cheaply, where this was offered, and then upload the same power into the home. Apartments have their own challenges when it comes to fitting EV charging infrastructure as body corporates have not supported installations. This will need to be addressed.

A reliable ratio of public charging stations for EVs would include at least one charging station for every 10 EVs and charging banks of between six to eight chargers every 50 to 75km along major roads and highways.

Incentivisation of consumers remains a key factor in the uptake of ZLEVs. Examples from around the world clearly show a direct parallel between the range and depth of incentives offered to car buyers and the rate at which EVs are purchased.

For the Australian Government to help close the internal combustion engine vs EV price parity gap they will need to consider dropping all the major vehicle purchasing taxes as a means of accelerating ZLEV uptakes. This would include the removal of GST, stamp duty and luxury car tax on ZLEVs.

For the automotive sector, there is much change ahead.

Dealerships in the countries visited reported the need to cycle more vehicles through their service areas. With less service and repair work on an EV, vehicles would often spend less than an hour in the dealership with vehicle owners timetabled to strict time slots to reduce storage back-ups and the cost of continually moving cars around parking bays.

The speed of ZLEV turn-around and the constant moving of ZLEVs in and out of a workshop has deeper ramifications for the independent repair market where smaller workshops in built up areas often already have clashes with local councils regarding parking challenges.

Dealerships and independent repairers are already looking to either bring back outsourced work into their workshops or to value-add where they can. An independent workshop in Sweden reported that the days of free advice and helping customers free of charge were over. In a market where a change of technology meant thinner margins, everything would need to be timed and paid for. The business owner reported "we will need to become more like dentist and doctors, billing for every minute".

The observations of the study tour indicated that body repairers would be less affected by the growth of the ZLEV fleet than other automotive industry sectors. Vehicle body repairs would continue, however, the level of technology capability and safety requirements in panel shops would increase.

Batteries dominated every discussion, and, in the majority of cases, automotive business owners would not get involved in the repair of high voltage

components or batteries. Repairers suggested there were opportunities in this technological change and the indications are it would be in the repair and re-purposing of vehicle batteries.

In markets where ZLEV uptakes were significant, there was already the emergence of businesses engaging in the changeover, diagnostics, and repair of batteries.

What will change – everything. The future of the automotive industry is both exciting and challenging.

A well designed plan will help Australia emerge as a leader, in reducing emissions and in the careful transition of a critical industry sector, that keeps Australia moving.

## Introduction

The Australian Government has set an ambitious target of 89 per cent of all new vehicle sales being electric by 2030. The government has also committed Australia to the Paris Agreement on climate change. With the transport sector comprising around 19 per cent of the nation's emissions, there is a major focus on the sector's contribution to these goals and targets.

In September 2022 the government released a consultation paper for a National Electric Vehicle Strategy, a key step in reducing the nation's transport emissions and transitioning away from internal combustion engine (ICE) powered road transport.

The sale of electric vehicles (EVs) in Australia is slow by international standards. While there is much debate about the likely growth rate of EVs over the coming decades, it is clear their impact will be felt across the Australian economy and particularly in the motor vehicle industry. Every sector of the industry will be impacted by this transformational shift in transport technology, but some more than others.

It is important then, as the peak bodies representing the motor trades across Australia, that the Motor Trades Association of Australia (MTAA) and its state and territory affiliates, have a deep understanding of, and plan for the likely impact of the growth of EVs on its members and in the industry more generally. For members in particular, it is vital they have an understanding of the likely 'on the ground' impact on their businesses, employees and communities.

For MTAA and its affiliates, understanding the potential impact for the motor trades industries is fundamental to their advocacy and policy development.

For this reason, a delegation of MTAA and its state and territory affiliates engaged with motor industry representative bodies, manufacturers, employers and regulators in a number of European countries where EV uptake is significantly advanced.

## Delegation overview

The delegation conducted meetings and site visits with employers, industry bodies, manufacturers and regulators in Norway, Sweden, the Netherlands, Germany, and the UK.

The visits provided a range of perspectives and experiences on the uptake of EVs. Importantly, the focus was on the real-world, practical impacts of the growth of EVs and the strategies being deployed by businesses and the industry to adapt to this fundamental technological change.

In all, around 16 meetings and site visits were conducted together with attendance at the internationally recognised trade event for the automotive industry, Automechanika, held in Frankfurt, Germany.

## Context for delegation

Until recently, Australian governments have relied predominantly on market forces as the catalyst for EV sales, with little national leadership to assist in the transition. This lack of leadership has resulted in Australia lagging well behind most other developed nations in the uptake of EVs. It is estimated that Australia is at least 10 years behind more advanced EV-uptake countries, such as Norway.

Around 20,000 EVs (battery, electric and hybrid) were sold in Australia in 2021, and as at July 2022, battery electric vehicles accounted for 1.7 per cent of the new vehicle market. Almost half of all EVs sold in Australia are comprised of one vehicle, the Tesla Model 3. By comparison, in Norway, EVs comprise some 65 per cent of annual sales. In the UK they comprise around 12 per cent.

To help achieve its target for the uptake of EVs, the federal government recently made them exempt from a five per cent import duty and intends to provide further tax benefits for company EVs and fleets. There are also some limited subsidies provided by state and territory governments for EV buyers.

With ICE, (or ICE variants), vehicles currently making up 98 per cent of Australia's new vehicle sales, Australia will need a comprehensive strategy that tackles the factors hindering EV uptake in Australia. This includes addressing the high cost and limited availability of EVs, the dearth of government incentives, the limited availability of EV charging infrastructure and a preference by Australians for driving large utility and SUV vehicles.

The following paragraphs highlight some of these issues.

### High EV prices

High upfront costs remain a major barrier to greater uptake of EVs in Australia. Around 65 per cent of Australians spend less than \$50,000 on a new vehicle, but only a handful of EVs are priced under \$50,000. The current price differential between a mid-sized ICE vehicle and a comparable EV is around \$30,000.

There is a critical need for more EV models to be supplied by manufacturers, particularly at lower price points. Whilst a greater range of affordable EVs is expected over time, until this occurs EV sales growth will likely be significantly constrained.



### Government policy

The National Electric Vehicle Strategy consultation paper identifies its objectives as:

- encouraging a rapid increase in demand for EVs
- increasing supply of affordable and accessible EVs, and
- establishing the systems and infrastructure to enable the rapid uptake of EVs.

As Australia is only a small vehicle market by global standards (around one million new vehicle sales annually), national leadership and favourable policy settings will be required to achieve these objectives. A national strategy to drive the electrification of Australia's fleet will need to incorporate:

- reducing emissions across the entire fleet
- CO2 emission standards to encourage cleaner, zero-emission vehicle choices
- comprehensive public and private charging infrastructure
- incentives to address affordability
- support for the motor industry to successfully transition
- improved fuel standards, and
- maximising the use of renewables in charging infrastructure.

In terms of incentives to stimulate EV purchases, while states and territories offer a \$3,000 – \$3,500 subsidy (below a price cap) this is well below that offered by many countries such as Norway, Sweden, Germany and the UK, which have far higher subsidies, tax credits and grants.

While Victoria has implemented road usage charges for electric and other low-emission vehicles, the federal government is challenging the legality of these charges. This uncertainty and lack of policy co-ordination between states and territories and the federal government acts as a disincentive for many prospective EV buyers.

The Federal Government has recently removed a five per cent import tariff that was applied on EVs, plug-in hybrid vehicles and hydrogen fuel-cell vehicles priced below \$84,916. This measure, however, is of limited benefit given that Australia already has free trade agreements with most source countries for its motor vehicles. Tax relief on the private usage of company fleet vehicles has also been introduced, and whilst this is welcome, it does little to reduce the high upfront cost of EVs for the private market.

### Charging infrastructure

Australia currently has only around 3,000 EV public charging points (2,531 standard AC, 470 supercharge DC) to cover an area of 7.692 million square kilometres. This amounts to one public charger for every 7.21 EVs currently in Australia. For EV numbers to grow there will need to be a significant and planned growth in charging infrastructure. This will be particularly important in regional and rural areas.

As 80 per cent of people express a desire to charge their vehicles at home, the capacity and incentive to install home charging units also needs to be part of the plan.

### Australians' vehicle preferences

In July 2022, single and dual cab utilities occupied four of the top 10 sales positions, with small and large SUVs taking a further five positions. Only one passenger vehicle was in the top 10 of motor vehicles sold in July 2022.

There are currently no electric utility vehicle offerings in Australia with very limited availability expected over the short to medium term

### Skills and training

Australia currently has only a limited number of technicians that are qualified to service and repair EVs. With the expected growth in the number of EVs, it is estimated that Australia will require an additional 7,000 qualified EV technicians by 2030. This will add to the existing and longstanding skill shortages being experienced across the industry.

Skills training for EV technicians is still in its infancy in Australia, with only a few Registered Training Organisations delivering EV skills training or qualifications.

## Key learnings and observations

While Australia is considerably behind many European countries in transitioning its vehicle fleet to EVs, there is an opportunity to learn from these countries and rapidly catch up. This report seeks to provide and share some of the experiences and learnings from a number of countries in Europe. Summary observations and insights are presented for each jurisdiction with detailed notes from each meeting provided further into the report, as Appendix 1.

### Norway

Norway is the world leader in the transition to EVs. This is the result of a long-term government intervention. In 2021 64.5 per cent of new passenger vehicles sales were EV and 15 per cent of the entire fleet are EVs (in Oslo it is 50 per cent).

Hybrid sales have plateaued, and plug-in hybrids are likely to do the same. It was suggested that within three years the only cars being sold in Norway will be pure EVs.

### Policy

This strong EV market share has been achieved through a series of legislated measures since 1990 to reduce the cost of EVs, including:

- lower road taxes
- removal of import tax and VAT (25 per cent)
- 50 per cent reduction in company car tax
- free parking, exemptions for road tolls
- a strong incentive regime.

Some concerns are now emerging, however, as the government begins rolling back the level of incentives.

Higher toll and vehicle registration fees have been used to penalise drivers who maintain the use of their ICE vehicles.

Given the current pricing for electricity due to global energy price increases, the cost-benefit of an EV is being challenged. Put simply, the evidence emerging is that charging vehicles via public charging stations is not considered economical and the priority is to charge at home through renewable energy sources.

### Infrastructure

While there is public charging infrastructure, the majority of charging takes place in the home. While public infrastructure was rolled out early in the transition plan, much of it was low-capacity units which have proven to be ineffective. It was strongly

recommended that all public charging stations need to be rapid charging units. Dedicated charging stations for taxi's are widespread.

EV range anxiety has now been replaced with queue-anxiety as large queues are common at public charging stations.

Charging infrastructure (including the charge speed) is emerging as a particular concern at holiday destinations during holiday periods that are swamped during peak travel periods.



Street chargers in Oslo

E-bicycles and e-scooters were endemic in Oslo and a large proportion of other traffic was made up of taxis/Uber and other ride services.

### Maintenance

Some industry personnel anticipate that around 30 per cent of dealerships and independent workshops will disappear as a result of the transition to EVs.

The growth in EVs is having a material impact on businesses servicing and repairing EVs. These impacts can be summarised as follows:

- EVs do not require the same level of servicing as ICE vehicles
- as a result, dealerships are increasingly re-introducing the sale of tyres, windscreens and body repairs
- independent repairers are also looking for alternative offerings to adopt

- dealers are implementing strategies to 'keep' customers who purchase used cars through service offerings, including subscription models
- brakes and tyres on EVs require more checking and replacing
- software updates are time consuming and require considerable space within the business to hold cars while being updated
- panel and paint shops are well placed to have continued repair work due to the increased frequency of accidents in EVs.

### Skills

Accessing skilled labour is particularly challenging given Norway's low unemployment rate of around 1.6 per cent. Attracting and retaining new and skilled technical repair staff has been a key objective of the industry. However, there were no signs this would be fixed in the short term.

Training for apprentices is similar to the German model with an individual beginning their first two years of technical training at high school and then two years training in a workshop. It has been identified that more needs to be done in schools to encourage young people into automotive trades.

Technicians have to be trained to a specified standard in high voltage vehicle maintenance and repair processes.

### Sweden

Fifty per cent of all new vehicles sold are EVs or hybrids. It is anticipated by some in industry that EVs will make up around 70–80 per cent of sales by 2030 with Plug in Hybrid Electric Vehicle (PHEVs) comprising some 20–30 per cent.

### Policy

There is a carbon charge on ICE vehicles. This is based on a combination of engine size, weight and the CO<sub>2</sub> emissions of a vehicle.

The government has a major challenge in replacing significant income from lost duty on petrol and diesel. One of the ways being considered is to introduce road-user charging for all vehicles.

### Infrastructure

The capacity to support EV charging in apartments is a significant issue. Sixty per cent of people in Sweden live in apartments and consequently have parking and charging limitations.

The energy crisis is affecting Sweden (and other European countries) with resultant electricity price increases expected to have an impact on EV purchases. Charging an electric vehicle currently costs around one third of the price of petrol. However, electricity pricing is expected to increase given the current energy crisis.

A lack of standard charging infrastructure is emerging as a challenge as the diversity of vehicles and charging infrastructure grows.

### Business response to EVs

In the main, EVs can be serviced relatively quickly and because of the low margin on work performed, workshops need to be able to cater for a higher throughput of EVs. This puts considerable pressure on vehicle movements and parking infrastructure in workshops.

Tyre hotels within dealerships are growing, as car tyres need to be changed in winter and dealers are out to win this work back from independent tyre operators, as a means of raising revenue to offset the loss of ICE vehicle maintenance margins. Dealers are also re-introducing windscreen repairs and are focused on battery health and repair, again to offset losses elsewhere.

Dealers are also trying to hold customers who purchase secondhand vehicles by offering subscription models for vehicle servicing at around \$A15 a month.

As EVs can be serviced quickly, workshops are being re-designed to enable technicians to work on up to four cars at a time (some may be downloading data or are on charge). This puts considerable pressure on vehicle movements and parking space required for more vehicles waiting for software upgrades and for cars waiting for customers to collect them.

Currently EV work is being subsidised by work on traditional ICE vehicles, where there are still good margins. However, as workshops become more populated with EVs, margins will deteriorate and without a shift in the business or repair costing models some workshops will be challenged.

### Skills

Ninety per cent of the training for new apprentices relates to EV technology. Advice to schools from some in industry is to stop training students in ICE technology.

## Netherlands

Hybrids sales are around 40 per cent of all new car sales in the Netherlands.

### Policy

There is a €3000 incentive for EVs but no incentives for plug-ins or hybrids.

The government wants to introduce legislation that will require all company cars to be EVs by 2025.

The government will gradually increase charges for ICE vehicles through an engine size, weight, and CO2 charging regime. It is expected the country will transition to road user charging.

Farmers have been flying the national flag upside down in protest at the government's efforts to reduce the farming sector's emissions.

### Infrastructure

Highway solar charging infrastructure is prominent, along with charging stations in service stations.

Access to charging facilities in apartments remains a barrier to the uptake of EVs. At the same time, there is some resistance for chargers in apartments due to perceived fire risks.

### Skills

There is a different skill base needed to navigate and work with new diagnostic tools required on modern vehicles. Re-skilling the existing workforce remains a challenge and its possible many older technicians will not move to work on EVs and will just time their careers out on conventional ICE vehicles.

## Germany

There was low visibility of EVs and public EV chargers even though there is a relative strong uptake of EVs in Germany, statistically. Almost all public vehicles, except trams, are ICE vehicles and bicycles and e-scooters make up a significant contribution to city traffic.

Electricity and other power price rises are central in the daily thoughts of many locals, and this may have a dampening effect on EV sales, given electricity prices are four-fold to what they were last year, in some regions.

The city and the region is largely driven by the culture and production of BMWs and its probable that as the company reflects a deeper EV fleet profile, so too will the local and regional community.

## Policy

There is some resistance to EVs as the energy crisis in Europe deepens, with attention on power price rises and their impact on EV operating costs. The delegation noted some concerns about the potential for a 'car divide' emerging. That is between wealthier people who could afford to buy a new EV and those who couldn't.

Since 2008, German cities can legally designate low- emission zones that only motorised vehicles with a certain category of emissions sticker is allowed to enter. This sticker is called Umweltplakette or Feinstaubplakette. Older and more polluting vehicles are not eligible for emissions stickers and are, as a result, barred from entering low-emission zones.

The German emissions sticker comes in three colours: red, yellow and green. The red sticker is for the most polluting vehicles, the yellow sticker for slightly less polluting vehicles and the green sticker for the least polluting vehicles.



As of 2021, vehicles with a red emissions sticker are no longer allowed to enter any low-emission zones in Germany. Red sticker vehicles are therefore almost impossible to sell.

Vehicles with a green sticker can enter all low-emission zones in Germany. This green emissions sticker is required if a driver visits German cities with a low- emission zone. Fines are provided to drivers who are not compliant with the system while driving in a low-emission zone.

Drivers are required to purchase their windscreen stickers through the regulatory authority with a cost of circa A\$20.

### Infrastructure

Some industry advice indicates infrastructure was insufficient to meet the government's EV targets and there are concerns that the closure of the nuclear powered plants will put further pressure on electricity supply.

## Munich – BMW

The two days of meetings with BMW provided a comprehensive understanding of their focus on the future.

BMW has taken control of its own battery manufacturing, and this has led to significant knowledge and capability benefits to the company. Notwithstanding a constant reporting in the press of various EV battery advances (sodium-ion for example) the BMW EV battery is still lithium-based.

Public and industry frustration is emerging in Munich regarding bi-directional EVs that will be in common production by many car makers by 2025. The issue is related to government putting a charge on the uploading and downloading of power from car batteries into homes.

BMW advised that by 2030 most models would be available in an EV offering, and most ICE vehicles would include an electrical motor. They would continue making ICE vehicles for countries where these were still in demand.

A cut-off date for the non-purchase of ICE vehicles has not been set by the EU, however it is expected this will be legislated to be 2035 in the near future. There was still room for the current production of ICE and hybrid vehicles to add significantly to the CO2 reduction efforts, through improved engine technology, and BMW has a target of making these important contributions. This is part of BMW's Sustainability Strategy.

BMW is committed to reducing its production of CO2 outputs by 80 per cent by 2030, based on its 2019 production outputs.

BMW was not certain that the forecast price reductions of EVs would eventuate to the degree being suggested in the media.

Hydrogen is a key area for development at BMW and is seen as an important spoke in the transition to a fully electrified vehicle fleet. BMW experience does not see merit in restricting their options to one power generation technology in meeting the electrification needs of the future. They expect hydrogen vehicles to be cost competitive by around 2032.

BMW, along with its partner in battery technologies, Toyota, saw much benefit in pursuing hydrogen vehicle technologies as a viable part of the overall EV solution, and particularly for heavy vehicles, trains and other large freight vehicles.

Hydrogen is already being piped across large distances through re-purposed gas pipelines.

In terms of infrastructure, BMW is of the view that any development of vehicle hydrogen infrastructure in Australia should be made on the basis that trucks and cars can use the same filling sites.

BMW believes Australia has a huge opportunity to generate significant outputs of green hydrogen through solar technologies.



*Delegation being welcomed at BMW Head Office, Munich*

## United Kingdom (UK)

- The UK is committed to being carbon neutral by 2050. The decarbonisation of the vehicle fleet is a big part of this transition, and it plans to be net carbon neutral by 2035.
- Also evident in the UK is a large presence of wind turbines for energy generation. The UK Office for National Statistics report considerable growth of UK wind generation and their June 2021 report on wind energy reports that 'Wind energy generation accounted for 24 per cent of total electricity generation (including renewables and non- renewables) in 2020; with 'offshore wind accounting for 13 per cent and onshore wind accounting for 11 per cent'. The Office also reports:
  - Electricity generation from wind power in the UK has increased by 715 per cent from 2009 to 2020
  - Turnover from wind energy was nearly £6 billion in 2019
  - The UK has the largest offshore wind farm in the world, which is located off the coast of Yorkshire



*Tesla chargers at UK-major A1 highway service centre*



*Plug-in EV chargers at Peterborough UK-major highway service centre*



*Offshore wind farm at Saltburn Yorkshire, UK*

- Employment in offshore wind in the UK has increased significantly since 2015, with 7200 full-time equivalent (FTE) employees in 2019
- According to the National Grid, 2020 was the "greenest year on record" for Britain, with record high levels of wind energy generation.

[Go to ons.gov.uk](https://ons.gov.uk) and search for [Wind energy in the UK: June 2021](#)

However, on balance, weather conditions also have the capacity to severely disrupt and lessen the reliability of wind energy generation. The UK Department for Business Energy, & Industrial Strategy, 2022 report, UK Energy in Brief, highlighted reductions in wind and solar energy outputs due to weather conditions.

The report found 'Electricity generated from renewable sources decreased by 9.3 per cent between 2020 and 2021 to 122.2 TWh, though this is still the second highest annual figure on record'. 2020 had been a record for renewable generation. The decrease is mostly due to less favourable weather conditions. Capacity grew by 3.7 per cent, a higher growth rate than 2020 (where new capacity was hampered by the COVID pandemic) but slower than in previous years.

Total wind generation decreased by nearly 15 per cent to 64.7 TWh, there had been exceptionally strong wind speeds in 2020. Hydro generation decreased by nearly 20 per cent in 2020, this was largely due to a fall in average rainfall. Generation from solar PV decreased by 5.9 per cent, a small increase in capacity was cancelled out by a decrease in average sunlight hours.

The commitment to wind farms in the UK is obvious, given their physical presence on land and offshore.

This phenomenon is likely a major factor in the uptake of EVs, given an environmentally focused car buyer may have a much higher expectation that their new EV will actually be running on green energy.

As a comparison the amount of wind generated power generated in Australia in 2021 was 11.7 per cent as a percentage of Australia's total energy generation. It would appear that much energy and focus by government in the UK has been on major wind power generation for a least a decade.

Currently in Australia there are multiple applications being made for the construction of large wind power generation sites offshore, and this is before the Federal Government.

[Go to gov.uk](https://gov.uk) and search for [UK energy in brief 2022](#)

### **Policy**

The focus of government in the UK is centred on fully electric vehicles (zero emission from the tailpipe). There appears little government policy and program support for hybrids that are seen as old technology in some policy circles.

The UK policy framework contains a number of elements:

- incentives for personal EV purchases in the UK have now largely been removed
- incentives are in place for corporate fleets and charging stations in flats and apartment blocks. The latter is a focus as 40 per cent of households in the UK do not have the capacity to charge an EV at home

- high voltage charging is a key focus. There is an awareness that low 7-11kW chargers are no longer fit for purpose and need replacing with fast chargers, and up to 350kW
- a push for contactless generic charging systems.

### Infrastructure

Infrastructure to support EVs is prominent. A good example of this is in major highway service stations that cater for multiple EV charging points. The two examples included on page 14 of this report, both from the North East, provide a highly visible 'signal' of the capacity to support EV charging.

As in other countries visited, the installation of charging facilities in apartments and other high-density accommodation remains a challenge.

EV and electricity pricing (especially given the current energy crisis in Europe) is hindering the uptake of EVs.

New EVs purchased in 2021 made up 11.6 per cent of all car sales and the UK fleet is around two per cent EV or hybrid.

### Maintenance

There is less work and less margin in the repair and maintenance of EVs, along with a recognition of the need to diversify business models in the automotive industry.

The current EU arrangements for access to vehicle repair information expires in the UK in October 2023 and the industry and government are considering future arrangements for the UK. There is strong support for the Australian approach, and it was seen as an exemplar.

Insurers are having a stronger focus on risk management in body repair shops, and this includes safety training of staff who work on EVs. Advice indicated that some shops would not get business insurance without the proper training being undertaken by repair staff.

### Skills

Skills shortages are severe and long-term. Similar to Australia, and all other countries visited, there was a sense that schools were not promoting automotive careers.



Charging from lamp post stem in central London



## Key findings and recommendations

- ✓ Attracting the supply of EVs to Australia's small, right hand drive market will require a clear national framework and strong government intervention
- ✓ The uptake of EVs, at least during the transition period, is contingent on the level and timeframe of financial incentives. To support the government's 2030 EV targets, stamp duty, GST and the Luxury Car Tax should be removed
- ✓ Financial incentives should be framed to ensure there is equity of access to EVs
- ✓ Australia needs a comprehensive and fit-for-purpose rapid charging network. The benchmark for public charging stations is one charging station for every 10 EVs and charging banks of between six to eight chargers every 50 to 75km along major highways
- ✓ There needs to be a focus on developing standardised charging infrastructure (e.g. generic payment systems and charge points)
- ✓ Changes to legislation to enable the uploading and downloading of power from bi-directional vehicles to homes and commercial properties should be implemented
- ✓ Consideration is required to exploit current infrastructure by supporting EV charging facilities in automotive business premises such as dealerships, independent repairers and fuel service stations
- ✓ The recent significant increases in energy prices in Europe, particularly, highlight the importance of focusing on reliable, affordable EV charging sources. Rising electricity prices impact the benefit of EVs
- ✓ Planning for Australia's EV fleet should not focus only on electricity as a source of fuel. Hydrogen should be actively supported through government policies and programs for motor vehicles, as well as heavy vehicles
- ✓ Enhanced EV workforce skills development will be an important factor in supporting a sustainable EV transition.



*Example of a number of new brand electric vehicles coming into the global car market*

## Appendix 1 Meeting notes

<b>Location</b>	Oslo, Norway
<b>Organisation</b>	Norwegian Automotive Industry Association
<b>About</b>	NBF (Norwegian Automotive Industry Association) is a nationwide organisation for companies that run automotive or car-related activities. NBF has its head office in Oslo. Members have free and unlimited access to some of the most competent resources in the Norwegian car industry

### Meeting and discussion:

#### Norwegian Automotive Industry Association

- 15 per cent of the vehicle fleet in Norway are EV. In Oslo it is 50 per cent
- VAT is 25 per cent. Personal tax goes up to 38 per cent
- In 2022, 75 per cent of all new car sales are EVs. Annual new car sales in 2021, 176,276
- Norway invests 20 billion Krona annually (A\$2.9B) in subsidies supporting the uptake of EVs
- Problems with charging in some towns with leads spread across streets from homes to cars. Most cars are charged at home
- Not enough charging stations in the city with major charging queues at holiday destinations

at peak times. Range anxiety has changed into queuing anxiety

- Most charging stations started at 50kW but now can go up to 300kW. There does not seem to be a problem with the constant rapid charging of vehicles and concerns about degrading batteries
- Taxes on cars are set at the point of sale based on a combination of NOx, CO2 and the weight of the vehicle
- Annual government income from ICE fuel levy on cars since 2012 has halved due to EV uptake
- In 2023 the government will start to increase taxes on ICE cars to further encourage these drivers to take up EVs. At the same time EV incentives will slowly be reduced
- Maintenance of an EV is less than a comparable ICE car. As a result of the reduction of dropped revenue to dealerships, the sale of tyres, windscreens and body repairs are being enhanced
- It is anticipated that around 30 per cent of dealerships and independent workshops will disappear as a result of the transition to EVs
- Three large companies are the key recyclers of batteries and many are recycled into new batteries. Norway is also exporting recycled batteries
- Over 96 per cent of a vehicle is reused or recycled. All vehicles have a 3,000 Krona levy on them when they are purchased, and this is returned to the last owner of the vehicle once it is scrapped.



Team at the NBF Offices

**Site visit: Major EV dealer (VW/Audi)  
Workshop/sales, Moller Bill, Oslo,  
Dealer Principal, Morton Andresen**

- Second largest dealership in Oslo. New and used car sales. VW was an early adopter of EVs in Norway. EVs outstrip ICE selling vehicles and are on a sharp trajectory to continue this. Nissan Leaf model currently leads the market in EV sales.

**EV success**

- Driven by government incentives, mainly through removing taxes on EVs
- Customer benefits include free road tolls, free ferries, reduced MOT (vehicle inspection) and parking fees
- The iMev started things off followed by the Leaf and then the VW e-up and e-Golf
- 2021 Tesla came along and was the biggest vehicle brand in Norway
- 2020 Audi was top five, due to e-Tron
- Incentives for EVs being withdrawn slowly and consequently there is not a big push back from the community as they are reduced.

**Servicing**

- Software updates are a benefit to dealers given the manufacturers pay the dealerships to carry this out. The fee does not offset the time required
- Tyres need to be changed more often on EVs and this is a positive for sales
- Windscreens are replaced more often due to gravel being used on many roads
- Salt on the roads in winter increases brake corrosion which drives maintenance
- Auto technicians often leave a workshop for more money and often into the oil industry

- Technicians have to be trained to a specified standard in high voltage vehicle maintenance and repair processes. Technicians are federally registered in Norway and have to sign-off on their MOT inspections and work on each vehicle
- After three years a vehicle has to go back to a workshop for an MOT (safety inspection) and every two years thereafter
- It's important to have technicians trained properly on EVs or time is lost, and this leads to customer problems
- Workshops need more room for EVs for tasks like dropping batteries out and isolating them
- Many dealerships have their own repair workshops or share a facility with another dealer
- 500,000 holiday cabins exist in Norway and it's important that an EV can easily drive from the city to a cabin. In most cases the cabins are more than 200km away. Norway had a range of EVs that easily fall into the 400-500km range
- A plan for charging infrastructure is critical for the roll-out of EVs
- Cost to charge a car is around \$A70 dollars for a 500km range. It was cheaper than this but the energy crisis in the EU has lifted prices considerably
- The automotive industry in Norway will still be working on ICE vehicles for the next 10 years
- Dealerships sell their used or damaged batteries to one of the three battery rebuilders/recyclers
- The issue of skilled labour was particularly important given Norway's extremely low unemployment rate of 1.6 per cent. Attracting and retaining new and skilled technical repair staff had been a key objective of the industry, however there were no signs this would be fixed in the short or longer term.



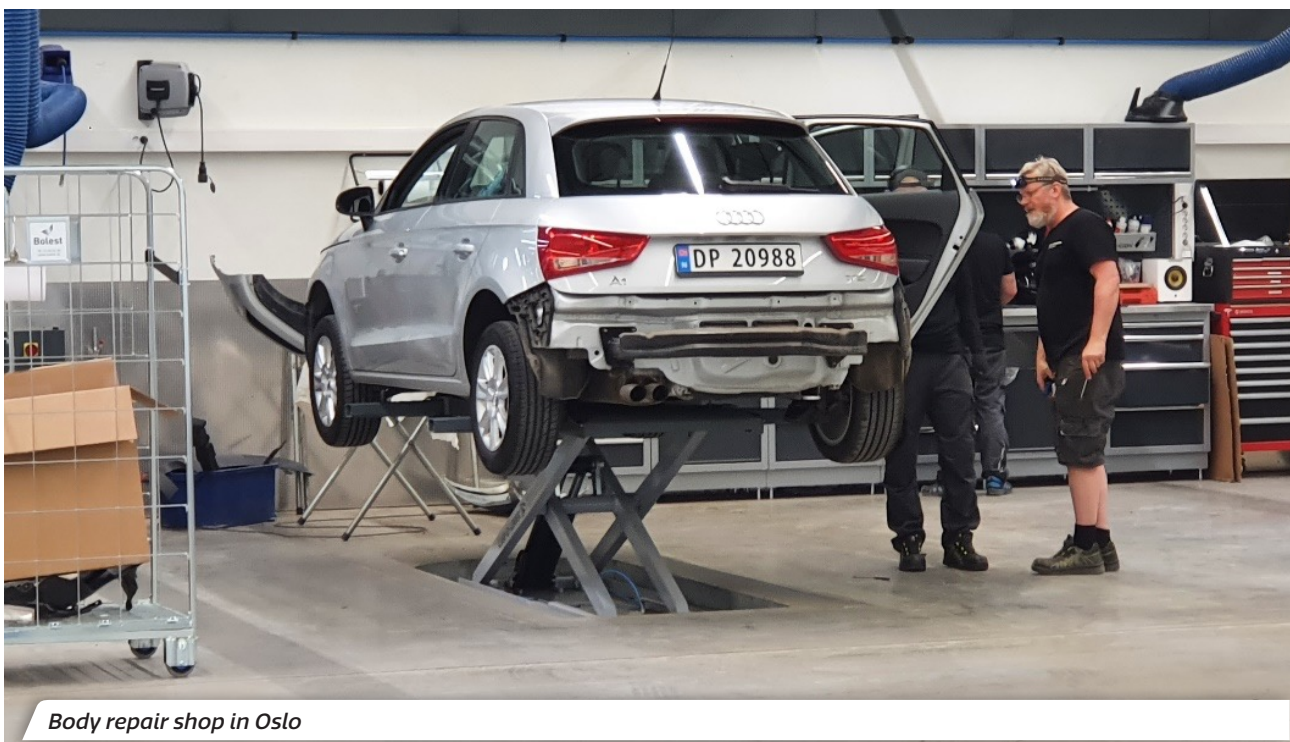
*New car dealership in Norway*



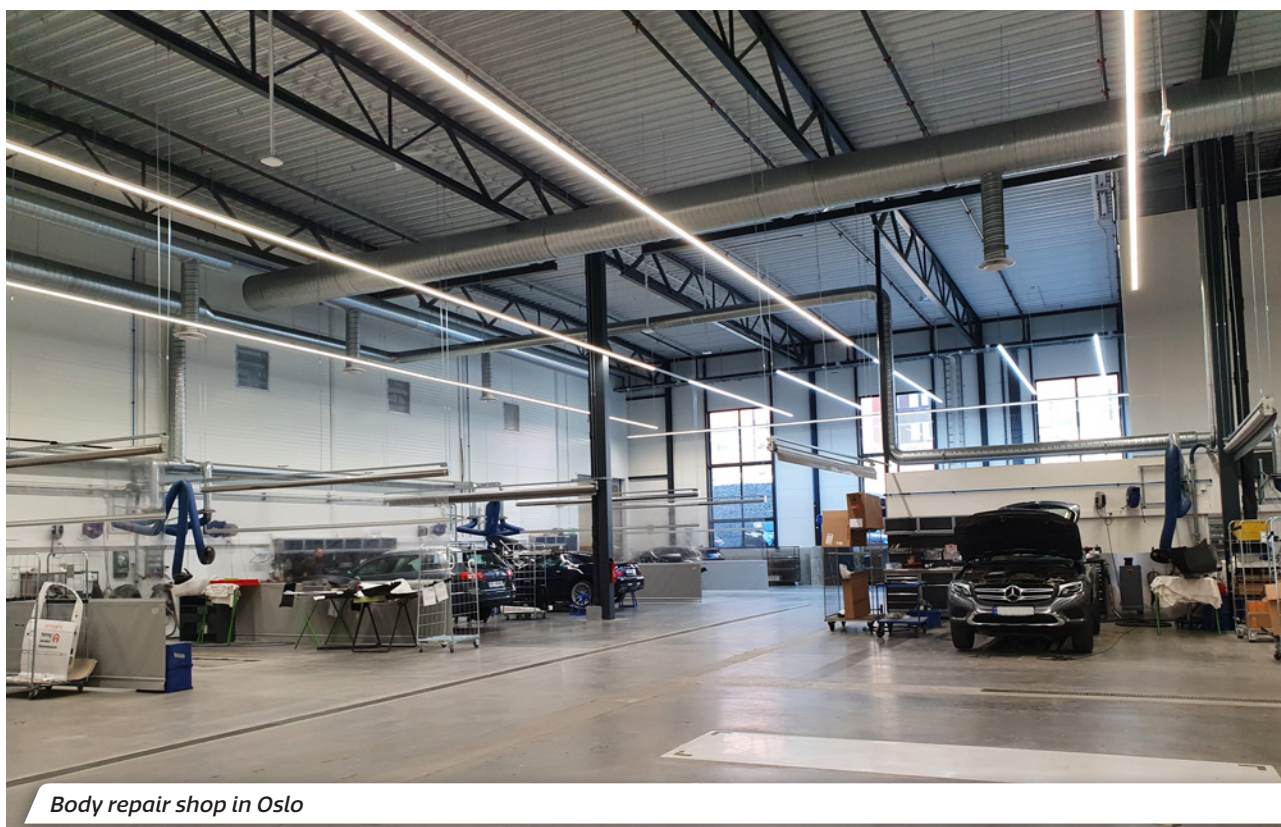
*Service department*

### Site visit: Large Body Repair Business, Langhus, Oslo

- Established 1946 and operating at four locations
- Large body shop repairing between 40 and 50 vehicles each week. Many of the vehicles are EVs and hybrids
- 99 per cent of the work in the shop is driven by insurers and the shop works for multiple insurance companies
- Locating local skilled tradespersons is a major challenge for the business and consequently they are unable to maximise the workflow capacity through the business. This is a major productivity issue raised on the tour
- Training for apprentices in body and paint followed something similar to the German model with an individual beginning their first two years of training at high school and then two years training in a workshop. It was raised that more needed to be done in schools to encourage young people into automotive trades
- Similar to Australia, it is reported that insurers have consistently pushed repair prices down in Norway and this has created a very lean business model in repair shops. However, on-site assessors are rare in the businesses visited and an estimate for the cost of a repair is generally accepted, based on a long term trusted working relationship between the repairer and insurer
- All insurers in Norway use a common repair times/ estimate platform called DBS. While DBS is insurer owned and managed, repairers accept it is just a guide and will often dispute times. DBS is updated every eight years and consequently it is generally out of date in relation to modern vehicles and contemporary repair times
- EVs have not significantly changed the operations of the body shop except a much higher focus on EV safety. It was considered a minimum requirement to have staff trained in EV safety
- There was not a record and any serious accidents or deaths from people working on EVs
- EV fire is the major concern however most workshops have measures in place to manage fires. In the workshop visited, EVs that were suspected of having any major battery damage were not brought into the workshop
- Removing batteries requires additional space to locate and secure
- EVs would be more likely written-off where severe battery damage was present. Issues were still raised in the industry regarding the insurers writing cars off, even when they could have been economically repaired
- Vehicle wastes seemed to be less of a challenge than in Australia and there did appear to be a far more uniform and managed waste management process in place



Body repair shop in Oslo



*Body repair shop in Oslo*

- Calibration was a key operation in this workshop and significant investments had been made in tooling and resourcing
- The workshop is considering undertaking minor mechanical repairs, partly as a means of raising profit margins in an increasingly competitive industry sector.

**Site visit: Large multi brand, new car dealership (seven brands), Marius Thorberg, General Manager**

- Visit to a large multi-brand dealer/showroom (seven brands, Stellantis brands, Mercedes-Benz, Smart and Kia)
- Established 1901. 290 staff. In 2021 sold 4,500 cars
- Car imports
- Own dealer network
- Customer services
- Snap Drive
- Car subscription usage is increasing and mainly amongst younger drivers
- Company has a traditional approach to apprenticeships. Trains their own apprentices. Two years at school and two years at work. First year of training at school is a general technology year and the second year is automotive specific. Then two years on the job. An employer can become an accredited training provider
- The EV transition meant the dealership sells no oil and has to undertake more data analysis and program uploads that have little profit margin
- Lower revenue on parts and labour given the lack of parts needed and the small amount of time required to service an EV. It can be less than one hour for a service
- Consequently, the dealership is getting back into tyres and other services that they gave away over many years
- The split for EVs in the dealership has seen EVs at 11 per cent of sales in 2017 move to 70 per cent in 2021. Plug-in hybrids have moved from 23 per cent of sales in 2017 to 19 per cent
- It was discussed the conventional hybrids have already plateaued and plug-in hybrids are likely to do the same. It was suggested that within three years the only new cars being sold in Norway will be pure EVs
- Tesla have been building more showrooms. Waiting time for Tesla repairs can be over a year. Tesla issues are one of the main complaints to the government office of consumer affairs



- The discussion of agency models was raised and there was not a huge resistance on the basis manufacturers have told dealerships that their overall business profitability will not change. Nonetheless there is a strong focus on improving the service offering to EV drivers given their vehicles will need less maintenance
- Agency agreements in Norway have evolved and there wasn't just one type of agreement. It is imperative that Australian dealers create the best possible agency agreements at the start of this transitioning and can learn from their counterparts in Norway
- Norway has a mandated tyre changeover from winter to summer tyres each year, with salt and grit on roads leading to significant brake repair and windscreen replacement work
- There was a view that an EV technician in the future would need at least the same time in training as a current mechanic, possibly more
- There are not specific EV technicians in the workshop, all technicians need to fix whatever comes into the workshop. Currently 70 per cent of all cars in the workshop are EVs
- Dealerships that are going to sell EVs should put in a supercharger with multiple charging points, however the upgrade costs are significant at around \$400,000.



*New cabling for EV chargers at dealership site*

<b>Location</b>	Stockholm, Sweden
<b>Organisation</b>	Motorbranschens Riksförbund (MRF)
<b>About</b>	<p>MRF (Motorbranschens Riksförbund) is the Swedish Association for Motor Retail Trades and Repairs. They demand high standards of members, especially in terms of sound business practice, the environment, quality and skills.</p> <p>The MRF has around 1,500 members nationwide, all of whom have undertaken to follow the MRF standards and guidelines, which includes guarantees and customer protection. All member companies use vehicle delivery and repair terms approved by the Swedish Consumer Agency</p>

### Meeting and discussion:

#### Motorbranschens Riksförbund

- Government has a major challenge in Sweden in finding a way to replace significant incomes from duty on petrol and diesel. One of the ways being considered is to introduce road-user charging for all vehicles
- A recommendation from MRF to lessen the CO2 emissions from the remaining car ICE fleet is to include the use of more biofuels
- The capacity of people in body corporates and strata accommodation to have increased power brought into their homes is a major issue. 60 per cent of people in Sweden live in properties that have shared residents

- Service stations are transitioning but a constraint is the size of service station sites and the degree to which they can provide any additional services
- Getting sufficient power to an existing service station is a major challenge
- It is anticipated by MRF that electric vehicles will make up around 70–80 per cent of sales by 2030. PHEVs will be 20–30 per cent
- Charging an electric vehicle currently costs around one third of the price of buying petrol. This is expected to increase given the current energy crisis
- Diesel trucks expected to make up 5–15 per cent of the truck sales market in 2030
- Customers in remote areas will purchase EVs if the electricity is cheap and readily available. Even in Sweden where temperatures drop below -20c (batteries loose around 20 per cent power in extreme cold conditions) people are still buying EVs
- The business conditions are in flux with different industry agreements and ownership models changing rapidly. The automotive landscape is shifting quickly
- MRF has developed an industry training program for the safe handling of high voltage systems in electric vehicles
- The Swedish government has been reluctant to enforce nationally consistent training requirements for technicians working on EVs.



General discussion at MRF headquarters

**Site visit: Din Bil dealership facility, Smista (VW, Audi and Porsche)**

- Din Bil is the biggest multi-brand dealer group in Sweden. It sells 50 per cent of vehicles in the market. It started importing and selling cars in 1948
- Fifty per cent of all new cars sold are EV or hybrids
- Stock shortage has driven high prices for used cars, often delivering twice the margin on new cars. Selling some 1,500 used cars a year
- Some new cars are taking over one year to get to the customer. Manufacturers are selling to markets that have the most margin and the capacity to move stock. This is unlikely to change for the foreseeable future
- Waiting times will shorten but unlikely to go back to where it was three years ago
- Two per cent of all new cars in Sweden are sold directly on-line. It was suggested this will be 10 per cent in five years
- ID.4 is the most popular vehicle being sold in the dealership
- EVs as a percentage of new car sales sold in the dealership is 60 per cent. Government incentives for buying EV are around \$A5,000 however this will be reduced next year and incentives for hybrids will be removed
- Tyre hotels are big in Sweden and Norway given by law car tyres need to be changed in winter. Dealerships are out to win this work back from the independents as a means of raising revenue given EVs require less maintenance
- Windscreen repairs are also common in Sweden and Norway due to gravel being spread on roads in winter
- Subscription models for vehicle servicing on older cars has been very successful and set at around \$A15 a month
- The agency model has been in some dealerships for three years and there is much discussion regarding how this will be further rolled out. There are different types of agency agreements. In the first few year's dealers were guaranteed their previous profit margins
- While Sweden doesn't currently have a cut-off date for the purchase of ICE vehicles it is expected there will not be any petrol and diesel new car sales beyond 2035
- Technicians were the hardest labour to find and particularly people with experience.
- There is great diversity of workers in the workshops but not good gender diversity.



*Team visit to Din Bil facility*





EV in service, dealership in Norway

### Meeting and discussion:

#### Circle K

- Circle K is a large member of the Association, along with OKQ8, PREEM, and ST1
- The main task of the association is to help transition their fuel retail members into the new energy market. They are working with big power suppliers to find the best solutions for the roll-out of the required infrastructure
- High rise apartments and body corporate problems in shared buildings, in countries such as Sweden may mean more people will use central charging locations. This may keep the metropolitan fuel and electric charging service centres alive
- In addition to metro charging stations, the main fuel outlets see charging along main highways as a main priority
- Government processes can mean it can take up to two years to get a permit to put chargers in and this has not changed for some years
- The next biggest challenge is getting sufficient power to the charging stations. There is not enough power available in many places
- The association has put a position to government that taxes should be dropped on biofuels as a means of reducing CO2 emissions whilst the transition process is taking place.

### Meeting and discussion:

#### Power Circle

- Power Circle started in 2005 is also a not-for-profit association that is focused on the power grid, electrification of transport and local power solutions. It is similar to the Australian Electric Vehicle Council
- Power Circle has a focus on working with policy advisers to speed up the EV transition process. They have a very broad range of members, from car manufacturers to electric vehicle companies
- It is estimated there are between 16,000 and 28,000 charging points in Sweden. This inconsistency is down to different definitions and anomalies in the categorisation of charging points
- Power Circle expect 100 per cent of all new cars will be electric by 2030. A key challenge in Sweden is the use of smart charging so that large numbers of cars aren't drawing a charge of the system at the same time
- Training programs are adapting and 90 per cent of skills development of new apprentices is focussed on EV technology. Advice to schools from MRF is to now stop training students in internal combustion engine technology
- Electrification of trucks is speeding up and there is an interest in the development of electric roads for heavy vehicle. Induction road charging is being looked at
- Hydrogen is also looking like a real possibility for long haul trucks in Sweden. Hydrogen rubbish trucks are being used in Sweden
- There was a discussion regarding the repair of batteries and how important this activity would be to the EV fleet and its maintenance.

**Site visit: Werksta Danderyd,  
light vehicle motor mechanic workshop**

- This business has an authority to carry out warranty and repair work for a broad range of vehicle types under the Stellantis range of vehicles
- Summers are short in Sweden and when cars come out of winter conditions, they often require significant service work. In times of high workflows dealerships often push work out to a broader authorised repairer network
- EVs in Sweden often stay with the dealer through the first few years of their life, except where external repairers have become an authorised warranty provider, or repairer, for one or more brands of vehicle. The workshop visited had numerous authorities from vehicle manufacturers
- There is a lack of service work associated with EVs, even when they were out of warranty and a poor rate of warranty payments provided to repair shops by manufacturers
- While manufacturers are promoting EVs as having very little servicing costs, there are preparation costs and space to locate a vehicle for hours of downloads and diagnostic work being absorbed by workshops
- EVs can be serviced quickly and because of the low margin on work performed, a workshop

will need to schedule in at least twice as many vehicles they would normally have in their workshop each day. This puts considerable pressure on vehicle movements and parking needed for more vehicles waiting for their service or being parked, waiting for a customer to pick it up. Tight scheduling, drop-off and pick up appointment times are needed, as is a resource to schedule and move multiple vehicles each day

- This work is currently being cross subsidised by work on traditional ICE vehicles, where there are still good margins. However, as workshops become more populated with EVs margins will deteriorate
- Some workshops have decided to not engage in EV work and to stay dedicated to ICE vehicles. This has some merit given the vehicle fleet in Sweden is around 18 years old, compared for instance that in Australia, which is around 10.5 years old. This means there will be a lot of older ICE cars on the roads in Sweden for some time
- Like many other automotive businesses in Sweden, they have decided to seek other work that is being performed by external business, – windscreens, tyres and vehicle detailing. This work has better profit margins and is also seen as an extension of a customer retention strategy



*Medium sized fuel retailer with charging stations in Stockholm*



Authorized general mechanical workshop, Stockholm Sweden

- The business visited was adamant that if mechanical workshops did not change their service model, they would not be viable in an EV world. Workshops will need to charge for all the work they perform, including any diagnostic work for customers. The days of helping people out for nothing were over and workshops needed to bill for their time in the future the same as a doctor or a dentist
- The workshop said that value-adding in areas such as vehicle cleaning and detailing would be necessary to maintain profitability. Subscription services, where a vehicle owner pays a monthly fee, for vehicle accessories like tow bars, heated seats and IT services would all be in the mix for sustainability. In some countries, this is already being made available
- On the matter of skilled labour many staff in the workshop originated in other countries, such as Poland and Afghanistan. Accessing general mechanical labour was not a big problem but finding skilled diagnostic technicians was a major challenge. Staff were not generally advertised for, but instead were found through word-of-mouth via their existing staff or through other informal networks
- The workshop manager was doubtful many young people coming out of school would have the attributes needed to diagnose and repair modern cars.

#### Site visit: RM Bilservice, Werksta

- Body and Paint/Workshop
- Large independent workshop with over 40 cars being worked on any one day. The business reported they had a good working relationship with insurers and to the point that they rarely attended the workshop. All repair estimates were provided to insurers were done so electronically
- The business had similar challenges with insurers recognising raising costs in the business environment including sharply escalating gas and electricity supplies and there were ongoing discussions on these matters
- In terms of labour in the workshop, it had 24 body repairers, 16 painters and four mechanics. There were also 12 administration staff
- The workshop undertook a significant proportion of mechanical work and of their labour pool it was hardest to find mechanics. Repairer staff in the business were a combination of trade qualified and non-qualified
- Most trade staff were found through word of mouth via the existing workers and a large proportion were from other countries
- Plastic welding and repair was still a specialist activity that was highly valued task in the body shop. It was also understood that the repair of vehicle plastics helped reduce the amount of vehicle plastic in the waste system.

<b>Location</b>	Amsterdam, Netherlands
<b>Organisation</b>	Haynes Pro, Diagnostic data specialists
<b>About</b>	Automotive data provider

- There is a different skill base needed to navigate and work with new diagnostic tools. While some vehicle calibrations are automated there is a big task in advising mechanics on how each vehicle technology works
- Labour-knowledge shifts in industry comes in waves. At the moment there is a big focus on electronics in the industry and not mechanical. However, this will leave big gaps in repair capability until the next wave of skilled staff comes through. An example is young workers not knowing how a multimeter works
- It's possible the role of the mechanic may diverge along two pathways, one mechanical and one electronics and diagnostics.

<b>Location</b>	Amsterdam, Netherlands
<b>Organisation</b>	Bicycle and Car Industry Association Netherlands (RAI)
<b>About</b>	RAI Automotive Industry NL is the leading authority in Dutch automotive manufacturing and supply chain industry, focusing on global automotive and mobility solutions by joining forces with industry members and stakeholders and acting as a catalyst in the fields of innovation and education

- Started in 1893 with a membership of 700 manufacturers, many of them manufacturing bicycles and trucks. RAI own and run the largest exhibition space in the Netherlands. This development started in the 1930s when the association members needed somewhere to exhibit their manufacturing goods. Then it was mainly cycles and cycle parts
- The exhibition facility is 75 per cent owned by the association and 25 per cent by government. Car shows were stopped some years ago and it was acknowledged the days of large car shows are largely over
- While the government has had a large drive to convert the vehicle fleet to EVs it is unlikely to meet its targets. They have major concerns regarding the capacity of the grid to supply



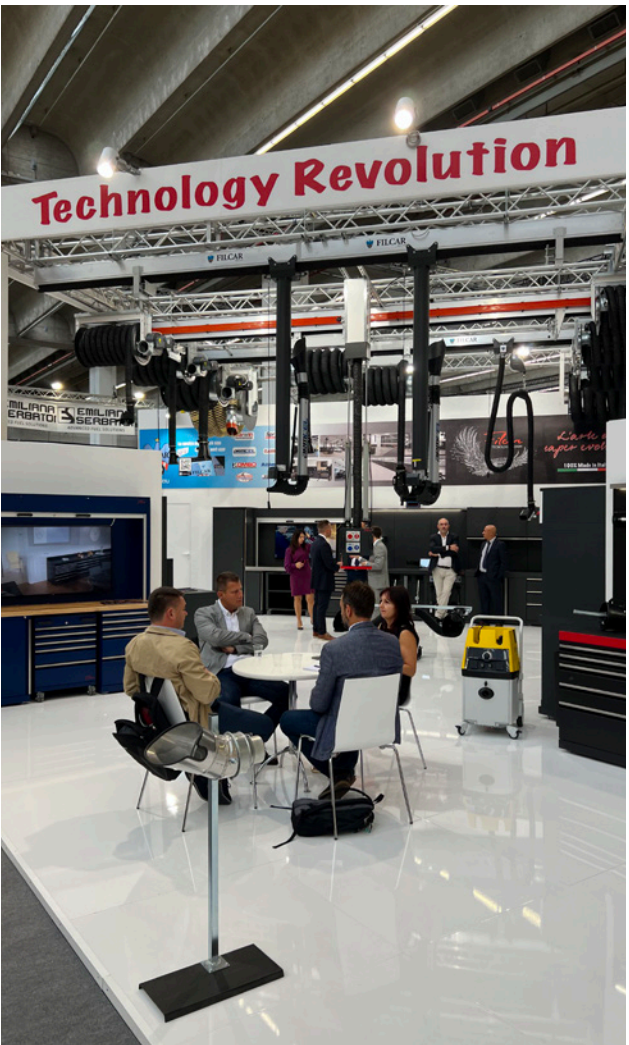
EV charger in Frankfurt

enough power for a large EV fleet. They also have concerns regarding the supply of EVs from manufacturers and the capacity of customers to buy them

- RAI has raised the capacity to use biofuels to drive ICE vehicles however this has little traction with government
- Farmers have been flying the national flag upside down in protest at the government's focus on the farming sector reducing its carbon emissions
- There was a concern that a number of incentives for the uptake of EVs were being reduced while at the same time carbon taxes on vehicles were increasing and with new considerations in government regarding road user charging initiatives
- The RAI expressed concern that government saw the ICE vehicle transition to EVs as a 'one size fits all' strategy and that they had not considered other multi-pronged strategies, biofuels for example.

<b>Location</b>	Automechanika, Frankfurt Germany
<b>About</b>	Innovations from international key players about new technologies and trends at the international meeting place for the manufacturing industry, repair shops and automotive trade. Automechanika represents the entire value chain of the automotive aftermarket. Automechanika Frankfurt, the world's leading trade fair, was held from 13-17 September 2022

Automechanika, one of the largest automotive trade expos in the world, was an opportunity to gain an understanding of where the aftermarket industry was focused. While the majority of equipment and products on display were ICE based, there was a range of EV related products including training aids and equipment and diagnostic tools. It was evident that the aftermarket suppliers are developing EV solutions.



<b>Location</b>	Munich Germany
<b>Organisation</b>	BMW Group Headquarters

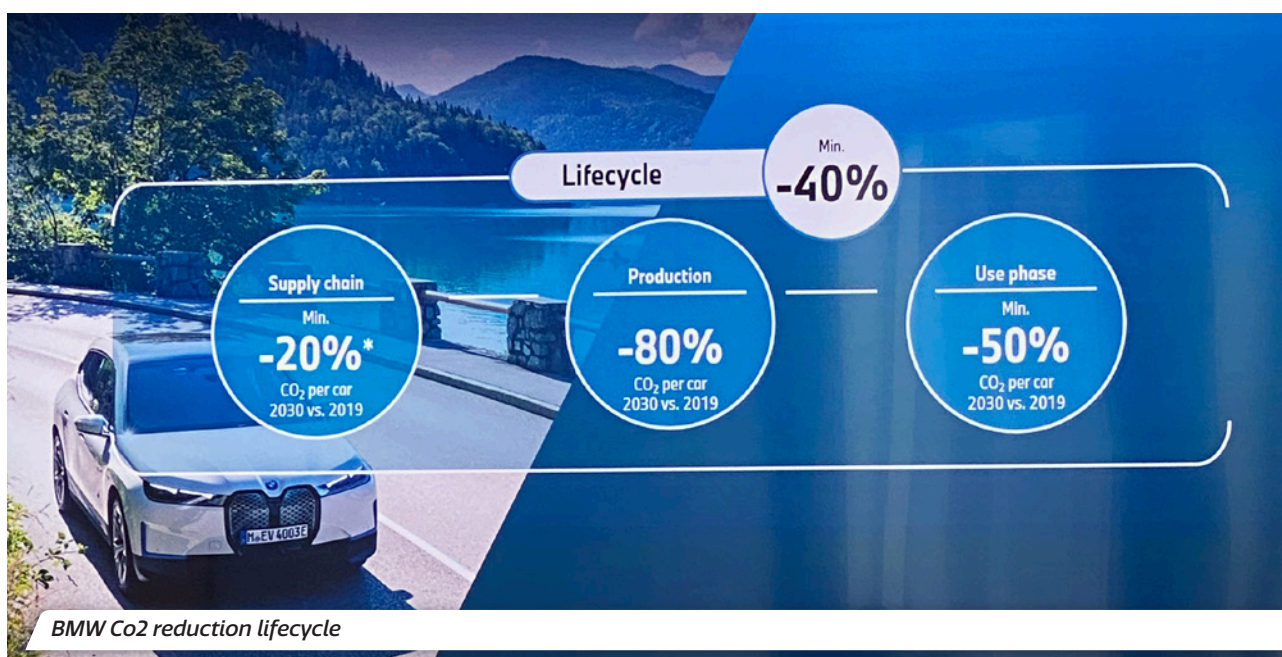
**Presentation:**

**Sustainability, EV Trajectory, Autonomous Driving**

- BMW is uniquely located in the centre of Munich. This is related to its early beginnings in 1913 and the company forms an integral part of the DNA and community fabric of Munich. The company has a production facility along with its Discovery Centre in the city. BMW employs around 60,000 people in Munich, including 7,000 in the vehicle production facility and 30,000 in research, design and development
- BMWs Discovery Centre highlighted BMW key products which included Rolls-Royce and Mini
- The costs of an EV reflected the battery composing 40 per cent of the total vehicle manufacture costs. BMW have taken control of its own battery manufacturing in Munich and this has led to significant knowledge and capability benefits to the company. Notwithstanding a constant reporting in the press of various EV battery advances (sodium-ion for example) the BMW EV battery is lithium based
- The supply of vehicle parts to BMW did not appear to be as severe as that reported by other manufacturers. Semiconductors also appeared to be in sufficient supply
- A public and industry frustration was emerging in Munich regarding bi-directional EVs that will be in common production by many car makers

by 2025. The issue related to government putting a charge on the uploading and downloading of power from car batteries into homes

- It was understood that changes to electrical legislation for the downloading and uploading of energy between properties and houses was being enacted but resistance was being felt in the community to what appeared to be a penalty tax when assisting with the energy load-balancing efforts
- BMW asserted that by 2030 most BMW models would be available in an EV offering, however this did not mean they would stop producing ICE vehicles for countries where these were still in demand
- A cut-off date for the non-purchase of ICE vehicles has not been set by the EU, however it is expected this will be legislated to be 2035. There was still room for the current production of ICE and hybrid vehicles to add significantly to the CO2 reduction efforts and BMW has a target on making these important contributions. This is part of BMWs Sustainability Strategy
- While BMW was deeply focused on reducing CO2 emissions in its vehicle production and use, it was not helped by a lack of clear EU policies and could not clearly commit to any one strategy until this was clearer
- BMW seeks to reduce its production CO2 outputs by 80 per cent by 2030, based on its 2019 production outputs



- The meeting discussed the price of EVs and the constant reporting by various press that batteries and EV prices would come down. The group were unsure if this would eventuate to the degree being suggested
- The impetus for more autonomy in cars would continue as would the generation of significant data sources from cars. EVs and modern connected cars would generate around 40 gigabytes of data every driving day
- Energy infrastructure remained a key discussion point at the meeting and it was understood that countries significantly advanced in their EV transitions have serious power transmission and infrastructure limitations.

**Site visit: BMW Group Research, New Technologies and Innovations House**

**Demonstration: E-Mobility in the Assembly Department**

- Hydrogen is a key area for development at BMW and is seen as an important spoke in the transition to a fully electrified vehicle fleet
- In visiting the hydrogen research facility it was clear that BMW, along with its partner in battery technologies, Toyota, saw much benefit in pursuing hydrogen vehicle technologies as a viable part of the overall EV solution, and particularly for heavy vehicles, trains, and other large freight tasks
- A highlight of the hydrogen discussions was noting that in some parts of the EU hydrogen is being piped across large distances through re-purposed gas pipelines. Hydrogen can be fed into the gas pipelines at a low pressure of seven Bar and the amount



*The delegation with BMWs Jürgen Guldner, General Project Manager Hydrogen Technology and Vehicle Projects*



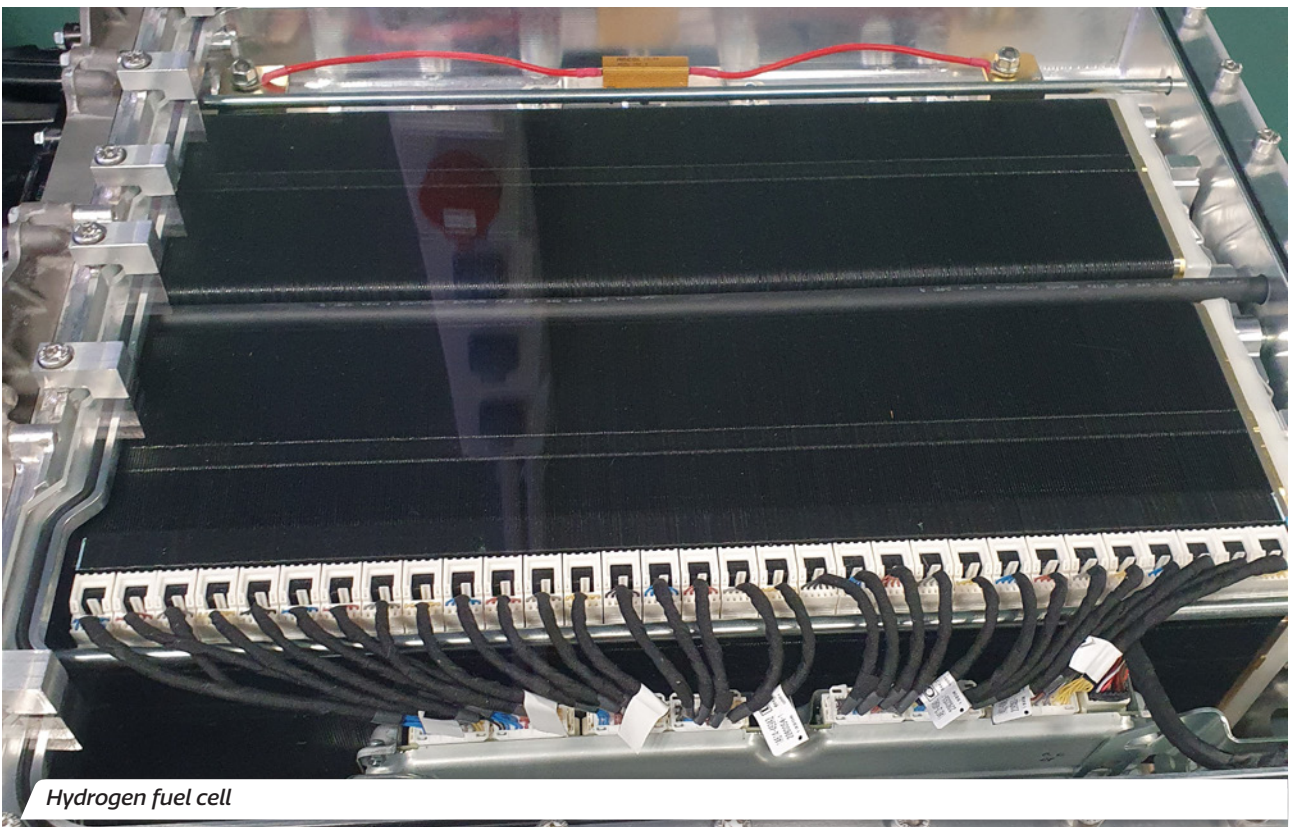
*BMW hydrogen drive chain cut-away*

of energy transmitted this way is five times the energy value of that passed through conventional electrified transmission lines

- A key theme throughout the entire BMW experience, and a view shared by many other EU industry stakeholders, was that one power generation technology will not be able to meet the electrification needs of the future
- An example of BMW's commitment to bring more EV to the market was reflected in the planning for 12 electric vehicles being in production and available by 2023. Including other hybrid variants, the number of electrified vehicles being made available in 2023 will be 25
- In 2021 there were already more than one million BMW EVs on the roads. By 2025 BMW will have sold over two million EVs into its markets. BMW's target is to have 50 per cent of its total global vehicle sales being EVs by 2030
- The group discussed the accessibility of hydrogen for vehicles in commercial and suburban areas and it was uncertain to what degree hydrogen would appear in metropolitan service stations. However, it could be pumped to local hydrogen hubs and then transported to service outlets
- It was made clear by the presentation team at BMW that any development of vehicle hydrogen

infrastructure in Australia should be made on the basis that trucks and cars use the same filling sites. The cost differences of enabling access to both was negligible given the base infrastructure needs was the same

- The group experienced the stacking and compression of cells and plates in hydrogen fuel cells, and it was clear that repairs to the actual plates of a fuel cell would be almost impossible. Once a fuel cell is built it is effectively a sealed unit. It was also observed that there were many other parts and functions of a hydrogen EVs that would need service and repair including the apparatus connected and driven by the fuel cell
- A view strongly expressed by BMW was that Australia had a huge opportunity to generate significant outputs of green hydrogen through solar technologies
- The group was provided a detailed and extensive tour of the Dingolfing manufacturing plant which is the biggest vehicle manufacturing plant in the EU. The plant produced 245,000 cars in 2021 with a daily production output of 1,600 cars.
- 17,000 personnel worked at the site with 12,000 in the production process. The site had 850 apprentices across 15 different disciplines.



Hydrogen fuel cell



<b>Location</b>	London, United Kingdom
<b>Organisation</b>	Retail Motor Industry
<b>About</b>	The Retail Motor Industry represents the interests of operators in England, Wales, Northern Ireland and the Isle of Man providing sales and services to motorists and businesses. The RMI has a formal association with the independent Scottish Motor Trade Association which represents the retail motor industry in Scotland

- New EVs purchased in 2021 made up 11.6 per cent of all car sales and the UK fleet is around two per cent EV or hybrid
- Forty per cent of households in the UK do not have the capacity to charge an EV at home
- Similar to other discussions it was understood that EVs were just one part of a bigger CO2 reduction solution, and that hydrogen would also play a big part in a greener traffic transition program
- The impact of EVs in workshops has not impacted businesses severely to date and this is due to a generally low number of EVs in the UK vehicle fleet and the fact that a large majority of these are still in their warranty period
- Repairers understand that there is less work and less margin in the repair and maintenance of EVs, but similar to the experiences in Germany, garages feel obliged to maintain these vehicles or their customers may take their EV and ICE cars to a repairer who will repair both
- The retention of staff through profit sharing was being raised more so in the UK and it was seen as just one method through which staff could be held for the longer term and motivated to stay in the business
- Skills shortages in the UK are severe and long term. Similar to Australia, and all other countries visited, there was a sense that schools were not promoting automotive careers, and, in many communities, auto jobs were still seen as being dirty jobs
- The RMI had worked with its partner training providers in the delivery of hybrid safety training. The training had great uptake in the early stages of roll-out but had slowed more recently. The slowing of training uptakes was likely to be due to a reduction in anxiety in the

industry regarding the EV transition and a slow uptake of EVs

- Body repairers would continue to see more EV work entering their workshops. In many ways they would be less impacted in the transition to EVs than light vehicle mechanical workshops
- Insurers are having more of a focus on risks in body repair shops and this included training of staff in EV safety. The group was told that some shops would not get business insurance without the proper training being undertaken by repair staff
- The storing of damaged EVs in body shops was highlighted as an area where body repairers would have increased storing and risk costs
- It was estimated there will be around 500 high voltage EV repair shops in the future where the majority of battery and power related repairs would be undertaken. It was clear that few if any general repair shops would be involved in the repair of batteries given the space and specialty required to do this. Most damaged batteries would be changed over with a reconditioned one
- The current EU arrangements for access to vehicle repair information expires in the UK in Oct 2023 and the industry and government are considering how to transition to a UK model. There was strong support for the Australian arrangements for access to repair information
- The group were provided with a presentation from automotive technician and RMIF member Matt Cleevly. Matt had created a specialist business in the repair of EVs and their batteries and was seen as a trail blazer in this space. The business provided a valuable insight into what a proficient EV repair business may look like
- It was acknowledged that the dealership network would not be able to service the entire EV fleet as it emerges, and this maintain the current split between dealership and independent repair work. Both parts of the industry were needed in the future
- Mobile EV service technicians were seen as an area for growth, and this reflected the Australian situation where mobile automotive repair services were one of the industry's largest growth segments
- The UK Hybrid and Electric Vehicle Repair Alliance (HEVRA) was identified as a key resource for mechanics who drive and repair EVs.

<b>Organisation</b>	BP Global Electrification Unit, London
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**BP strategy**

**Global electrification strategy**

**EV global insights B to C**

- Every country is different and has its own challenges
- BP is developing their first EV sites in Australia on forecourts next month. Electricity connections in all countries are a challenge. Lots of regulations and mandates to overcome. Example, India electricity tariffs that are mandated but are hard to initiate by electricity providers
- BP like any other energy companies is transitioning into an integrated energy company and will be rolling out a charging network as sales increase
- Up to 70 per cent of service stations are in BPs core geographic. In some areas this will be 90 per cent by 2050
- Australia's EV uptake looks a bit like India. New Zealand looks more like the EU and is ahead of Australia
- Electrification is happening and by 2040 the car park would have largely transitioned

- Hydrogen will not play a key role in cars but more so for heavy vehicles
- Every EV strategy has to be reviewed annually
- Australia needs a big change in policy and philosophy to be a leading regional EV transition agent. Given Australia doesn't make cars it is likely to get the vehicles when the OEMs have filled their local and more lucrative markets
- BP track eight key indicators in the market such as cost of vehicle ownership, the state of EV sales, fleet decisions, government incentives, fast charging and infrastructure capacity
- Even in mature EV markets we are effectively on day one of a very big transition
- The consumer experience will be a key factor for brand loyalty given the electricity is the same wherever you go
- 40 per cent of the UK don't have charging space or capability to charge a vehicle. 15 to 20 per cent of the vehicles in Australia are likely to be charged via public and pay services. This will require a comprehensive network



- Food sales in garages will increase as fuel sales drop and customers charge their cars. BP fuel options/products, on the go, fleet solutions and convenience charging
- Also selling wall boxes for home. BP Pulse is the general branding name for their power transition strategy for forecourts
- BP suggest 6.3 per cent of the A/NZ car fleet will be EVs by 2030
- Inbound roaming and telematic messaging to vehicles will largely direct consumers to power, food and service arrangements
- BP is putting, €1 billion into Spain and Portugal to deploy 11,000 fast charging points
- Green hydrogen being produced by BP in Spain, Portugal and the UK
- Putting chargers in is not difficult it's the cost of power and how consumers are driven to it
- Service stations and other high traffic areas will still be central to the BR power roll-out.
- Power to fleets and fleet/energy deals will be an early and central part of the BP electricity transition
- Governments in Australia and NZ tend to favour start-ups in new technology businesses.

## Australia and NZ Consumer Insights summary

- Motivations for consumers to get an EV. Sustainability and green concerns are a key reason for buying an EV in Australia. Triggers for changing to and EV, solar power benefits, cost of fuel, future proofing budgets for retirees
- There are concerns amongst consumers in Australia around batteries and a lack of freedom around where and when they are going to charge their vehicle
- Hopes for the future form Australia consumers
- Real green power, lower price of power, range anxiety as a thing of the past, capacity for one vehicle per family.

## NZ experience

- There is a pride in NZ EV drivers feeling they have done the right thing. No longer having to visit the garage for fuel. Green energy is important as is moving to a one car per family
- Barriers to EV adoption. Price of vehicles, extra effort required to use and maintain a different type of vehicle, social influence of being seen as an EV driver, charging infrastructures.



BP's representative and the delegation team at central London underground UBER charging station

## UK Pulse network overview, Pulse BP

- Technology and charging stations: Tesla has now opened up 15 stations so that non-Tesla vehicles can use them
- BP end of the year expect 10,000 charging stations across the UK. 70 per cent of people live within five km of a pulse Rapid or UFC. Chargers can go up to 300kW (super-fast). 50kW is a Rapid Charge
- Already thinking of taking out 7kW charge posts and putting in higher kW posts. Local authorities are changing their position on planning applications for EV chargers
- Overstay penalties are becoming more common for vehicles just parking in EV bays. Councils are demanding more car parks have charging stations
- UK EV car park to exceed 13 million vehicles in 2030 (32 per cent of the car park will be EV)
- Car registrations. 20 per cent market share for BEV and PHEVs. More people in company cars are seeing EVs as an economically good decision
- Geographic planning tools are used to determine where EV chargers should be located
- Planning applications for low voltage chargers (lift and shift) are not problematic. BP are in joint ventures where say they get the power to a site and then a charging company will put the chargers in and then pay BP a rental cost.

### Forecourt roll-out

- 300kW chargers are on some forecourts. Space is a challenge on some sites. EV chargers can go under cover in service stations unless the fuel pumps have been taken out
- Around 15 minutes to charge a vehicle at a forecourt
- Grid connection costs can take up to eight months and costs can be 80 to 2.5 million pounds.

<b>Organisation</b>	Society of Motor Manufacturers and Traders
<b>About</b>	<p>The Society of Motor Manufacturers and Traders (SMMT) is one of the largest and most influential trade associations in the UK. Its resources, reputation and unrivalled automotive data place it at the heart of the UK automotive industry.</p> <p>SMMT is the voice of the UK motor industry, supporting and promoting its members' interests, at home and abroad, to government, stakeholders and the media.</p> <p>SMMT represents more than 800 automotive companies in the UK, providing them with a forum to voice their views on issues affecting the sector, helping to guide strategies and build positive relationships with government and regulatory authorities</p>

- The UK needs to be carbon neutral by 2050. The decarbonisation of the vehicle fleet is a big part of this transition. The car fleet has to be net carbon neutral by 2035
- Fuel levies in the UK raise around 35 billion pounds annually. It is expected that road user charging regimes will be introduced to collect revenue lost from wet fuel levies
- Hydrogen was seen as part of the vehicle decarbonisation solution, but this would largely be limited to heavy and commercial vehicles
- Charge points that were fit for the quickly changing EV fleet were raised as a major challenge for the transition process
- There is a massive energy pricing challenge in the UK and prices for home and industry are up three times on last year. On the day of the meeting the UK PM made announcements regarding the capping of energy prices for industry, schools, and hospitals for six months
- Orders for vehicles in the UK still has waiting times of six to eight months, driven by manufacturer backlogs. Semiconductor supply seemed less problematic than last year, but general manufacturing supply was a problem
- EV and electricity pricing has meant that the UK ICE vehicle fleet is and will continue to age as some people were unable to transition into an EV

- The UK had made significant investments in battery manufacturing plants and more facilities would be established. This looks to be a larger and emerging industry in the UK
- The association had concerns that vehicle cost predictions for the future were made when mineral and power prices were far cheaper than they were currently. This could lead to significant over confidence in terms of EV affordability and consequent up-take
- Overwhelmingly discussions in government are centred on fully that electric vehicles. There is very little support for hybrids that are seen as old technology
- Incentives for personal EV purchases in the UK have largely been removed with remaining incentives for company and fleet cars and some for charging station in flats and apartment blocks. The UK position parallels that of other countries visited where incentives had been brought through in recent years and were gradually being removed
- Incentives for vehicle fleets have been supported on the basis it is a faster way of generating a used EV car park and consequently affordable cars for people who can't afford a new EV
- Typical policy models to bring EVs into the UK, to meet CO2 reduction mandates, rely on manufacturers having CO2 reduction targets across the vehicle range they sell. This means OEMs can sell some high polluting vehicles as long as the balance of their CO2 car sales for the year meet an ever-tightening CO2 target. Carbon trading between OEMs and high financial penalties for missing targets are the main operational triggers in the model
- It's possible some OEMs may leave the UK market if they can't produce zero emission vehicles or generate favourable carbon trading conditions for their brand.



<b>Organisation</b>	Office of Zero Emission Vehicles, United Kingdom
<b>About</b>	The Office for Zero Emission Vehicles (OZEV) is a team working across government to support the transition to zero emission vehicles (ZEVs). The Office of Zero Emission Vehicles provides support for the take-up of plug-in vehicles, as well as funding to support charge point infrastructure across the UK

The Office for Zero Emission Vehicles (OZEV) is a team working across government to support the transition to zero emission vehicles (ZEVs).

- The presentation outlined the key zero emission fleet policy developments in the UK including a position on enabling OEMs to achieve a balance in the emissions of the vehicles they sell into the UK market
- UK government has currently 2.5 billion pounds to support a zero-emission transition. This funding is largely targeted at improving power infrastructures and charging stations
- The group discussed e-bicycles and e-scooters and it was clear these would remain a key part of a transition to e-mobility in the UK. E-scooters will shortly be designated as a vehicle in the UK and categorised as low speed zero emission vehicles

There are currently 30 licenced e-scooter trials under way in the UK

- High voltage charging will be at the centre of the power framework, and this is something that had changed in the market even over the past five years. There was a growing view that low 7-11kW chargers in public places were not fit for purpose given the time needed to get a decent charge into a vehicle. More cars would be able to take rapid charging and the charging network would have to respond to this
- The group were informed about an accreditation program for dealers that work on EVs. This was based on training and equipment standards being met and maintained
- The importance of an education campaign by dealerships in order that consumers were properly advised on charging capacities of their vehicles was identified
- Over time it is expected that annual compulsory vehicle testing and the cost to improve ICE vehicle emission compliance would be a major incentive for drivers to get out of ICE cars
- Ease of use of public charging stations remained a key theme with a push to contactless systems. The UK had transitioned through different level of charging systems in recent years. Multiple providers with different machines and processes were a concern.



*The team from the UK Department for Transport-zero emissions vehicle group, and the delegation group*



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