

RACE for 2030

RELIABLE
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ENERGY

FINAL REPORT

E8: International Electric Vehicle Policy Scan

Strategic Research for Informing EV Policy in Australia: Achieving our 2035 Targets



Research Theme ET8: Integrating Electric Vehicles with the Grid

Project Code: 1067

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What is RACE for 2030?

RACE for 2030 is a 10-year cooperative research centre (CRC) with \$350 million of resources to fund and support research towards a reliable, affordable, and clean energy future.

Acknowledgement of Country

The authors of this report would like to respectfully acknowledge the Traditional Owners of the ancestral lands throughout Australia and their connection to land, sea and community. We recognise their continuing connection to the land, waters, and culture and pay our respects to them, their cultures and to their Elders past and present.

Disclaimer

The authors have used all due care and skill to ensure the material is accurate as at the date of this report. The authors do not accept any responsibility for any loss that may arise by anyone relying upon its contents.

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List of Abbreviations

Abbreviation	Meaning
AEMC	Australian Energy Market Commission
AEVA	Australian Electric Vehicle Association
AER	Australian Energy Regulator
AFIR	Alternative Fuels Infrastructure Regulation
ARENA	Australian Renewable Energy Agency
BEV	Battery Electric Vehicle
BiK	Benefit-in-Kind
BIL	Bipartisan Infrastructure Law
BMS	Battery Management Systems
CALD	Culturally and Linguistically Diverse
CBA	Cost-Benefit Analysis
CEC	Clean Energy Council
CEE	Energy Saving Certificate
CEF	Connecting Europe Facility
CEFC	Clean Energy Finance Corporation
CFI	Charging and Fueling Infrastructure
CPP	Critical Peak Price
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DER	Distributed Energy Resource
DMO	Default Market Offer
DNO	Distribution Network Operator
DNSP	Distribution Network Service Provider
DOE	Dynamic Operating Envelops
DSO	Distribution System Operator
ECA	Energy Consumers Australia
EECA	Energy Efficiency and Conservation Authority
ENA	Energy Networks Australia
EU	European Union
EVC	Electric Vehicle Council

FBT	Fringe Benefits Tax
Abbreviation	Meaning
FCAI	Federal Chamber of Automotive
FCAS	Frequency Control Ancillary Services
FHWA	Federal Highway Administration
HUF	Highway Use Fee
HVIP	Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project
ICA	Insurance Council of Australian
ICE	Internal Combustion Engine
IIJA	Infrastructure Investment and Jobs Act
iMHZEV	Incentives for Medium- and Heavy-Duty Zero-Emission Vehicles
IRA	Inflation Reduction Act
KsNI	Klimaschonende Nutzfahrzeuge und Infrastruktur (Climate Friendly Commercial Vehicles and Infrastructure)
LCT	Luxury Car Tax
LCLF	Low Carbon Liquid Fuel
LEHVF	Low Emissions Heavy Vehicle Fund
LEVI	Local Electric Vehicle Infrastructure
LEZ	Low Emission Zone
LV	Low-Voltage
MCS	Megawatt Charging System
MTAA	Motor Trades Association of Australia
NEDO	New Energy and Industrial Technology Development Organisation
NER	National Electricity Rules
NEVI	National Electric Vehicle Infrastructure
NEVS	National Electric Vehicle Strategy
NVES	New Vehicle Efficiency Standard
OBR	Office for Budget Responsibility
OEM	Original Equipment Manufacturer
PHEV	Plug-in Hybrid Electric Vehicles
RCF	Rapid Charging Fund
SAPN	SA Power Networks

SEAI	Sustainable Energy Authority of Ireland
SEC	Smart Energy Council
Abbreviation	Meaning
SMMT	Society of Motor Manufacturers and Traders
ToU	Time-of-Use
ULEZ	Ultra Low Emission Zone
VAT	Value Added Tax
VES	Enhanced Vehicular Emissions Scheme
VPP	Virtual Power Plants
V2G	Vehicle-to-Grid
ZEHDV	Zero Emission Heavy Duty Vehicle
ZETA	Zero Emission Transportation Association
ZEV	Zero Emission Vehicle
ZEZ	Zero Emission Zones
ZEZ-F	Zero Emission Zones for Freight
ZFE-m	Zones à Faibles Émissions Mobilité (Low Emission Mobility Zones)

Executive Summary

International experience shows that accelerating electric-vehicle (EV) uptake requires a coordinated and durable suite of policies that work across dimensions of affordability, infrastructure, supply-chain resilience, and the evolving needs of consumers. Policies must also adapt as markets move from early adopters to the early majority.

Across those jurisdictions leading EV adoption, there are several policy patterns emerging relevant to Australia's market transformation. This report draws on policy experience and higher levels of EV adoption across the EU, UK, US, Norway, France, Germany, Sweden, New Zealand, India, Singapore and China. Cross-cutting themes have emerged from this analysis that are directly relevant to Australia's next phase of market development.



1. Sequencing, certainty, and policy durability

Markets that have sustained EV uptake share a common trait: providing clear, long-term signals to manufacturers, investors, infrastructure providers, and consumers. This principle applies beyond standouts such as Norway's three decades of tax exemptions to examples, the UK's Zero Emission Vehicle Mandate, and the EU's binding 2035 zero-emission vehicle target. Counter-examples are equally instructive with Germany's abrupt withdrawal of the *Umweltbonus* EV subsidy in late 2023, and New Zealand's removal of the Clean Car Discount in early 2024. In both cases, these policy changes were followed by sharp declines in EV sales contributing to increased market uncertainty.



2. Coordinated national-to-local charging infrastructure frameworks

Mature EV markets consistently demonstrate the value of nationally coordinated charging strategies delivered through local implementation. The EU's Alternative Fuels Infrastructure Regulation, Germany's Charging Infrastructure Masterplan and the United States' NEVI program demonstrate how national targets, minimum technical standards, conditional co-funding and mandated uptime requirements improve network consistency and reliability. The UK's Local Electric Vehicle Infrastructure (LEVI) Fund also shows that with central guidance, standards and capability support, kerbside and on-street charging can be delivered at scale while drawing on local knowledge and community context. International evidence supports national-to-local frameworks having a critical role, and that delegating without an overarching national framework risks fragmented outcomes and inefficient investment.



3. Equity by design

As EV markets mature, equity becomes central to sustaining adoption and without deliberate intervention, EVs remain concentrated among higher-income households and well-served urban areas. Leading jurisdictions are responding through targeted affordability measures such as France's social leasing program, UK salary-sacrifice schemes, the US point-of-sale tax credit, and fleet-focused subsidies that can reach lower- and middle-income households. For heavy vehicles, targeted grants and purchase incentives (Germany's KsNI, Ireland's ZEHDV scheme,

California's HVIP) are emerging as key tools to overcome high upfront costs. Feebate systems are creating self-sustaining pricing signals although step-based schemes (e.g., Singapore) require calibration to maintain budget neutrality.



4. Australia's changing position in the international system

The modern vehicle is now as much a software and data platform as it is mechanical. Connectivity, over-the-air updates, cybersecurity, interoperability and data governance are integral to vehicle performance, safety and consumer trust. The EU has introduced binding cybersecurity and software-update regulations (UNECE R155 and R156) through its Type Approval framework, is implementing the Data Act to govern vehicle-generated data and is driving charging-interoperability standards through AFIR. The UK has established a dedicated framework for automated and connected vehicles through its 2024 Automated Vehicles Act. The United States has expanded cybersecurity guidance through NHTSA and moved to restrict connected-vehicle imports on data-security grounds. Australia will primarily adopt rather than create rules in this environment but by engaging more actively in international rule-shaping forums, clearer market signals can be provided to industry, investors and consumers. Jurisdictions that fail to engage actively in international regulatory and standards-setting forums risk delays in deploying emerging energy and data-enabled services, and reduced influence over the technologies that will shape consumer choice, system resilience and consumer protection.



5. Policies designed to support domestic supply chains are also intensifying

The EU, UK, US and India are investing heavily in domestic battery manufacturing, recycling and critical-minerals security, reflecting wider geopolitical and industrial-policy shifts. Battery-recycling frameworks such as the *EU Battery Regulation* and India's *Battery Waste Management Rules* highlight the growing importance of circular-economy requirements and lifecycle transparency through innovative mechanisms like digital battery passports.



6. Emerging consumer insights are reinforcing the need for targeted and differentiated policy approaches

In markets that are moving beyond early adopters, purchase decisions are still being shaped by concerns about price, range, and charging access. However, preferences (and therefore uptake) are highly variable across demographic groups, localities, and regions. Research consistently finds that prior exposure to EV driving, tailored communications, and clear public-awareness campaigns significantly increase willingness to adopt.

Overall, international evidence is demonstrating success for well- coordinated EV transition policy and program strategies that combine:

- Targeted financial incentives to improve affordability and broaden access.
- Robust, coordinated charging strategies backed by national standards and local delivery.
- Consumer-focused communication and segmentation strategies that can support mainstream adoption.
- Supply-chain and circular-economy policies that build long-term resilience.
- Integrated workforce planning to meet growing skills requirements.

These early lessons provide a strong evidence base to inform Australia’s next phase of EV market development and policy design. The four cross-cutting themes drawn from this evidence are developed in greater depth in the report’s synthesis chapter.



1. Introduction

Context and challenge

Australia is at a critical juncture in the electrification of its transport sector.

Emissions from transport are expected to overtake electricity generation to become the largest source of greenhouse gas emissions in Australia by 2030. EV adoption has grown rapidly with 500,000 EVs now on the roads. Even with the current surge in interest in EVs as the oil crisis hits with the 2026 conflict in Iran, almost 90% of new car purchases remain fuelled by petrol or diesel with their emissions locked in for the next 15-20 years.

Sustaining momentum in transport decarbonisation will require policy certainty, shared knowledge, cross-sectoral collaboration, and trusted evidence. As EV markets move beyond early adopters, policy settings will increasingly determine whether uptake continues to accelerate or begins to plateau.

The research here recognises that EVs are an emerging technology which are quickly scaling internationally. Scaling has resulted from a combination of effects including policy design, industry support and growing economies of scale. As such, the literature is relatively limited, but the outcomes of the research conducted here provide evidence of how these technologies have been scaled through well-designed policy choices addressing a range of outcomes including air quality, reductions in greenhouse gas emissions and higher degrees of system resilience, industrial competitiveness and energy security.

This research has not sought to explicitly model the cost or benefits of various approaches, nor has it separately quantified the comparative effectiveness of individual policy design features against alternatives. Rather, it highlights different activities undertaken globally and the rationale for those choices. Direct comparison with Australia and its distinctive characteristics, including a widely spread population, federated governance arrangements, specific tax and energy market architecture, and industrial policy settings, has not been undertaken. Rather the paper concentrates on the rationale for international choices and the evidence of changes brought about through those changes.

Timing and policy alignment

The timing of this analysis is important. Several policy initiatives and decision points are converging, influencing how Australia plans to achieve its 2035 targets and remain on track for net zero by 2050.

The Net Zero Plan sets out the actions required to keep global warming well below 2°C degrees, with efforts to limit it to 1.5°C degrees. For the transport sector, this challenge is amplified by projected population and economic growth through to 2050. The Net Zero Authority's Sectoral Plans for Transport & Energy identifies priority actions, which include investing in and enabling low and zero emission transport infrastructure and electrifying transport, among others.¹

¹ Department of Infrastructure, Transport, Regional Development, Communications and the Arts. (2025). *Transport and infrastructure net zero roadmap and action plan*. Australian Government. <https://www.infrastructure.gov.au/sites/default/files/documents/transport-and-infrastructure-net-zero-roadmap-and-action-plan.pdf>

The Australian Government has also announced a 2035 emission target on its pathway to net zero, aiming for a reduction of 62-70% below 2005 levels. At the international level,

Australia and the Pacific nations will play a key role in COP 31 in 2026, an internationally important event focussed on climate action and progress towards the goals of climate change mitigation and adaption.

At the same time, live policy debates continue to shape Australia's EV adoption trajectory. Issues such as Fringe Benefits Tax (FBT) exemptions, road user taxing, and infrastructure investment have been under active consideration, while misinformation risks diluting public confidence and slowing progress.

Other jurisdictions are grappling with similar challenges and are implementing policy responses which Australia can learn from. However, not all approaches will be directly transferable to the Australian context.

Against this backdrop, this report draws on international experience to identify cross-cutting insights and policy implications relevant to Australia's next phase of EV market development.



2. Approach and Context

This report provides a snapshot of current and previous international EV policy that has relevance for the Australian context.

Research approach

The research was structured around the six policy areas outlined in Table 1, which were identified by industry body, the EV Council, as the core pillars shaping contemporary EV policy development in Australia today. These areas had been refined with input from across the Australian EV industry through multilateral and bilateral engagement undertaken by the EV Council.

Table 1. Policy area focus

Policy Area	
1. Light Vehicle Policies	Incentives, road user and congestion charging, phase outs, industry advocacy (not policy per se but area of focus)
2. Heavy Vehicle Policies	Subsidies, feebates, zero emission zones
3. Energy Policies	Tariffs, network connections, network visibility, equity and access
4. Charging Policies	Roadmaps and strategies, charging hubs, Megawatt charging, different use cases, local government
5. Enabling and Supporting Industries	Insurance, financing, supply chains, recycling and local manufacturing, skills and workforce.
6. Consumer Adoption and Education	Purchasing trends, demand-side policies, beyond early adopters, information, public awareness campaigns.

Country and region shortlisting

The selection of EV policies for the assessment was conducted through a process designed to capture both proven international best practices and highly relevant domestic industry priorities.

Initially, countries and jurisdictions were identified from those with high EV adoption rates, mature regulatory environments, and geographic or economic similarities to the Australian context.

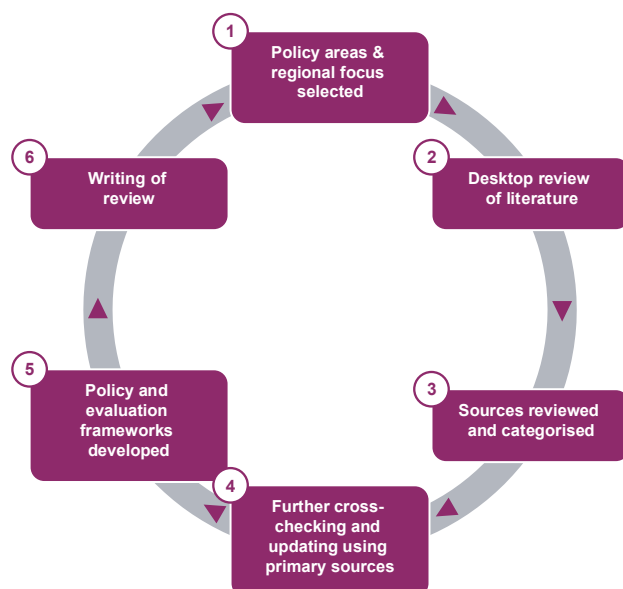


Figure 1. Approach of the international policy scan

From this global pool, specific policy instruments were identified and shortlisted based on the availability of policy reports and their demonstrated capacity to address primary market barriers. Some flexibility was allowed where jurisdictions outside the core comparator group offered particularly relevant or instructive policy examples, or where useful insights emerged during the course of the research.

The research also marks a moment in time amidst a fast moving and dynamic policy and economic environment. This approach therefore sought to balance these factors while still capturing a mix of instructive examples from leading EV jurisdictions and comparator markets facing similar structural constraints.

Policy evaluation & transferability framework

A structured framework was developed to systematically compare international EV policies to assess their relevance and transferability to the Australian context while deriving overarching insights. Policies were examined across legislative instruments, regulatory standards, and implementation mechanisms, considering both their intended objectives and observed outcomes. Transferability was informed by six risk categories.

Assessment criteria

- ☒ Practical Implementability
- ☒ Political Feasibility
- ☒ Australian Relevance
- ☒ Cost & Value for Money
- ☒ Strategic Fit
- ☒ Expected Impact

Risk categories

					
Political & legitimacy	Economic & fiscal	Social & equity	Technology & operation	Legal & compliance	Administration & implementation

Australia's vehicle regulatory environment

Historical and structural context

Australia's vehicle regulatory system has historically operated as a rule-taking framework. The primary system governing vehicle standards is the United Nations Economic Commission for Europe's World Forum for Harmonization of Vehicle Regulations, which Australia adopts through the Australian Design Rules. While this approach has supported market access and regulatory alignment, it has resulted in a largely reactive model of governance.

This position emerged from Australia's reliance on vehicle imports and limited domestic manufacturing scale since Holden ceased production in 2017, which reduced incentives to lead international standard-setting. Over time, this has constrained Australia's ability to proactively shape regulatory outcomes and respond early to emerging vehicle technologies.

However, this has also resulted in Australia pursuing a relatively open approach to vehicle imports compared with European and US markets. Since then, Chinese-manufactured vehicles in particular have become more widely available in Australia, seeing strong growth over this time to represent a significant share of passenger vehicle market.

Costs and emerging challenges

The relatively late introduction of emission standards in the New Vehicle Efficiency Standard (NVES) from 1 January 2025 illustrates the consequences of delayed action, with Australia experiencing prolonged inflows of high-emitting vehicles relative to comparable markets.

As Chinese manufacturers become a larger source of supply, Australia's vehicle import base is changing. Their vehicles were not always designed with the European UNECE vehicle regulations, and Standards Australia has traditionally adopted UNECE regulations through Australian Design Rules. This shift is occurring alongside rapid development of EV-specific regulations internationally and outside, or on, the peripheral of Australia's existing vehicle standards framework. In particular, around grid integration, cybersecurity, communication standards, and data sovereignty. The shift also has data-sovereignty and cybersecurity dimensions that Australian regulatory frameworks are only beginning to address, alongside the underlying standards-adoption question. These issues require coordination across transport, energy, and digital policy domains that have historically been treated separately.

Policy context and timing

Australia is at a critical point in transport electrification. Transport emissions are projected to overtake electricity generation as the largest source of greenhouse gas emissions before 2030. While EV uptake is accelerating, around 90 per cent of new vehicle purchases still rely on fossil fuels, locking in emissions for the next 15 to 20 years.

Major policy debates continue to shape Australia's EV adoption pathway. Progress will depend on policy certainty, trusted evidence, and effective cross-sector collaboration. The timing of the current policy refresh aligns with key budget and policy planning cycles, creating an opportunity to maximise policy influence and address structural gaps in the regulatory framework.

3. Light Vehicle Policies

Introduction

Light-vehicle policies are a critical early lever for shaping electric vehicle (EV) adoption and driving market transformation in Australia, as in many other markets. This section examines international approaches to a range of policy mechanisms, including road user charges, EV purchase incentives, internal combustion engine (ICE) disincentives, feebate schemes, and phased ICE bans. It also considers the effectiveness of centralised EV management models and industry advocacy strategies in accelerating uptake. Drawing on global best practices and lessons learned, with supporting evidence on outcomes and consumer responses, the section highlights measures that are both impactful and potentially transferable to the Australian context.

Road user charges

Australia

In OECD countries, road funding is generally sourced from vehicle registration fees, vehicle-related taxes, and fuel excise². In Australia, discussion on applying road user charges to EVs has been underway since at least the late 2010s, in response to declining revenue from traditional funding sources and rising road maintenance costs. The High Court's decision in *Vanderstock & Anor v The State of Victoria* found that the Victorian EV road user charge was unconstitutional, as only the Commonwealth may levy duties of customs and excise.³

An Australian study of 1,227 respondents in New South Wales found a growing public awareness that road funding mechanisms will need to evolve as excise revenue decreases due to more efficient ICE vehicles and increased EV uptake. This issue, while acute in Australia and no less contentious, is also a prevailing issue in other jurisdictions.⁴

International

Around the world, governments are exploring new approaches to road funding as fuel-tax revenue declines with the shift to electric vehicles. Several countries and states have begun trialling or implementing distance-based charging systems, with emerging evidence showing that the design and timing of these schemes can significantly influence EV uptake.

United Kingdom

In the UK, the Office for Budget Responsibility (OBR) will introduce a pay-per-mile tax for electric and hybrid vehicles from April 2028. Under this system, battery EVs will be charged 3p per mile and plug-in hybrids 1.5p per mile, with rates rising annually in line with inflation. The tax applies to all UK-registered EVs and will be based on odometer readings during annual Ministry of Transport Test checks. Acknowledging the risk of odometer tampering, OBR is exploring measures to mitigate manipulation.

² Beck, M. J., Bliemer, M. C. J., & Bushell, J. (2025). Ready for road pricing reform? Identifying segments of support in Australia and uncovering (hidden) attitudes. *Transportation Research Part A: Policy and Practice*, 200. 104646. <https://www.sciencedirect.com/science/article/pii/S0965856425002745>

³ High Court of Australia. (2023). *Judgment summary: Vanderstock & Anor v State of Victoria* [2023] HCA 30. <https://www.hcourt.gov.au/sites/default/files/assets/publications/judgment-summaries/2023/hca-30-2023-10-18.pdf>

⁴ Beck, M. J., Bliemer, M. C. J., & Bushell, J. (2025). Ready for road pricing reform? Identifying segments of support in Australia and uncovering (hidden) attitudes. *Transportation Research Part A: Policy and Practice*, 200. 104646. <https://www.sciencedirect.com/science/article/pii/S0965856425002745>

The charge is projected to raise £1.1 billion in 2028–29, increasing to £1.9 billion by 2030–31, though actual revenue will depend on EV adoption levels. The introduction of the tax is expected to increase lifetime vehicle costs while reducing demand (it's been estimated that it will result in 440,000 fewer EV sales), though this impact may be partly offset by other government incentives.

Industry groups, including Ford and the Society of Motor Manufacturers and Traders (SMMT), have criticised the timing of the measure, arguing it risks undermining EV uptake despite the government's £1.3 billion investment commitment.⁵ The pay-per-mile system will be integrated into vehicle excise duty and administered by the Driver and Vehicle Licensing Agency as "eVED". A key concern is that even proposing such a novel system purely for EVs may deter potential late adopters from purchasing one.⁶ This is supported by examples of similar schemes being launched in New Zealand and Iceland in 2024, which led to sales of EVs roughly halving as a result.⁷

Hawai'i, US

In the United States, the Hawai'i Road Usage Charge Program commenced on 1 July 2025, replacing the previous flat US\$50 state EV registration surcharge. When renewing their registration, eligible EV drivers can choose either a:

- Per-mile road usage charge of US\$8 per 1,000 miles, capped at US\$50, or
- Flat annual charge of US\$50.

Odometer readings collected during annual safety inspections are used to calculate the RUC. From 1 July 2028, all EV drivers will be automatically enrolled in the per-mile system.⁸ The Hawai'i Department of Transportation is responsible for developing a plan to transition all light-duty vehicles into the RUC program by 2033, replacing the state fuel tax.⁹

The Department notes that rural and outer-suburban drivers often rely on older, less fuel-efficient vehicles and therefore currently pay more fuel tax. Under a future RUC system, it expects that these motorists are likely to pay less than they do today.¹⁰

Oregon, US

Oregon operates a voluntary pay-per-mile program for EV drivers, known as OReGO. Participants currently pay US\$0.02 per mile. As of 15 August 2025, 849 vehicles were enrolled.¹¹ Under House Bill 3991 the program will become mandatory for EVs and hybrids¹².

Key milestones include:

- From 2026: OReGO members pay US\$0.023 cents per mile.

⁵ Mistry, P. (2025, November 27). Electric vehicle owners to face pay-per-mile tax. *BBC News*. <https://www.bbc.com/news/articles/c8jw9l7gx920>

⁶ Al-Habaibeh, A. (2025, November 26). Electric vehicle owners face new pay-per-mile tax – what could be the environmental costs? *The Conversation*. <https://theconversation.com/electric-vehicle-owners-face-new-pay-per-mile-tax-what-could-be-the-environmental-costs-270193>

⁷ Financial Times. (2025, November 6). *Carmakers slam UK's plan for EV pay-per-mile tax*. <https://www.ft.com/content/380ae202-6137-4122-bbbb-603822090eag>

⁸ Department of Customer Services. (2025). *HiRUC program*. City and Country of Honolulu. <https://www.honolulu.gov/csd/hiruc-program/>

⁹ Hawai'i Department of Transportation. (2025, June). *Hawai'i road usage charge fact sheet*. State of Hawai'i. <https://hidot.hawaii.gov/wp-content/uploads/2025/06/2025-MEDIA-HiRUC-Fact-Sheet.pdf>

¹⁰ Hawai'i Department of Transportation. (2025, June). *Hawai'i road usage charge fact sheet*. State of Hawai'i. <https://hidot.hawaii.gov/wp-content/uploads/2025/06/2025-MEDIA-HiRUC-Fact-Sheet.pdf>

¹¹ Samayoa, M. (2025, August 28). Gov. Tina Kotek's transportation plan could reshape how Oregonians think about electric vehicles. *OPB*. <https://www.opb.org/article/2025/08/28/oregon-electric-vehicles-cars-evs-rebate-environment-transportation/>

¹² Office of the Governor. (2025, November 10). Governor Kotek Signs Emergency Transportation Package into Law. *Governor's Office Newsroom*. <https://apps.oregon.gov/oregon-newsroom/OR/GOV/Posts/Post/governor-kotek-signs-emergency-transportation-package-into-law>

- From 1 July 2027: Used EV owners renewing registration must choose either a flat fee or per-mile charge.¹³
- From 1 January 2028: The same rule applies to new EVs.
- From 1 July 2028: The rule extends to hybrids.

Currently, EV drivers pay a supplemental registration fee of US\$316 for two years.¹⁴ OReGO participants instead pay only the base registration fee plus the per-mile charge.¹⁵ The voluntary program has managed privacy concerns by deleting mileage data 30 days after receiving payment.¹⁶

Virginia, US

Virginia operates the Milage Choice Program, a voluntary pay-per-mile program. EV and fuel efficient vehicle owners currently pay the highway use fee (HUF), but the Mileage Choice Program they can opt to pay only for the miles driven, capped at the price of the usual HUF. Mileage is tracked using a device installed in the vehicle, with both GPS or non-GPS options available.¹⁷

Utah, US

Utah requires EV and efficient vehicle owners to pay an alternative fuel vehicle fee. The voluntary Road Usage Charge program allows drivers to instead pay per mile. In 2025, the per-mile charge is US\$0.0111, with participants never paying more than the alternative fuel vehicle fee.¹⁸ Drivers may choose between using telematics or submitting an odometer photo. No location data is collected or shared under either option.¹⁹

KEY TAKEAWAYS: Road user charge

For Australia, the international evidence on road user charge design points to timing as a key variable. New Zealand and Iceland both introduced distance-based charges for EVs during their early-adoption phase, and in both cases EV sales fell by roughly 50%.

The Commonwealth's constitutional primacy in excise collection means any Australian framework will need to be Commonwealth-led and require coordinated state-territory implementation.

¹³ Oregon Department of Transportation. (n.d.) *OReGO: Oregon's Road Usage Charge Program*. Oregon Government. <https://www.oregon.gov/odot/programs/pages/orego.aspx>

¹⁴ Samayoa, M. (2025, August 28). Gov. Tina Kotek's transportation plan could reshape how Oregonians think about electric vehicles. *OPB*. <https://www.opb.org/article/2025/08/28/oregon-electric-vehicles-cars-evs-rebate-environment-transportation/>

¹⁵ Oregon Department of Transportation. (n.d.) *OReGO: Oregon's Road Usage Charge Program*. Oregon Government. <https://www.oregon.gov/odot/programs/pages/orego.aspx>

¹⁶ Rush, C. (2025, August 29). Oregon could join Hawaii in mandating pay-per-mile fees for EV owners as gas tax projections fall. *PBS News*. <https://www.pbs.org/newshour/nation/oregon-could-join-hawaii-in-mandating-pay-per-mile-fees-for-ev-owners-as-gas-tax-projections-fall>

¹⁷ Virginia Department of Motor Vehicles. (n.d.). *Virginia's Mileage Choice Program*. Commonwealth of Virginia. <https://www.dmv.virginia.gov/vehicles/taxes-fees/mileage-choice>

¹⁸ Utah Department of Transportation. (n.d.). *Road usage charge*. State of Utah. <https://www.utahroadusagecharge.com/EN/>

¹⁹ Utah Department of Transportation. (n.d.). *Utah road usage charge program*. State of Utah. <https://www.roadusagechargeutah.org/>

EV incentives

Australia

Australia has offered a range of incentives including those at both federal and state levels for EVs, as well as funding support for the deployment of infrastructure and supporting EV charging in apartments, on power poles, at destinations, and for fleets. State incentives no longer exist for EVs with the Federal FBT exemption the primary mechanism for making new EVs more affordable. The FBT exemption represents a significant and growing fiscal cost as EV uptake accelerates; its long-term calibration will need to balance incentive strength with budget sustainability, a trade-off increasingly acknowledged in Australian tax policy discussion.

International

Across international markets, upfront financial incentives continue to play a central role in supporting EV adoption, although their design, stability and generosity vary widely. Recent experience shows that both the presence, and sudden withdrawal, of these incentives can have immediate and significant effects on consumer demand.



Denmark and Sweden

In Denmark, consumer uncertainty has been found to be notably higher than in Sweden. This has been attributed to frequent Danish policy changes in recent years that have created confusion among potential EV buyers.²⁰

France

In France, Battery Electric Vehicles (BEV) are exempt from annual taxes applied to company cars, offering major savings on ownership costs.²¹ They are also exempt from the mass-based “malus” tax that applies to other vehicles.

Germany

In Germany, all EV subsidies were discontinued in 2023 following a ruling on the Climate and Transformation Fund during a national budget crisis. EV sales fell by almost 30% the following year.²² A new subsidy program launched on 1 January 2026 and running until 2029 will offer a base subsidy of between €3000 and €6000 for BEV (depending on income and household size), and €4500 for Plug-in Hybrid Electric Vehicle (PHEV) new passenger vehicle purchases.²³

Norway

Norway's incentives for zero-emission vehicles include exemptions from registration tax, value added tax (VAT) and fuel tax, along with discounts of at least 50% on tolls, ferries, and parking. The Government plans to gradually reduce these incentives, reintroduce some taxes (such as VAT on higher-priced EVs) and establish road-use charges under a more sustainable funding model.²⁴

Cincotta and Thomassen (2025) analyse the effectiveness of Norway's EV incentive policies. The study highlights that EVs reached 66% of new car sales in 2021, largely driven by exemptions from VAT and CO₂- and weight-based registration taxes. Together, these taxes account for around 70% of the pre-tax price of an ICE vehicle. The authors counterfactual modelling suggests that removing these tax exemptions would reduce EV market share to 25%. The paper also considers future policy considerations, including EV taxation to address congestion and non-exhaust particulate emissions. In addition, scenarios involving strict ICE taxation or outright bans indicate that differentiated taxes could achieve similar outcomes to bans, potentially representing a more efficient policy tool.

Norway's foregone tax revenues corresponds to an implied carbon price of around US\$1700 per tonne.²⁵ This is a very high implied carbon price by international benchmarks, and reflects the scale of Norway's underlying vehicle taxation, a broader tax-efficiency point noted in the same literature. Bøyum (2025) finds that environmental attitudes strongly influence BEV

²⁰ Haustein, S., Jensen, A. F., & Cherchi, E. (2021). Battery electric vehicle adoption in Denmark and Sweden: Recent changes, related factors and policy implications. *Energy Policy*, 149, 112096. <https://doi.org/10.1016/j.enpol.2020.112096>

²¹ European Automobile Manufacturers' Association. (2025). *Tax benefits and purchase incentives for electric vehicles 2025*. ACEA. <https://www.acea.auto/files/Electric-cars-Tax-benefits-purchase-incentives-2025.pdf>

²² Agence France-Presse. (2025, January 6). Germany's EV sales crash as buyers abandon electric cars in droves. *Fortune*. <https://fortune.com/2025/01/06/germanys-ev-sales-crash-electric-cars-tesla-volkswagen/>

²³ Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz. (2026, January). *Neues E-Auto-Förderprogramm mit sozialer Staffelung: Zuschüsse für Neuzulassungen ab 1. Januar 2026* [New electric car subsidy program with social tiering: Subsidies for new registrations from 1 January 2026]. BMUKN. <https://www.bundesumweltministerium.de/pressemitteilung/neues-e-auto-foerderprogramm-mit-sozialer-staffelung-zuschuesse-fuer-neuzulassungen-ab-1-januar-2026>

²⁴ Organisation for Economic Co-operation and Development. (2022). *Norway's evolving incentives for zero-emission vehicles*. OECD.

https://www.oecd.org/en/publications/ipac-policies-in-practice_22632907-en/norway-s-evolving-incentives-for-zero-emission-vehicles_22d2485b-en.html

²⁵ Cincotta, C., & Thomassen, Ø. (2025). Evaluating Norway's electric vehicle incentives. *Energy Economics*, 146, 108490. <https://doi.org/10.1016/j.eneco.2025.108490>

adoption intention, although 9% of non-adopters believe BEVs are environmentally harmful. Norway's model is embedded within a distinctive fiscal architecture of high baseline vehicle taxation and hydropower-dominated electricity; direct replicability of the incentive structure alone is limited without the surrounding tax and energy context. The study suggests that policies could address these concerns by promoting sustainable battery practices, using renewable energy for charging, and clearly communicating the environmental benefits.²⁶ Norway's long-standing consistency in BEV policy has helped to reinforce consumer confidence in the technology and contributed to stable, sustained uptake.

United States

In analysis by J.D. Power, a global data analytics and consumer intelligence company, it was found that 49% of EV buyers in the United States selected their vehicle based on the availability of tax credits and incentives.²⁷ Eligibility for the full credit is tied to critical-mineral sourcing and battery-component-of-origin requirements that operate as explicit industrial-policy levers, reflecting a wider shift in the US toward manufacturing localisation. In 2024, 87% of all EVs purchased or leased received the federal EV tax credit, highlighting the continued importance of financial incentives in influencing consumer behaviour.

KEY TAKEAWAYS: EV Incentives

Germany's experience provides directly relevant evidence on the effects of an immediate budget withdrawal. The policy-certainty principle reflected here is not unique to EVs; comparable patterns have been observed in earlier clean-energy support programs, including PV in Spain²⁸. With Australia's Fringe Benefits Tax exemption operating as an important early-stage incentive, the Germany case points to the value of multi-year visibility for industry and consumers on how incentive settings will evolve.

²⁶ Bøyum, L. (2025). Consumer preferences for battery electric vehicles: Comparing Norwegian consumer groups. *Transportation Research Part D: Transport and Environment*, 148, 104982. <https://doi.org/10.1016/j.trd.2025.104982>

²⁷ J.D. Power. (2024, November). *How influential are EV tax credits on vehicle sales? Which manufacturers will be hurt most if tax credit ends?* E-Vision Intelligence Report. <https://www.jdpower.com/business/resources/e-vision-intelligence-report-november-2024>

²⁸ del Río, P. & Mir-Artigues, P., 2014. Spain's Solar PV Investment Bubble: A Cautionary Tale, IISD. https://www.iisd.org/sites/default/files/gsi/rens_ct_spain.pdf

ICE disincentives

ICE disincentives are typically regulatory or fiscal measures designed to discourage the purchase or use of fossil-fuelled vehicles. While incentives “pull” consumers towards EVs, disincentives act as a “stick” by increasing the relative cost or reducing the convenience of owning an ICE vehicle. Common approaches include higher purchase taxes based on CO₂ emissions, higher annual circulation fees (i.e. annual registration), fuel excise increases, and access restrictions such as Low Emission Zones.

Australia

Australia has historically had few direct ICE disincentives compared to other OECD nations. The most prominent example is the Luxury Car Tax (LCT), which applies to vehicles above a specified price threshold. Although not originally designed as an environmental measure, the threshold is higher for fuel-efficient vehicles (A\$91,387 for 2025-26) compared to other vehicles (A\$80,567). This effectively creates a modest disincentive for purchasing expensive, more polluting ICE vehicles.²⁹

While explicit “pollution taxes” have remained politically contentious, the introduction of the New Vehicle Efficiency Standard (NVES) in 2025 acts as a significant supply-side disincentive.³⁰ By penalising manufacturers for selling high-emitting fleets, NVES discourages the importation of inefficient ICE models without imposing a direct consumer-facing tax at the point of sale.

Debate is ongoing regarding road user charges as EV uptake increases as the Government seeks to replace declining fuel excise with revenue generated from a distance-based charge, which (if differentiated by vehicle efficiency/drive train) could function as a further disincentive for more polluting vehicles.

International

Across global markets, governments are increasingly using ICE disincentives to reinforce EV incentives and accelerate the shift away from fossil-fuelled vehicles.

Approaches vary widely, from strict emissions-based taxes to phased registration charges and long-term phase-out commitments. However, all are signalling a tightening regulatory environment for conventional ICE technologies.

European Union

The European Union (EU) originally legislated a de facto ban on new petrol and diesel car sales by 2035 through a requirement for a 100% reduction in tailpipe CO₂ emissions.³¹ In December 2025, following sustained lobbying from some automakers and member states, the European Commission proposed a revised target of 90% emissions reduction by 2035. The updated proposal allows the continued sale of some ICE vehicles, plug-in hybrids, and range extenders after that date.

²⁹ Australian Taxation Office. (n.d.). *Luxury car tax*. Australian Government. <https://www.ato.gov.au/businesses-and-organisations/gst-excise-and-indirect-taxes/luxury-car-tax>

³⁰ *New Vehicle Efficiency Standard Act 2024 (Cth)*. Federal Register of Legislation. <https://www.legislation.gov.au/C2024A00034/asmade/text>

³¹ European Commission. (2023, March 28). *Fit for 55: EU reaches new milestone to make all new cars and vans zero-emission from 2035*. https://climate.ec.europa.eu/news-other-reads/news/fit-55-eu-reaches-new-milestone-make-all-new-cars-and-vans-zero-emission-2035-2023-03-28_en

The remaining 10% of emissions may be offset through:

- Low-carbon steel produced within the EU (up to 7%) and
- Actual emissions reductions savings achieved from e-fuels and biofuels (up to 3%).³²

Although diluted, the revised target is still intended to discourage long-term investment in conventional ICE technologies and signal to consumers that ICE vehicles have a limited future in EU markets.

Denmark

Denmark applies a phased and highly structured taxation regime as its primary ICE disincentive. The country's vehicle registration tax can exceed 100% of a vehicle's value, with ICE vehicles paying the full rate while BEVs receive substantial reductions.³³ Between 2021 and 2025, BEVs were subject to only 40% of the calculated registration tax. This rate increases by eight percentage points annually, reaching 80% by 2030 and full parity with ICE vehicles by 2035. The gradual trajectory provides market certainty and gives consumers and industry time to adjust. Denmark's system also includes a convex, value-based structure that imposes disproportionately higher taxes on larger and more expensive ICE vehicles.³⁴

France

France operates one of the most stringent penalty schemes for high-emitting vehicles. As of 2025, the *malus écologique* (a one-off registration tax) can reach €70,000 for vehicles emitting more than 193 g CO₂/km.³⁵ This imposes a major financial barrier for purchasing inefficient ICE vehicles and can effectively double the price of certain models. France has also tightened weight-based penalties and introduced fleet quotas, whereby companies with more than 100 vehicles must meet BEV targets from March 2025 or incur annual penalties.

Norway

Norway's high EV uptake is strongly linked to the significant cost differential created by its taxation system. ICE vehicles are subject to VAT, a weight tax and CO₂/NO_x taxes, while EVs are exempt.³⁶ These measures create a substantial upfront price gap between EV and ICEV models, reinforcing the economic incentive to choose zero-emission vehicles.

United Kingdom

The UK has experienced several shifts in its approach to phasing out new ICE vehicles, with timelines affected by changes in government and ministerial priorities since 2017. The current policy retains the phase-out of new petrol and diesel cars from 2030 while hybrids, plug-in hybrids and some specific vehicle categories will remain permitted until 2035.³⁷

³² Pacheco, M. (2025, December 16). EU carmakers to comply with 90% emissions reduction by 2035 as full combustion engine ban scrapped. *Euronews*. <https://www.euronews.com/my-europe/2025/12/16/eu-carmakers-to-comply-with-90-emissions-reduction-by-2035-as-full-combustion-engine-ban-s>

³³ European Alternative Fuels Observatory. (n.d.) *Denmark: Incentives and legislation*. European Commission. <https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/denmark/incentives-legislations>

³⁴ Østli, V., Fridstrøm, L., Kristensen, N. B., & Lindberg, G. (2022). Comparing the Scandinavian automobile taxation systems and their CO₂ mitigation effects. *International Journal of Sustainable Transportation*, 16(10), 910–927. <https://doi.org/10.1080/15568318.2021.1949763>

³⁵ Directorate for Legal and Administrative Information. (2025, February 24). *Automobile malus fee increases as of March 1, 2025*. Service-Public. République Française. <https://www.service-public.gouv.fr/particuliers/actualites/A17079?lang=en>

³⁶ Østli, V., Fridstrøm, L., Kristensen, N. B., & Lindberg, G. (2022). Comparing the Scandinavian automobile taxation systems and their CO₂ mitigation effects. *International Journal of Sustainable Transportation*, 16(10), 910–927. <https://doi.org/10.1080/15568318.2021.1949763>

³⁷ Department for Transport. (2025). *Phasing out sales of new petrol and diesel cars from 2030 and supporting the ZEV transition: Summary of responses and joint government response*. UK Government. <https://www.gov.uk/government/consultations/phasing-out-sales-of-new-petrol-and-diesel-cars-from-2030-and-supporting-the-zev-transition/outcome/phasing-out-sales-of-new-petrol-and-diesel-cars-from-2030-and-supporting-the-zev-transition-summary-of-responses-and-joint-government-response>

KEY TAKEAWAYS: ICE Disincentives

The introduction of Australia's New Vehicle Efficiency Standards at the start of 2025 represents a significant supply-side ICE disincentive but will take time before the full impact is felt as it gradually ramps up over time.

Consumer-facing pricing signals via taxation or planned ICE phase outs as used in France, Denmark, and Norway have not been adopted for Australia.

Internationally, jurisdictions accelerating EV uptake have typically combined supply-side standards with demand-side fiscal signals across multiple market segments.



Feebates

Australia

Feebates - combining fees on high emission products with rebates for low emission alternatives - are designed to be self-funding. Australia has not yet adopted feebates in the transport sector, nor indeed for any other products where they might apply (such as in buildings, appliances, or waste management).

International

Many countries have adopted feebate schemes as a way to accelerate EV uptake while discouraging higher-emitting vehicles. Although the design and generosity of these systems vary, international experience shows that well-structured bonus-malus programs can significantly influence purchasing decisions and shape market outcomes.

France

France's *Bonus-Malus* scheme consists of the Bonus écologique (financial support for zero emission vehicles) and the Malus écologique (a one-off tax on higher-emitting vehicles).

The Bonus écologique provides grants of up to €7,000 for households purchasing or leasing BEVs priced under €47,000, with amounts adjusted for income and household size.³⁸ From October 2025, an additional €1,000 is available if the vehicle and its battery cells are assembled in Europe.³⁹

Eligibility requires BEVs to achieve an environmental score of at least 60 points, which reflects emissions associated with production and transport. This eligibility test means that vehicles manufactured outside Europe are effectively excluded.⁴⁰ Grants may be deducted directly from the invoice or paid after purchase.⁴¹ Companies cannot claim the grants for procuring passenger vehicles, although light commercial vehicles remain eligible.⁴²

The 2025 program budget of €1 million is expected to support around 200,000 BEV purchases. The scheme will continue in 2026 with additional support for low- and middle-income households and a price cap to maintain market stability and sustain demand for more price-sensitive segments.

The Malus écologique applies at vehicle registration and is based on CO₂ emissions. In 2025, the tax starts at €50 for vehicles emitting 118 g CO₂/km, rising to €60,000 for those above 194 g CO₂/km.⁴³ Thresholds tightened from 2025 to 113 g CO₂/km with a maximum penalty of €70,000 for vehicles over 193 g CO₂/km. Further tightening is under discussion, including

³⁸ European Alternative Fuels Observatory. (n.d.). *France: Incentives and legislations*. European Commission. <https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/france/incentives-legislations>

³⁹ Ministère de l'Économie, des Finances et de la Souveraineté Industrielle et Numérique. (n.d.). *Achat d'un véhicule électrique : pouvez-vous bénéficier de la prime « coup de pouce »?* [Buying an electric vehicle: can you benefit from the "electric private vehicle incentive"?]. République Française. <https://www.economie.gouv.fr/particuliers/voyager-et-se-deplacer/achat-dun-vehicule-electrique-pouvez-vous-beneficier-de-la-prime-coup-de-pouce-vehicules-particuliers-electriques#>

⁴⁰ Negri, M. & Bieker, G. (2025, October 17). Three birds with one stone? How the French bonus écologique supports zero-emissions mobility and domestic production, but could focus more on smaller vehicles. *International Council on Clean Transportation*. <https://theicct.org/how-the-french-bonus-ecologique-supports-zero-emissions-mobility-and-domestic-production-but-could-focus-more-on-smaller-vehicles-oct25/>

⁴¹ Ministère de l'Économie, des Finances et de la Souveraineté Industrielle et Numérique. (n.d.). *Achat d'un véhicule électrique : pouvez-vous bénéficier de la prime « coup de pouce »?* [Buying an electric vehicle: can you benefit from the "electric private vehicle incentive"?]. République Française. <https://www.economie.gouv.fr/particuliers/voyager-et-se-deplacer/achat-dun-vehicule-electrique-pouvez-vous-beneficier-de-la-prime-coup-de-pouce-vehicules-particuliers-electriques#>

⁴² European Alternative Fuels Observatory. (n.d.). *France: Incentives and legislations*. European Commission. <https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/france/incentives-legislations>

⁴³ Westerheide, C. (2024, November 29). France cuts Ev environmental bonus to a maximum of 4,000 euros. *Electrify*. [https://www.electrify.com/2024/11/29/france-cuts-ev-environmental-bonus-to-a-maximum-of-4000-euros/#:~:text=In%20addition%20to%20incentives%2C%20France,g/km%20and%20more\).](https://www.electrify.com/2024/11/29/france-cuts-ev-environmental-bonus-to-a-maximum-of-4000-euros/#:~:text=In%20addition%20to%20incentives%2C%20France,g/km%20and%20more).)

proposals to lower limits to 105 g CO₂/km in 2026 and 98 g CO₂/km in 2027.⁴⁴ In practice, France's scheme has required ongoing recalibration in response to fiscal cost pressures and manufacturer optimisation of vehicle configurations to sit within favourable feebate bands, such trade-offs are documented in both ICCT and OECD analyses of the program.

Sweden

In Sweden, the previous bonus-malus bonuses has not been reinstated, with its removal having contributed to a significant decline in EV registrations.⁴⁵

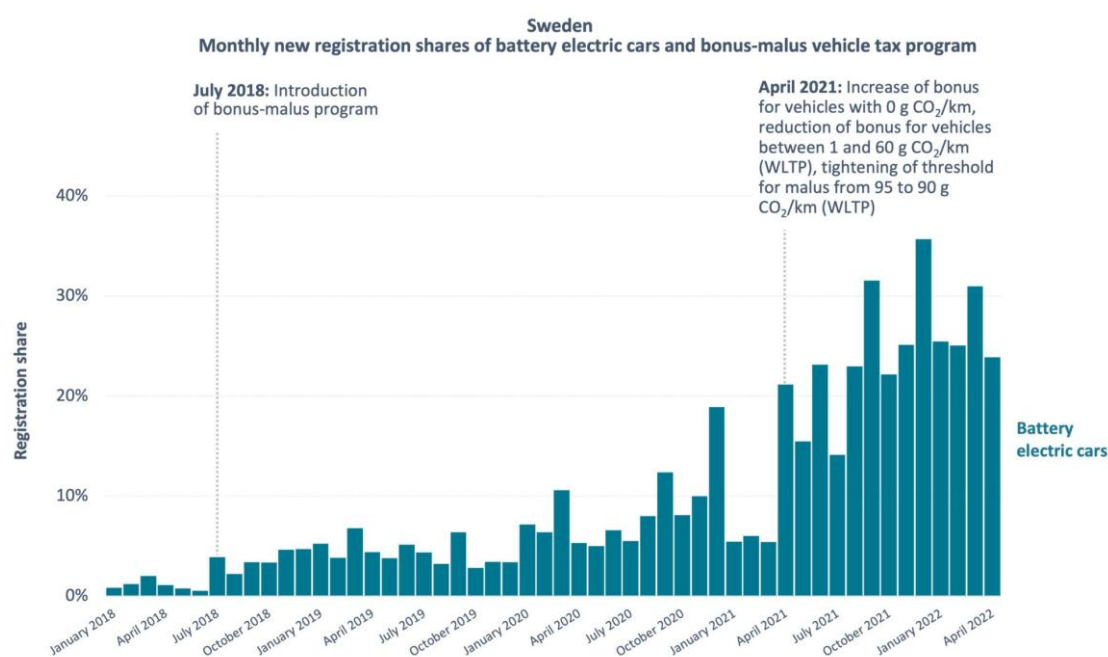


Figure 2. Monthly new registration shares of battery electric cars and bonus-malus vehicle tax program in Sweden⁴⁶

New Zealand

New Zealand operated a feebate-style scheme through Clean Car Discount scheme, which ran from April 2022 until 31 December 2023. Over its duration, the scheme issued 192,100 rebates and collected fees on 128,300 vehicles. A total of NZ\$617.2 million was paid in rebates, funded partly through NZ\$297.4 million in collected fees and administrative charges. An additional NZ\$337.1 million of Crown Grant funding was required to meet the remaining rebate cost.⁴⁷

Before the scheme ended:

- New vehicles emitting 0 g CO₂/km were eligible for rebates of up to NZ\$8625.
- New vehicles emitting 1–56 g CO₂/km could receive NZ\$3,423 tapering to NZ\$654 for new vehicles emitting 56–146 g CO₂/km.
- High-emitting new vehicles were required to pay a fee starting at NZ\$259 for 192 g CO₂/km, rising linearly to NZ\$5,175 for 276 g CO₂/km or more.

⁴⁴ European Alternative Fuels Observatory. (n.d.). *France: Incentives and legislations*. European Commission. <https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/france/incentives-legislations>

⁴⁵ European Alternative Fuels Observatory. (n.d.). *Sweden: Incentives and legislation*. European Commission. <https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/sweden/incentives-legislations>

⁴⁶ Wappelhorst, S. (2022, Aug 8). Incentivizing zero- and low-emission vehicles: The magic of feebate programs. *International Council on Clean Transportation*. <https://theicct.org/magic-of-feebate-programs-jun22/>

⁴⁷ NZ Transport Agency. (n.d.). *Clean car discount scheme financial reports*. New Zealand Government. <https://www.nzta.govt.nz/vehicles/clean-car-programme/clean-car-discount-ended-on-31-december-2023/clean-car-discount-scheme-financial-reports>

Rebates and fees for second-hand vehicles were approximately half the values applied to new vehicles.⁴⁸

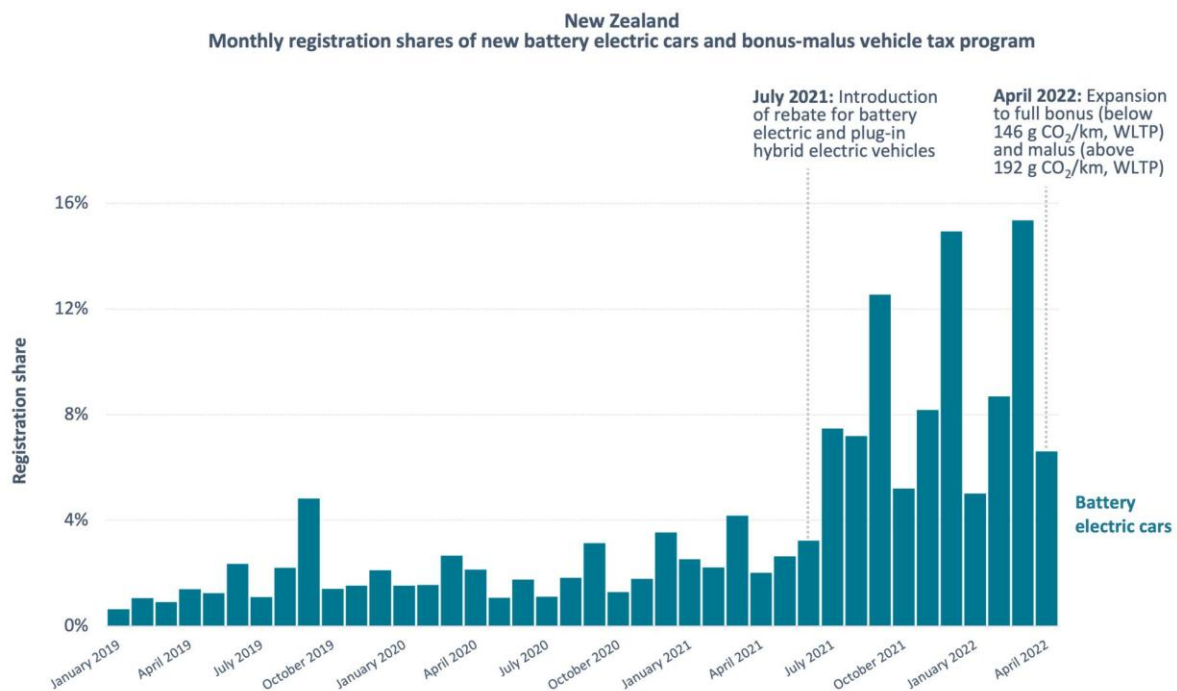


Figure 3. Monthly registration shares of new battery electric cars and bonus-malus vehicle tax program in Singapore⁴⁹

Singapore

Singapore's Enhanced Vehicular Emissions Scheme (VES) has been in place since 2018 and was recently extended to 31 December 2027.⁵⁰ Under the scheme, light vehicles are assigned one of five bands based on pollutant emission levels, with buyers either paying receiving a rebate or paying a surcharge depending on their vehicle's band.⁵¹

Under the revised VES, only EVs qualify for rebates with hybrids no longer qualifying. Combined savings under the VES and the Enhanced Early Adoption Incentive (EEAI) can reach up to S\$30,000 in 2026 and S\$20,000 in 2027 for EVs registered in those years. The Additional Registration Fee (ARF) floor of \$0 for EVs and electric taxis also remains in place until 31 December 2027. Since 2021, more than 39,000 electric cars and taxis have received VES or EEA support.⁵²

Singapore calculates feebates using a step-function approach, in contrast to the progressive function used in many other schemes.⁵³

⁴⁸ Wappelhorst, S. (2022, Aug 8). Incentivizing zero- and low-emission vehicles: The magic of feebate programs. *International Council on Clean Transportation*. <https://theicct.org/magic-of-feebate-programs-jun22/>

⁴⁹ Wappelhorst, S. (2022, Aug 8). Incentivizing zero- and low-emission vehicles: The magic of feebate programs. *International Council on Clean Transportation*. <https://theicct.org/magic-of-feebate-programs-jun22/>

⁵⁰ National Environment Agency. (2025, September 8). *Extension of Vehicular Emissions Scheme (VES) and EV Early Adoption Incentive (EEAI) to support vehicle electrification*. Singapore Government. [https://www.nea.gov.sg/media/news/news/index/extension-of-vehicular-emissions-scheme-\(ves\)-and-ev-early-adoption-incentive-\(eeai\)-to-support-vehicle-electrification](https://www.nea.gov.sg/media/news/news/index/extension-of-vehicular-emissions-scheme-(ves)-and-ev-early-adoption-incentive-(eeai)-to-support-vehicle-electrification)

⁵¹ International Energy Agency. (n.d.). *Vehicule emissions scheme*. <https://www.iea.org/policies/18860-vehicule-emissions-scheme>

⁵² National Environment Agency. (2025, September 8). *Extension of Vehicular Emissions Scheme (VES) and EV Early Adoption Incentive (EEAI) to support vehicle electrification*. Singapore Government. [https://www.nea.gov.sg/media/news/news/index/extension-of-vehicular-emissions-scheme-\(ves\)-and-ev-early-adoption-incentive-\(eeai\)-to-support-vehicle-electrification](https://www.nea.gov.sg/media/news/news/index/extension-of-vehicular-emissions-scheme-(ves)-and-ev-early-adoption-incentive-(eeai)-to-support-vehicle-electrification)

⁵³ Wappelhorst, S. (2022, Aug 8). Incentivizing zero- and low-emission vehicles: The magic of feebate programs. *International Council on Clean Transportation*. <https://theicct.org/magic-of-feebate-programs-jun22/>

Table 2. VES schedule and adjustments to VES bands from 2026 to 2027⁵⁴

Existing VES Rebate/Surcharge (-/+) (01 Jan 2025 to 31 Dec 2025)		Revised VES Rebate/Surcharge (-/+)		
		Revised VES Bands	(01 Jan 2026 to 31 Dec 2026)	(01 Jan 2027 to 31 Dec 2027)
Band A1	-\$25,000	Band A	-\$22,500	-\$20,000
Band A2	-\$2,500	Band B	\$0	\$0
Band B	\$0	Band C1	+\$7,500	+\$15,000
Band C1	+\$15,00	Band C2	+\$22,500	+\$30,000
Band C2	+\$25,000	Band C3	+\$35,000	+\$45,000

Note: There will be a 1.5x multiplier for taxis.

Table 3. VES schedule and adjustments to VES bands from 2026 to 2027⁵⁵

Existing VES Bands (From 01 Jan 2024 to 31 Dec 2025)	New VES Bands (From 01 Jan 2026 to 31 Dec 2027)	Pollutant Thresholds				
		CO ₂ (g/km)*	HC (g/km)	CO (g/km)	NO _x (g/km)	PM (mg/km)
A1	A	≤ 90	0	0	0	0
A2	B	≤ 120	≤ 0.024	≤ 0.19	≤ 0.009	≤ 0.3
B	C1	≤ 159	≤ 0.029	≤ 0.27	≤ 0.018	≤ 0.4
C1	C2	≤ 182	≤ 0.040	≤ 0.35	≤ 0.022	≤ 1.0
C2	C3	> 182	> 0.040	> 0.35	> 0.022	> 1.0

⁵⁴ National Environment Agency. (2025, September 8). *Extension of Vehicular Emissions Scheme (VES) and EV Early Adoption Incentive (EEAI) to support vehicle electrification*. Singapore Government. [https://www.nea.gov.sg/media/news/news/index/extension-of-vehicular-emissions-scheme-\(ves\)-and-ev-early-adoption-incentive-\(eeai\)-to-support-vehicle-electrification](https://www.nea.gov.sg/media/news/news/index/extension-of-vehicular-emissions-scheme-(ves)-and-ev-early-adoption-incentive-(eeai)-to-support-vehicle-electrification)

⁵⁵ National Environment Agency. (2025, September 8). *Extension of Vehicular Emissions Scheme (VES) and EV Early Adoption Incentive (EEAI) to support vehicle electrification*. Singapore Government. [https://www.nea.gov.sg/media/news/news/index/extension-of-vehicular-emissions-scheme-\(ves\)-and-ev-early-adoption-incentive-\(eeai\)-to-support-vehicle-electrification](https://www.nea.gov.sg/media/news/news/index/extension-of-vehicular-emissions-scheme-(ves)-and-ev-early-adoption-incentive-(eeai)-to-support-vehicle-electrification)

Singapore's step-based bonus-malus design, unlike the progressive curves used in France, Sweden and New Zealand, can make budget neutrality more difficult to maintain. Manufacturers may optimise vehicles to sit just below band thresholds, enabling them to secure larger rebates.⁵⁶ Several schemes (including those in France, Singapore and New Zealand) have also extended feebates to used vehicles, broadening access for lower-income households.

KEY TAKEAWAYS: Feebates

France's Bonus-Malus scheme, operating since 2008, and New Zealand's Clean Car Discount both demonstrate the potential, and the risks, of feebates. New Zealand's experience is particularly instructive: the scheme's cancellation after twenty months demonstrates that feebates must be introduced and wound back with long, signalled timelines to avoid market disruption.



⁵⁶ Wappelhorst, S. (2022, Aug 8). Incentivizing zero- and low-emission vehicles: The magic of feebate programs. *International Council on Clean Transportation*. <https://theicct.org/magic-of-feebate-programs-jun22/>

ICE bans/phase-outs

Australia

ICE bans – also referred to as ICE phase-outs or zero-emission vehicle (ZEV) mandates – are regulatory measures that prohibit the sale of new ICE vehicles from a specified date, often with phased timelines and exemptions for particular vehicles categories. In Australia, the ACT Government has indicated that it is examining options to prevent new sales of ICE light vehicles from 2035.⁵⁷

International

Across major markets, governments are increasingly turning to ICE sales bans or phase-out timelines as a core mechanism for accelerating the transition to zero-emission vehicles. While the strength and certainty of these commitments vary, each approach aims to provide long-term market signals that discourage continued investment in conventional ICE technologies.

European Union

The EU adopted legislation in March 2023 requiring a 100% reduction in CO₂ emissions from new cars and vans by 2035, effectively banning new ICE vehicle sales, including hybrids. The measure formed part of the EU Green Deal and the Fit for 55 package and followed protracted negotiations. The law includes a mechanism allowing future proposals for vehicles running exclusively on carbon-neutral fuels after 2035.⁵⁸

While the ban remains in force, elements have been softened in response to concerns about feasibility and competitiveness. In this context, ‘competitiveness’ refers principally to European automakers’ cost and scale position relative to Chinese EV producers, whose lower cost base and faster scale-up have made near-term compliance more difficult for legacy European manufacturers.⁵⁹ The European Parliament introduced additional flexibility in performance reporting, allowing automakers to average their emissions performance over 2025-2027, giving manufacturers more headroom to manage short-term compliance.⁶⁰

Under industry pressure, the European Commission brought forward the scheduled 2026 review to December 2025. Automakers argued the 2035 deadline is unrealistic due to slower than expected EV uptake, high costs, dependence on Chinese battery supplies, and new US tariffs. They also requested greater tax incentives, additional flexibility for hybrids and other low-emission technologies.⁶¹

Recently, it has been reported that the EU is preparing to scale back the ban following pressure from automakers and a letter from German Chancellor Friedrich Merz. Apostolos Tzitzikostas, European Commissioner for Sustainable Transport and Tourism, confirmed that combustion engines will still be allowed after 2035, but only in vehicles powered by low-emission renewable

⁵⁷ ACT Government. (n.d.). *Zero emissions vehicles*. Everyday Climate Choices. <https://www.climatechoices.act.gov.au/transport-and-travel/zero-emissions-vehicles>

⁵⁸ European Commission. (2023, March 28). *Fit for 55: EU reaches new milestone to make all new cars and vans zero-emission from 2035*. https://climate.ec.europa.eu/news-other-reads/news/fit-55-eu-reaches-new-milestone-make-all-new-cars-and-vans-zero-emission-2035-2023-03-28_en

⁵⁹ Transport & Environment. (2025, December 16). *EU 2035 reversal: playing for time won't make European carmakers great again*. <https://www.transportenvironment.org/articles/t-es-reaction-to-automotive-package>

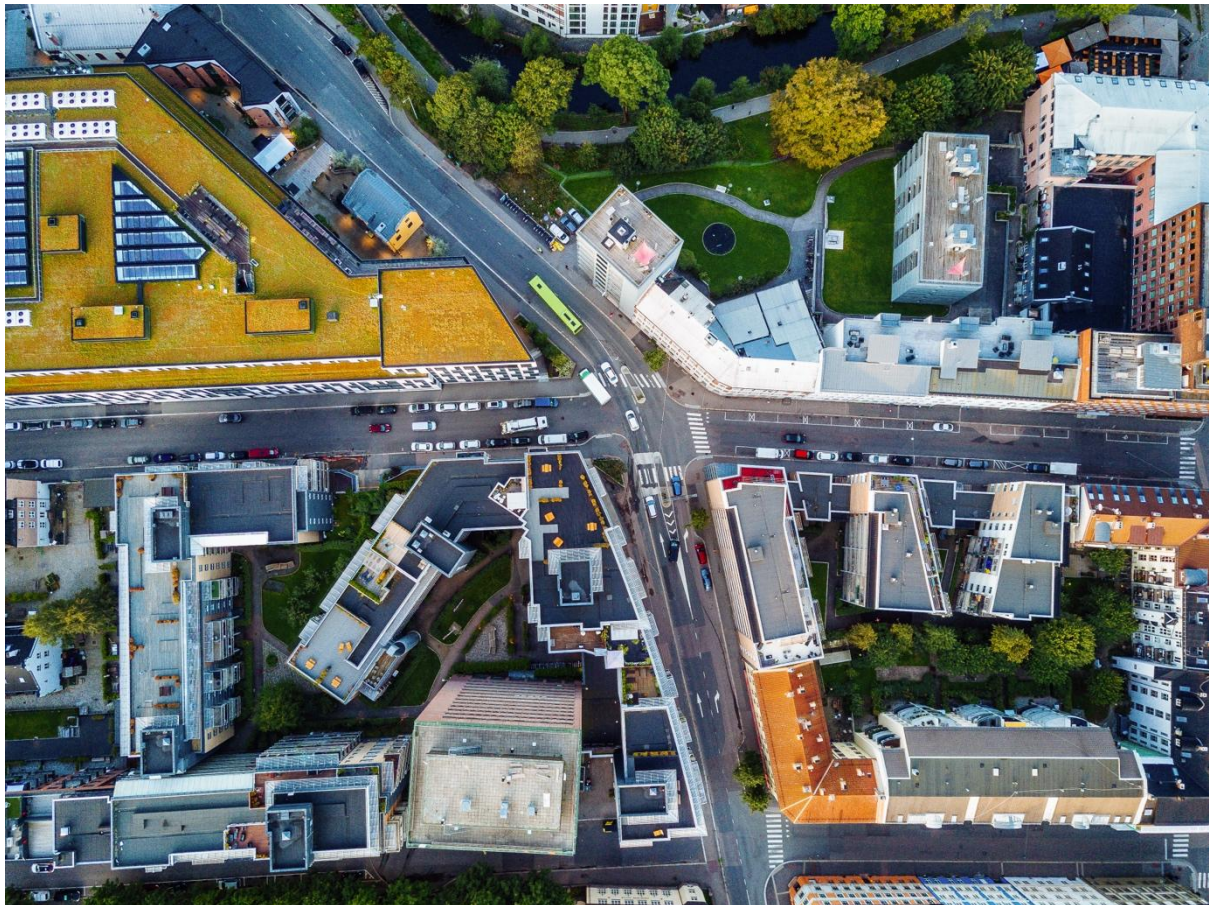
⁶⁰ European Parliament. (2025, May 8). *CO₂ emissions: EP adopts flexibility measures for carmakers*. <https://www.europarl.europa.eu/news/en/press-room/20250502IPR28225/co2-emissions-ep-adopts-flexibility-measures-for-carmakers>

⁶¹ Agence France-Presse. (2025, September 12). *Carmakers to push EU for 2035 combustion engine ban rethink*. *France 24*. <https://www.france24.com/en/live-news/20250912-carmakers-to-push-eu-for-2035-combustion-engine-ban-rethink>

fuels such as synthetic fuels and biofuels.⁶² The e-fuel and biofuel carve-out has been actively pursued by fuel suppliers and some legacy OEMs; if scaled production of these fuels does not materialise, the provision risks leaving a residual ICE fleet operating well beyond the intended phase-out horizon. Battery-electric vehicles made up 14.6% of all new car registrations in the EU in 2023, and 12.1% in 2022.⁶³

Norway

Cincotta and Thomassen (2025) affirm that Norway's high EV adoption (at over 95% of new car sales in 2025) is primarily driven by tax exemptions that remove around 70% of the pre-tax cost compared with ICE vehicles. Their modelling shows that without these exemptions, EV market share would fall to approximately 25%. The study also finds that heavy taxation on non-EVs could achieve similar outcomes to an outright ban, with extreme scenarios producing EV shares between 76% and 94%. The authors argue that taxing non-EVs is more economically efficient than banning them outright, as it preserves social surplus for consumers willing to pay more than the externality cost.⁶⁴



⁶² Padeanu, A. (2025, December 3). Europe changes its mind. Won't ban combustion engines after all. *Motor1.com*. <https://www.motor1.com/news/780651/europe-cancels-combustion-engine-ban/>

⁶³ Eurostat. (2024, August 2). 1.5 million new battery-only electric cars in 2023. <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20240802-1>

⁶⁴ Cincotta, C., & Thomassen, Ø. (2025). Evaluating Norway's electric vehicle incentives. *Energy Economics*, 146, 108490. <https://doi.org/10.1016/j.eneco.2025.108490>

United Kingdom

The UK plans to phase out the sale of new petrol and diesel vehicles from 2030, consistent with a consultation initiated in early 2025 based on the government's manifesto pledge. The government noted that previous date changes had created uncertainty for investors and industry.⁶⁵ Consultation outcomes (supported by evidence of £20 billion in supply chain investment since the ZEV mandate was announced) confirmed that sales of ICE vehicles will end in 2030, while hybrids and PHEV will be allowed to 2035. Sales of vans and light commercial vehicles will also be allowed until 2035. Additional flexibilities were incorporated into the ZEV mandate in response to consultation feedback.⁶⁶ Industry expressed broad support but sought longer lead-in times and more flexibility, while some groups argued that the mandate should be stronger.⁶⁷

KEY TAKEAWAYS: ICE bans/Phase outs

The jurisdictions reviewed have established phase-out commitments at the national or supranational level (e.g. the EU-wide 2035 commitment).

The UK's repeated changes to its 2030 phase-out date, and the investor uncertainty these created, offer a cautionary lesson about the cost of policy inconsistency

Australia's NVES provides a demand signal, but a clear long-term ICE phase-out timeline would offer greater clarity but would come with some political and legitimacy risks with important considerations for social and equity aspects.

Centralised EV policy management

Australia

In Australia, the coordination of EV market transformation is led at the federal level by the Department of Climate Change, Energy, the Environment and Water (DCCEEW), which is responsible for the National Electric Vehicle Strategy (NEVS) and the New Vehicle Emission Standard (NVES). DCCEEW also provides consumer information (through its ev.gov.au hub), maintains a mapping tool to guide investment in public EV charging infrastructure (<https://evciroadmap.evenergi.com>), and oversees the Driving the Nation Fund, which supports initiatives such as grants for installing EV chargers in dealerships, expanding highway charging, and delivering innovative projects through the Driving the Nation Program). Funding is assessed and administered under the Driving under the Nation Program. Program funding in this case is assessed and administered by ARENA, the Australian Renewable Energy Agency.

⁶⁵ Department for Transport & Alexander, H. (2025, January 6). *Phasing out the sale of new petrol and diesel cars from 2030 and support for zero emission vehicle (ZEV) transition*. GOV.UK. <https://www.gov.uk/government/speeches/phasing-out-the-sale-of-new-petrol-and-diesel-cars-from-2030-and-support-for-zero-emission-vehicle-zev-transition>

⁶⁶ Department for Transport. (2025). *Phasing out sales of new petrol and diesel cars from 2030 and supporting the ZEV transition: Summary of responses and joint government response*. GOV.UK. <https://www.gov.uk/government/consultations/phasing-out-sales-of-new-petrol-and-diesel-cars-from-2030-and-supporting-the-zev-transition/outcome/phasing-out-sales-of-new-petrol-and-diesel-cars-from-2030-and-supporting-the-zev-transition-summary-of-responses-and-joint-government-response>

⁶⁷ Roberts, G. (2025, April 7). ZEV mandate: Industry reacts to diesel and petrol phase out plan. *Fleet News*. <https://www.fleetnews.co.uk/news/zev-mandate-industry-reacts-to-diesel-and-petrol-phase-out-plan>

State and territory governments complemented these national efforts to varying degrees by offering their own consumer information resources, mapping tools, and charging infrastructure funding.

International

Internationally, governments have taken varied approaches to coordinating the EV transition, with most countries spreading responsibilities across multiple departments. While this fragmentation is common, a few jurisdictions have established more centralised structures to streamline policy delivery and accelerate EV deployment.

United Kingdom

In the UK, the Office for Zero Emission Vehicles (OZEV) works across the Department for Transport and the Department for Energy Security and Net Zero.⁶⁸ OZEV was established to coordinate government efforts to accelerate the transition to zero-emission transport. It provides support for the uptake of plug-in EVs and funds the expansion of charging infrastructure across the UK. These initiatives are intended to support economic activity while reducing greenhouse gas emissions and improving air quality on UK roads.

United States

In the United States, the Joint Office of Energy and Transportation was established under the Infrastructure Investment and Jobs Act to coordinate EV charging infrastructure between the Department of Energy and the Department of Transportation.⁶⁹ The Joint Office provides technical expertise and guidance to stakeholders and programs focused on deploying EV charging networks, alternative refuelling infrastructure and clean transit solutions, including electric school buses. By aligning resources and offering unified support, analysis and technical assistance, the Joint Office aims to accelerate the nationwide rollout of charging infrastructure and support the country's EV transition.

Japan

In Japan, the Ministry of Economy, Trade and Industry (METI) is responsible for EV and broader zero-emission vehicle policy and strategy, including promotion, targets, infrastructure and industry support. METI works closely with the New Energy and Industrial Technology Development Organisation (NEDO), which serves as the national R&D agency and manages associated funding and administration.⁷⁰

⁶⁸ Office for Zero Emission Vehicles. (n.d.). *Office for Zero Emission Vehicles*. GOV.UK. <https://www.gov.uk/government/organisations/office-for-zero-emission-vehicles>

⁶⁹ Joint Office of Energy and Transportation. (n.d.). *DriveElectric.gov*. U.S. Department of Energy & U.S. Department of Transportation. <https://driveelectric.gov/>

⁷⁰ Ministry of Economy, Trade and Industry. (n.d.). *Automobiles*. Government of Japan.

https://www.meti.go.jp/policy/mono_info_service/mono/automobile/index.html; New Energy and Industrial Technology Development Organization. (n.d.). *About NEDO*. https://www.nedo.go.jp/english/introducing/introducing_index.html

KEY TAKEAWAYS: Centralised EV Policy Management

Australia's EV coordination architecture is centred on the Federal Government's National Electric Vehicle Strategy and the ARENA-administered Driving the Nation Program.

The UK's Office for Zero Emission Vehicles and the US Joint Office of Energy and Transportation are examples of cross-departmental coordinating bodies with defined mandates and resources. The UK's Office for Zero Emission Vehicles and the US Joint Office of Energy and Transportation both demonstrate the value of cross-departmental mechanisms with clear mandates and dedicated resources.

Australia's federated governance arrangements distribute responsibility for EV-related strategy across the Commonwealth, states and territories. The international examples reviewed here are drawn primarily from jurisdictions with different constitutional and coordination arrangements. This is further challenged by resource constraints that limit their ability to engage with the topic consistently, resulting in unharmonised strategies that can discourage OEMs and investors.



Industry advocacy

Industry advocacy is one mechanism through which stakeholders across the EV value chain present a coordinated position to government.

Advocacy organisations can act as information channels between industry and policymakers, contribute to public information on emerging technologies, and provide technical input into policy design.

These functions overlap with broader public-information activities undertaken by government and other actors.

Australia

There are a multitude of peak bodies in Australia engaged in advocacy on EVs as part of their broader remit.

- **Electric Vehicle Council (EVC):** The EVC is the peak body for the EV industry in Australia. The EVC has been instrumental in advocating for a number of policy, financial, consumer, and infrastructure barriers to accelerate EV adoption. Recent advocacy has included the New Vehicle Efficiency Standards (NVES), harmonised charging standards, Fringe Benefits Tax (FBT) exemptions, and funding for public charging infrastructure.⁷¹
- **The Federal Chamber of Automotive Industries (FCAI):** The FCAI represents the broader automotive industry, including incumbent ICEV manufacturers and those with battery electric models. Its advocacy has focused on navigating the transition for legacy brands and supporting what it calls a “technology-neutral” approach.⁷²
- **The Clean Energy Council (CEC):** The CEC is a peak body for the renewable energy sector, with a focus on large scale wind, solar, and energy storage. Members typically include developers, generators, and energy retailers. Recent advocacy have included supporting improved community engagement for large scale renewables, steps to achieve 82% renewables by 2030, and the phase out of gas in new homes. The CEC also manages industry and product accreditation programs, including for inverters and bidirectional EV chargers.
- **Smart Energy Council (SEC):** The SEC is another renewables energy sector peak body but with a greater focus on Consumer Energy Resources (CER), including rooftop solar, residential battery storage, and EVs. Members include manufacturers, distributors, and installers of these technologies. Their recent advocacy has included supporting the Cheaper Home Batteries program, encouraging PV and battery recycling, and challenging proposals for fixed electricity network charges.
- **Energy Networks Australia (ENA):** ENA represents electricity transmission and distribution networks, as well as gas distribution businesses. Its EV advocacy centres on grid integration, including standards, connection processes, regulatory frameworks, and cybersecurity across EV charging use cases. ENA also commissions research and provides technical and policy advice to government.⁷³

⁷¹ Australian Taxation Office (ATO). (2025). *Electric cars exemption: FBT eligibility and requirements*. Australian Government. <https://www.ato.gov.au/businesses-and-organisations/hiring-and-paying-your-workers/fringe-benefits-tax/types-of-fringe-benefits/fbt-on-cars-other-vehicles-parking-and-tolls/electric-cars-exemption>

⁷² Federal Chamber of Automotive Industries (FCAI). (2024, March 6). *Submission in response to Cleaner, Cheaper to Run Cars: The Australian New Vehicle Efficiency Standard*. <https://www.fcai.com.au/fcai-submission-in-response-to-cleaner-cheaper-to-run-cars-the-australian-new-vehicle-efficiency-standard/>

⁷³ Energy Networks Australia. (n.d.). *Energy Networks Australia*. <https://www.energynetworks.com.au/>

- **Energy Consumers Australia (ECA):** ECA is a consumer advocacy organisation that was established by the Council of Australian Governments (COAG) and is funded by a levy on energy consumers in the National Energy Market (NEM) states. It represents residential and small business energy consumers, undertaking research and analysis to improve consumer outcomes. Its EV-related work sits within its broader CER agenda, covering energy equity, regulation, and grid integration.⁷⁴
- **Australian Electric Vehicle Association (AEVA):** AEVA is another consumer advocacy organisation that is funded by paying members. It more directly advocates for EV drivers, focusing on practical issues such as charging reliability, right to repair, and fair road user charges.⁷⁵
- **Intelligent Transport Systems (ITS) Australia** is the peak body for advanced transport technology in Australia. Its remit includes autonomous vehicles, passenger transport, AI traffic management, and other enablers for reducing congestion and environmental and health outcomes. There are additional organisations responsible for the transport sector more broadly but not included here, which are not engaged in current forums more directly related to the EV policy.

International

Industry and civil-society advocacy organisations have become key actors in global EV transitions, influencing policy design, supporting public communication, and strengthening market confidence. Their approaches vary, from multi-stakeholder alliances to user-led movements, but each contributes to more coherent and durable EV policy landscapes.

European Union

The EU's *Platform for Electromobility* is not strictly a peak body but is instead an alliance of more than 40 organisations spanning the transport, energy, and civil society sectors. This Platform played a significant role in advocating for the EU's "Fit for 55" package and the original 2035 ICE phase-out. It's approach centres on coordinating diverse stakeholder interests while maintaining a shared focus on climate and decarbonisation objectives.⁷⁶

Norway

Norway illustrates the importance of user-led advocacy in enabling successful EV transitions. The Norwegian EV Association (*Norsk Elbilforening*), established in the early 1990s, has played a central role in supporting Norway's world-leading EV uptake.⁷⁷ Initially focussed on information dissemination and facilitating test drives, the organisation evolved to provide structured knowledge sharing between early adopters and prospective buyers through an online platform. This long-standing grassroots engagement, combined with coordinated action from multiple actors, demonstrates how intermediary organisations can help position the public as active participants in the transition.

⁷⁴ Energy Consumer Australia. (2024). *Submission to the Inquiry into the transition to electric vehicles*. <https://www.aph.gov.au/DocumentStore.ashx?id=f9a24d40-ebaf-4f4a-a11d-b01562b89d28&subId=753471#:~:text=ECA%20is%20the%20national%20voice,delivers%20good%20outcomes%20for%20consumers>.

⁷⁵ Australian Electric Vehicle Association. (2025, November). *Submission to the inquiry into electricity supply for electric vehicles*. Parliament of Victoria.

⁷⁶ Platform for electromobility. (n.d.). *Platform for electromobility*. <https://www.platformelectromobility.eu/>

⁷⁷ Ryghaug, M., & Skjølsvold, T. M. (2023). How policies and actor strategies affect electric vehicle diffusion and wider sustainability transitions. *Proceedings of the National Academy of Sciences*, 120(47), e2207888119. <https://doi.org/10.1073/pnas.2207888119>

United Kingdom

In the UK, advocacy efforts have extended beyond policy engagement to include large-scale public communication campaigns. The “Go Ultra Low” initiative in the UK (2014-2021), a joint government/industry program, focused on consumer education through test-drive events, myth-busting communications, and clear fact-based information.⁷⁸ The campaign aimed to normalise EV ownership and address concerns about range, charging, and costs, demonstrating the importance of sustained, coordinated communication in shaping public perceptions and EV adoption.

United States

In the US, the Zero Emission Transportation Association (ZETA) promotes cross-sector advocacy through coordinated coalition building. Formed as an industry-backed alliance, ZETA brings together stakeholders (such as energy utilities, mining companies, automakers, and technology providers) to advocate for federal policies that support the EV supply chain.⁷⁹ ZETA frames the EV transition through economic and national interest benefits, such as job creation in manufacturing and mining, and strengthened supply chain security, rather than relying solely on environmental arguments. A key element of its work is producing research-backed white papers that offer policymakers evidence-based guidance.

KEY TAKEAWAYS: Industry Advocacy

The Norwegian EV Association and the US ZETA coalition are examples of EV-focused advocacy organisations that have included stakeholders beyond vehicle manufacturers, including consumer groups, utilities and community organisations. Broader stakeholder diversity within advocacy coalitions is widely associated with more effective policy engagement. Building breadth in Australia’s advocacy architecture, particularly to reach non-traditional EV audiences and counter misinformation in regional, culturally and linguistically diverse (CALD), and lower-income communities would strengthen the conditions for mainstream adoption.

Congestion charge and air quality

Australia

Australia currently has no current congestion charges despite over a quarter of a century of policy research describing benefits. For instance, in 2000, the Bureau of Infrastructure and Transport Research Economics (BITRE)⁸⁰ showed that levying optimal road user charges within major Australian cities could reduce travel times by 40% and fuel consumption by 30%. Melbourne does apply an annual levy (approx. \$1,000-3,000) on off-street parking in the inner city. Over the last decade, proposals for congestion charging have been put forward by a

⁷⁸ Energy Saving Trust. (2021, January 20). *Lessons learned from the Go Ultra Low Cities scheme*. <https://energysavingtrust.org.uk/lessons-learned-from-the-go-ultra-low-cities-scheme/>

⁷⁹ Zero Emission Transportation Association. (n.d.). *About ZETA*. <https://www.zeta.org/about>

⁸⁰ BITRE (2000) Urban congestion – the implications for greenhouse gas emissions. https://www.bitre.gov.au/sites/default/files/is_016.pdf

number of organisations, including Infrastructure Australia, Infrastructure Victoria, the Productivity Commission, City of Melbourne, and the Grattan Institute.⁸¹

A key rationale for introducing congestion charging is the health impacts of traffic related pollution. Research from the University of Melbourne estimates that traffic-related air pollution in Australia contributes annually to around 11,000 premature deaths, 19,000 hospitalisations for cardiovascular and respiratory illnesses, and approximately 66,000 asthma cases. Congestion charging has also been proposed as a more efficient mechanism for reducing traffic than constructing new roads.

Despite the attention these proposals attracted, none of the core recommendations have been implemented. For example, the Andrews Government rejected Infrastructure Victoria's 2016 recommendation on the grounds that it was inconsistent with its policy of not introducing new tolls for existing roads.⁸² Other criticisms have included concerns that such changes may disproportionately affect lower-income drivers, as well as the lack of suitable alternatives in active and public transport.

Table 4. Proposal for congestion charge in Australia

Organisation Name	Proposal Details	Year
<i>Infrastructure Australia</i>	To hold a public inquiry into road user charging in its <i>Australian Infrastructure Plan</i> from the same year.	2016
<i>Infrastructure Victoria</i>	Proposed congestion charging for Melbourne's inner city suburbs as part of its 30 year strategy.	2016
<i>Productivity Commission</i>	To introduce broader road pricing along with the phasing out of current road-related fees and charges in its <i>Five-Year Productivity Review</i> .	2017
<i>City of Melbourne</i>	Calling for more efficient, equitable transport pricing in the way road users and public transport users are charged.	2019
<i>Grattan Institute</i>	Charging drivers to enter Sydney/Melbourne CBDs as a more efficient and effective congestion measure than road building.	2019

International

International experience demonstrates that congestion charging and low-emission access schemes can reduce traffic volumes, encourage shifts to cleaner vehicles and create more liveable city centres. However, the impact of these programs depends heavily on their design, level of public support and the degree to which they align with broader EV and transport policies.

France

France has implemented Low Emission Mobility Zones (ZFE-m) in major cities. All vehicles driving and parking in these zones (including foreign-registered vehicles) must display a Crit'Air sticker, with certain sticker categories restricted from entering specific zones.⁸³ In May 2025, Parliament voted to abolish Low Emission Mobility Zones but the measure is not yet in force

⁸¹ Infrastructure Victoria. (2020, March). *Good move: Fixing transport congestion*. Victoria State Government.

<https://assets.infrastructurevictoria.com.au/assets/Videos/Good-Move-fixing-transport-congestion-Infrastructure-Victoria.pdf>

⁸² Anderson, S. (2016, October 4). Infrastructure Victoria calls for congestion tax; urges governments not to kill off east-west road link. *ABC News*.

<https://www.abc.net.au/news/2016-10-04/independent-body-calls-for-congestion-tax-on-melbourne-roads/7898562>

⁸³ France.fr. (2020, September 1). *The Crit'Air anti-pollution vehicle sticker*. Explore France. <https://www.france.fr/en/article/crit-air-anti-pollution-vehicle-sticker/>

and awaits full approval. Even if confirmed, municipalities may still retail these zones through local decrees.

Sweden

Sweden offers a scrapping premium of SEK 10,000 to individuals who scrap a car more than 15 years old and purchase or lease a BEV. The funds were made available from 20 August 2024 with the program originally scheduled to end on 31 October 2025. As of August 2025, only 1,463 scrappage premiums had been paid at a total cost of SEK 36 million. This left SEK 460 million (or 93% of the total budget) unused and the scheme at the start of 2026 remains open.⁸⁴ Reasons for the limited interest in the scrappage scheme could be strongly linked to the ending of Sweden's climate bonus EV subsidy which was halted in 2022.

United Kingdom



In London, a congestion charge has applied to all vehicles that entered the city from 2003 to 2025 with a 100% exemption (known as the Clean Vehicle Discount) available to EV drivers from 2019. From January 2026, this changed to a 25% discount on the £18 daily charge, reducing to 12.5% from 4 March 2030. The changes are intended to balance congestion management with maintaining incentives for EV uptake. Transport for London estimates that retaining the full exemption could have resulted in an additional 2,000 vehicles entering the zone during operating hours on an average weekday as EV registrations increased. Electric

⁸⁴ TT News Agency. (2024). Scrapping premium falls short with 460 million kronor unused. *Sweden Herald*. <https://swedenherald.com/article/scrapping-premium-falls-short-with-460-million-kronor-unused>

car-share vehicles hired from and returned to the same marked parking space within the zone will continue to receive a 100% discount.⁸⁵

Stonehaven (a consulting firm) has estimates that up to 75% of private hire drivers may revert to ICE vehicles within the next three years. Private hire drivers report concerns about the higher price of electric models, reflected in higher leasing costs and public charging costs, particularly for those who cannot charge at home and rely on ultrarapid charging. Uber polling indicates that about half of its drivers would switch to a petrol or diesel vehicle if they were required to pay the congestion charge.⁸⁶

Since the Clean Vehicle Discount began in 2019, EV registrations in the UK have increased nearly sixfold, from about 20,000 to over 116,000 in early 2025. At the time the 100% exemption ended, EVs are expected to make up almost 20% of vehicles in London's Congestion Charging Zone.

Morton and Ali (2025) found that congestion charges consistently lead to lower rates of private car ownership in surrounding areas, out to 1 km from the congestion charge boundary.⁸⁷

London's congestion charge was introduced with a five-year monitoring program. According to the 2007 monitoring report, traffic entering the congestion zone was 21% lower than in 2002.⁸⁸ The monitoring reports show sustained reductions of 15-30% in traffic during charging hours in the original congestion zone since 2003. In the Western extension, evaluations found that 14% fewer vehicles entered during charging hours and 10% fewer circulated within the zone. Boundary routes saw a small, anticipated increase of around 4%.⁸⁹

London's Ultra Low Emission Zone (ULEZ) scrappage scheme was launched in 2023 to provide financial support to eligible residents, businesses and charities to scrap, donate or retrofit vehicles that did not meet ULEZ standards. The scheme, now closed, resulted in the removal of 35,094 cars and 17,964 vans from London's roads. Funding was increased from an initial \$110 million to £160 million in 2023 and £210 million in 2024.⁹⁰

KEY TAKEAWAYS

No Australian state or territory has yet introduced a fully operational congestion charge, despite many of the major cities face growing congestion challenges and a long history of policy research describing benefits.

The London experience shows that congestion charges with EV exemptions during the early adoption phase can coincide with reductions in central-city traffic and drive fleet electrification in exempted vehicle categories.

⁸⁵ Transport for London. (2025, November 13). *Changes confirmed to the congestion charge to keep London moving sustainably*. Mayor of London. <https://tfl.gov.uk/info-for/media/press-releases/2025/november/changes-confirmed-to-the-congestion-charge-to-keep-london-moving-sustainably>

⁸⁶ Financial Times. (2025, November 6). *Carmakers slam UK's plan for EV pay-per-mile tax*. <https://www.ft.com/content/380ae202-6137-4122-bbbb-603822090eag>

⁸⁷ Morton, C., & Ali, Y. (2025). The impact of congestion charging on car ownership: Evidence from a quasi-natural experiment. *Transport Policy*, 160, 181-191. <https://doi.org/10.1016/j.tranpol.2024.10.039>

⁸⁸ Transport for London. (2007, July). *Central London congestion charging: Impacts monitoring - Fifth annual report*. Mayor of London. <http://www.tfl.gov.uk/assets/downloads/fifth-annual-impacts-monitoring-report-2007-07-07.pdf>

⁸⁹ Transport for London. (n.d.). *Congestion charge*. Mayor of London. <https://tfl.gov.uk/corporate/publications-and-reports/congestion-charge>

⁹⁰ Mayor of London. (2025, June 13). *Mayor hails success of London-wide ULEZ scrappage scheme, with over 53,000 older, more polluting vehicles removed from London's roads*. London City Hall. <https://www.london.gov.uk/mayor-hails-success-london-wide-ulez-scrappage-scheme-over-53000-older-more-polluting-vehicles>

4. Heavy Vehicle Policies

Introduction

Decarbonising the freight sector is essential to achieving national emissions targets, given its significant contribution to transport-related emissions. International experience shows that targeted policy interventions can accelerate the uptake of electric trucks and other zero-emission heavy vehicles. Measures such as point-of-sale subsidies, zero-emission zones, and feebate or bonus-malus schemes have been deployed in jurisdictions including California, New Zealand, the Netherlands, Hong Kong and Singapore. These approaches are typically designed to reduce upfront costs and to influence fleet purchasing decisions.



Australian context

Australia's road freight industry contributes 8.6% of national GDP, and heavy vehicles account for 23% of all transport emissions.⁹¹ The Australian government's *Transport and Infrastructure Net Zero Roadmap and Action Plan 2025* outlines a decarbonisation pathway for heavy vehicles through to 2050. In the short-term, it prioritises electrifying key vehicle segments (i.e. buses, rigid trucks) and expanding charging infrastructure. Alongside BEV, the plan identifies the need for continued research and development into low carbon liquid fuel (LCLF) and other emission reduction technologies.⁹²

The *National Freight & Supply Chain Strategy 2025* has been updated to include decarbonisation as a National Priority Action Area, recognising the important role freight transport will play in meeting national net-zero targets.⁹³

⁹¹ Department of Climate Change, Energy, the Environment and Water. (2024). *Australia's emissions projections 2024*. Australian Government. <https://www.dcceew.gov.au/climate-change/publications/australias-emissions-projections-2024>

⁹² Department of Infrastructure, Transport, Regional Development, Communications and the Arts. (2025). *Transport and infrastructure net zero roadmap and action plan*. Australian Government. <https://www.infrastructure.gov.au/sites/default/files/documents/transport-and-infrastructure-net-zero-roadmap-and-action-plan.pdf>

⁹³ Department of Infrastructure, Transport, Regional Development, Communications and the Arts. (2025). *National freight and supply chain strategy 2025*. Australian Government. <https://www.freightaustralia.gov.au/sites/default/files/documents/national-freight-supply-chain-strategy-2025.pdf>

The Australian Government, in consultation with states and territories, is undertaking a cost-benefit analysis (CBA) on whether increasing mass limits for low- and zero-emission heavy vehicles would support their uptake. The results of the CBA was due to be published in 2025.⁹⁴

ARENA's *Driving the Nation* program includes a A\$100 million funding pool to support the deployment of heavy electric vehicles and associated charging infrastructure.⁹⁵ In a separate study it funded d by AECOM, the barriers were identified (in declining order from the perceived greatest) as cost of vehicle and infrastructure, availability of public charging infrastructure, vehicle availability, grid capacity, operational limitations, market uncertainty of solutions, and training and knowledge.⁹⁶

Point of sale subsidies

International

While Australia has never offered point of sale subsidies for heavy vehicles, multiple countries do with substantial discounts ranging from percentage discounts (25% of a vehicle's cost as in New Zealand), price differential discounts (e.g. up to 80% of the cost gap as in Germany) to fixed amounts (e.g. CA\$200,000 per vehicle as in Canada). The common themes are the recognition of an upfront cost barrier that is preventing accelerated electrification of these vehicles. The other policy objectives listed by the subsidy programs include improving air quality and reducing carbon emissions. They follow a similar theory of change that reducing the cost barrier will provide the right market signals to manufactures and speed commercialisation. The subsidies include a range of low emission technologies. Most countries have introduced limits on when they subsidies expire, either for a set number of years or until the assigned funding runs out. In terms of implementation, many of these subsidies are applied directly at the point of sale. Suppliers on a predetermined list manage the purchase process, owners pay them minus the grant amount.

International experience shows that targeted point-of-sale incentives are a critical tool for overcoming the substantial price premium of zero-emission trucks and buses. Countries have adopted different approaches—from high-value grant schemes to voucher-based programs—but all aim to stimulate fleet turnover and create momentum in traditionally slow-moving heavy-vehicle markets.

Germany

Germany's subsidy program for light and heavy commercial vehicles (*Richtlinie zur Förderung von leichten und schweren Nutzfahrzeugen mit alternativen, klimaschonenden Antrieben und zugehöriger Tank- und Ladeinfrastruktur*, known as the KsNI) was established in 2021 but ended in 2024, shortly after the passenger EV subsidy was withdrawn. The program was discontinued due to a national budget crisis. KsNI provided subsidies covering up to 80% of the cost gap between a conventional internal combustion engine truck and an electric truck.

⁹⁴ Department of Infrastructure, Transport, Regional Development, Communications and the Arts. (2025). *Transport and infrastructure net zero roadmap and action plan*. Australian Government. <https://www.infrastructure.gov.au/sites/default/files/documents/transport-and-infrastructure-net-zero-roadmap-and-action-plan.pdf>

⁹⁵ Bowen, C. (2024, November 9). *Shut the truck up! \$100 million in funding to electrify Australia's trucks for quieter, cleaner transport*. Department of Climate Change, Energy, the Environment and Water. <https://minister.dcccew.gov.au/bowen/media-releases/shut-truck-100-million-funding-electrify-australias-trucks-quieter-cleaner-transport>

⁹⁶ AECOM. (2025, July). *Electrifying road freight*. Australian Renewable Energy Agency. <https://arena.gov.au/assets/2025/07/AECOM-%E2%80%93Electrifying-Road-Freight-Report.pdf>

The German Government initially positioned KsNI as a key mechanism to accelerate electric truck adoption, although the focus has since shifted towards supporting charging infrastructure.

An evaluation of KsNI found that more than 6,600 trucks were funded through the program, with over half of these being heavy-duty N3-class vehicles. Criticisms of the program included its relatively high administrative burden and the high subsidy rate. However, the evaluation also estimated that the use of KsNI-funded commercial vehicles will avoid around 846,000 tonnes of carbon dioxide in future years, with the funding responsible for approximately two-thirds of this reduction.⁹⁷

Ireland

Ireland's *Zero Emission Heavy Duty Vehicle (ZEHDV) Purchase Grant Scheme* was launched in February 2024 by the Department of Transport who funds the program, with Transport Infrastructure Ireland appointed as the grant administrator. Grants of up to €500,000 are available depending on the power train and fuel type of the vehicle being procured, the size of the business applying for the grant, and whether they have received any funding from the Scheme previously. Between 30% and 60% of the price differential (excl. VAT and discounts) between the zero-emission heavy vehicle and its diesel equivalent is available. A baseline diesel purchase price is provided for different vehicle classes.⁹⁸

California

California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), introduced in 2009, is one of the longest-running point-of-sale subsidy programs in the United States. It is funded through Cap-and-Invest revenues, making it one of the few programs with ongoing, dedicated funding. A catalogue of eligible vehicle types provides purchasers with the incentive amounts available for each model. Incentive levels vary by vehicle category, including trucks, school and public buses, and refuse or drayage trucks. Funding ranges from US\$16,500 to US\$660,000 for trucks, US\$9,750 to US\$312,000 for buses, and US\$205,000 to US\$480,000 for refuse and drayage trucks. To date, HVIP has supported the deployment of more than 14,000 vehicles, with a total program investment of approximately US\$1 billion.⁹⁹

Canada

Canada's Incentives for Medium- and Heavy-Duty Zero-Emission Vehicles (iMHZEV) Program, introduced in July 2022, is scheduled to run until 31 March 2026 unless funding is exhausted earlier. The program covers battery electric vehicles (BEVs), PHEVs, and fuel cell electric vehicles (FCEVs). It provides incentives of up to CA\$200,000 for eligible vehicle models purchased or leased for at least 12 months. Incentives are applied at the point of sale by the dealer or authorised seller once eligibility is confirmed. Each organisation or level of government may receive up to 10 incentives or a maximum of CA\$1,000,000 per calendar year, whichever comes first.¹⁰⁰ Since the program's launch, Transport Canada has received

⁹⁷ NOW GmbH. (2024). Evaluation report on funding support for climate-friendly commercial vehicles. <https://www.now-gmbh.de/en/news/pressreleases/evaluation-report-on-funding-support-for-climate-friendly-commercial-vehicles/>

⁹⁸ Transport Infrastructure Ireland. (n.d.). *Zero emission heavy duty*. <https://www.tii.ie/en/roads-tolling/alt-fuel-projects-unit/zero-emission-heavy-duty/>

⁹⁹ California Air Resources Board. (n.d.). *Incentives for clean trucks and buses*. <https://californiahvip.org/>

¹⁰⁰ Transport Canada. (n.d.). *Incentives for medium- and heavy-duty zero-emission vehicles (iMHZEV) program*. Government of Canada. <https://tc.canada.ca/en/road-transportation/innovative-technologies/zero-emission-vehicles/incentives-medium-heavy-duty-zero-emission-vehicles>

6,736 iMHZEV requests. In 2024, medium- and heavy-duty ZEVs accounted for 1.4% of Canada's vehicle market.¹⁰¹

New Zealand

New Zealand's Low Emissions Heavy Vehicle Fund (LEHVF), introduced in 2024, will run until 2028 or until its NZ\$24 million allocation runs out. The program covers BEV, PHEV and hydrogen vehicles and provides up to 25% of the cost of a new or converted vehicle. A scheduled review of the LEHVF was completed in February 2025, with the Minister for Energy approving the Energy Efficiency and Conservation Authority's (EECA) recommended updates in May 2025 with the revised settings apply from 28th of the same month. The funding caps per Supplier and Customer remain the same for financial year 2025/26 with the key policy changes made as follows.¹⁰²

- Broader eligibility for conversions: Vehicles are now eligible if they were first registered in New Zealand within the past five years, replacing the earlier fixed 2022–2024 window.
- Increased grant support with higher funding levels now apply to: Zero-emission conversions, new hybrid vehicle purchases, and hybrid conversions.
- Updated company eligibility where applicants must be either a New Zealand-registered company, or a company registered to operate in New Zealand.
- Clarified exclusions: Off-road and heavy-equipment vehicles (now defined as vehicles unable to exceed 70 km/h) remain ineligible.
- Revised vehicle weight classes - Updated classifications for both new purchases and conversions:
 - Light: >5.9–12 t GVM
 - Medium: >12 t GVM to 39 t GCM
 - Heavy: >12 t GVM and >39 t GCM

KEY TAKEAWAYS: Point of Sale subsidies

Point-of-sale subsidies for heavy zero-emission vehicles have been deployed in markets including Germany, Ireland, California, and New Zealand, with observable effects on fleet purchase decisions.

Australia has only recently begun to offer point-of-sale subsidies for heavy vehicles, again taking a state-based approach with NSW and Victoria offering different levels of funding and eligibility requirements.

Across the jurisdictions reviewed, grants structured as point-of-sale discounts (rather than retrospective rebates) and targeted at fleet operators in high-utilisation duty cycles have featured prominently. The relative effectiveness of these design features compared with alternatives has not been separately quantified in the literature reviewed however

¹⁰¹ Transport Canada. (n.d.). 09. *Incentives for zero-emission vehicle program*. Government of Canada. <https://tc.canada.ca/en/binder/09-incentives-zero-emission-vehicle-program>

¹⁰² Energy Efficiency and Conservation Authority. (n.d.). *Low emissions heavy vehicle fund*. New Zealand Government. <https://www.eeca.govt.nz/co-funding-and-support/products/low-emissions-heavy-vehicle-fund/>

preliminary evidence suggests that these international policies have met their targeted objective in bringing forward investment.

Feebates

Australia

Australia has not adopted feebate schemes in any sector where they are typically applied, whether in transport, buildings, appliances or waste management. Feebates are typically designed so that revenue collected from higher-emission products is used to subsidise cleaner alternatives, but this approach has not been implemented domestically. Examples do exist internationally such as in France and Singapore that are relevant for heavy vehicles, with most schemes being in place for at least 10 years.

International

Several countries have introduced feebate-style mechanisms to influence the cost of heavy vehicles and encourage the transition to cleaner technologies. These schemes use penalties on high-emitting models and incentives for low-emission alternatives, offering an additional lever alongside purchase subsidies and regulatory measures.

France

France introduced a vehicle feebate scheme in 2008. Since 2022, heavy ICE vehicles weighing 1,800 kg or more have been subject to a penalty (*malus*) of up to €60,000. The government has progressively lowered the allowable CO₂ emissions threshold per kilometre over time. A bonus is available for low-emission vehicles; however, plug-in hybrid vehicles (PHEVs) have been excluded from the bonus since 2022.¹⁰³ The bonus structure is environmentally based and considers factors such as the ecological footprint of the assembly plant and the transport routes to the point of sale.

Sweden

Sweden introduced a feebate scheme in 2018, which operated until 2022. It was discontinued when EV purchase costs were considered broadly comparable with ICE vehicles, and ongoing subsidies were viewed as no longer justifiable. The *malus* component (an increased vehicle ownership tax) has continued. The scheme applied to passenger vehicles, motorhomes, light trucks and light buses.

BEV sales increased from a 1% monthly share prior to the scheme in 2018 to between 20–30% in 2022. Removal of the subsidy led to reduced private EV leasing due to higher lease prices, although fleet purchasing was not significantly affected.¹⁰⁴ Light vehicles were impacted more than heavy vehicles.

Singapore

Singapore's Early Turnover Scheme for Heavy Commercial Vehicles provides incentives for replacing older vehicles and operates until December 2025. Replacement vehicles with no tailpipe emissions receive the highest incentives of between 70% and 90%, depending on the

¹⁰³ Westerheide, C. (2024, January 09). *France tightens penalty tax for polluting and heavy new vehicles*. Electrive. <https://www.electrive.com/2024/01/09/france-tightens-penalty-tax-for-polluting-and-heavy-new-vehicles/>

¹⁰⁴ Lundberg, L., Bengtsson, G., Sprei, F., Fernqvist, N., & Zetterholm, J. (2026). Charging forward or falling behind? Effects of electric vehicle subsidy removal. *Transportation Research Part D: Transport and Environment*, 151, 105126. <https://doi.org/10.1016/j.trd.2025.105126>

emissions standard of the existing vehicle.¹⁰⁵ A feebate system also applied to taxis and light commercial vehicles and remains in place until 2025.¹⁰⁶

KEY TAKEAWAYS: Feebates

Australia lacks experience of bonus-malus schemes and has yet to introduce these in any sectors where they have been applied elsewhere.

France has extended bonus–malus logic to commercial vehicles, and Sweden has applied emissions-based differentiation to road pricing, demonstrating how feebate-type designs can be applied to freight.

Zero Emission Zones/Low Emission Zones

Australia

Australia does not currently have any zero emission zones (ZEVs) or low emission zones (LEVs) to address air quality and air pollution. A key rationale for introducing such zones internationally is to reduce the health impacts of traffic-related pollution. The University of Melbourne estimates that traffic-related air pollution in Australia contributes each year to approximately 11,000 premature deaths, 19,000 hospitalisations for cardiovascular and respiratory illness, and 66,000 asthma cases.¹⁰⁷

International

Internationally, heavy-vehicle zero-emission and low-emission zones have become important policy tools for reducing the environmental and health impacts of freight activity. Experiences in Europe, North America and Asia show that well-designed zones can rapidly reshape fleet purchasing decisions and drive significant improvements in local air quality.

Germany

Germany introduced its first low emission zones (LEVs) in 2008, beginning with twelve zones across twenty of the country's largest cities. There are now 49 LEVs in operation.¹⁰⁸ Research shows that the introduction of LEVs in Germany has led to substantial reductions in NO₂ and PM₁₀ levels, along with improved health, wellbeing and productivity for local populations. Studies have also found positive educational outcomes for children living within these zones.¹⁰⁹

¹⁰⁵ Land Transport Authority. (n.d.). *Earl turnover scheme*. OneMotoring. <https://onemotoring.lta.gov.sg/content/onemotoring/home/buying/vehicle-types-and-registrations/commercial-vehicle/early-turnover.html>

¹⁰⁶ Wappelhorst, S. (2022, Aug 8). Incentivizing zero- and low-emission vehicles: The magic of feebate programs. *International Council on Clean Transportation*. <https://theicct.org/magic-of-feebate-programs-jun22/>

¹⁰⁷ Terrill, M., Emslie, O., & Coates, B. (2019, October). *Why it's time for congestion charging: Better ways to manage busy roads*. Grattan Institute. <https://grattan.edu.au/wp-content/uploads/2019/10/923-Why-its-time-for-congestion-charging.pdf>

¹⁰⁸ Milieusticker voor Duitsland. (n.d.). *Environmental zones in Germany*. <https://www.germanemissionssticker.com/zones/>

¹⁰⁹ Gehrsitz, M. (2017). The effect of low emission zones on air pollution and infant health. *Journal of Environmental Economics and Management*, 83, 121-144. <https://doi.org/10.1016/j.jeem.2017.02.003>; Brehm, J., Pestel, N., Schaffner, S., & Schmitz, L. (2025). From Low Emission Zone to academic track: Environmental policy effects on educational achievement in elementary school. *Journal of Environmental Economics and Management*, 132, 103165. <https://doi.org/10.1016/j.jeem.2025.103165>

Netherlands

The Netherlands introduced zero-emission zones for freight (ZEZ-Fs) in 2025. Within six months, the market share of newly registered zero-emission vans and trucks increased from single digits to 76%. Eighteen cities have adopted a unified national framework that specifies zone rules based on emission standards, vehicle type and registration date, allowing only zero-emission vans and trucks to operate within zonal boundaries.

Grace periods apply for certain vehicle categories, including vintage vehicles, wheelchair-accessible vehicles, and special-purpose vehicles. The national approach evolved from voluntary regional pilots, with zones announced four years before implementation. Government support has been available in the form of subsidies for zero-emission vehicles and charging infrastructure.¹¹⁰

Vehicles allowed to access a ZEZ-F							
Vehicle category		2025	2026	2027	2028	2029	2030
No transitional period							
New vehicles	N1 vans (≤ 3,5 tonnes)	Zero tailpipe emissions					
Registered from January 1, 2025	N2 trucks (3.5–12 tonnes)						
	N3 trucks (> 12 tonnes)						
Transitional period							
Fleet vehicles	N1 vans (≤ 3,5 tonnes)	Euro 5 vans	Zero tailpipe emissions				
		Euro 6 vans		Zero tailpipe emissions			
	N2 trucks (3.5–12 tonnes)	Euro VI box trucks with a maximum age of 5 years on January 1, 2025					Zero tailpipe emissions
		Euro VI semi-trailer trucks with a maximum age of 8 years on January 1, 2025					
		Plug-in hybrid trucks provided they can drive emission-free					
N3 trucks (> 12 tonnes)							
	Exemptions						
New and fleet vehicles	N1 vans (≤3.5 tonnes) N2 trucks (3.5-12 tonnes) N3 trucks (>12 tonnes)	Exemptions for vans and trucks 40 years and older, wheelchair-accessible vans, and certain trucks (e.g., trucks for street cleaning, crane trucks, and fire trucks)					

Figure 4. Implementation schedule as of August 2025 for ZEZ-Fs in the Netherlands (Government of the Netherlands, 2025)

United Kingdom

London operates one of the most well-known Low Emission Zones (LEZs), primarily targeting trucks and heavy goods vehicles. Other large UK cities (seven in England and four in Scotland) have established similar zones. ICEV are required to pay a fee or penalty to enter the zones,

¹¹⁰ Government of the Netherlands. (n.d.). *Zero-emission zones in the Netherlands*. Business.gov.nl. <https://business.gov.nl/sustainable-business/sustainable-business-operations/zero-emission-zones-in-the-netherlands/>

with costs substantially higher for heavy vehicles compared to passenger cars. Some UK LEZs apply exclusively to heavy vehicles, while others cover all vehicle types.¹¹¹

United States

Several Californian cities have trialled Zero Emission Delivery Zones. In 2021, Santa Monica introduced a voluntary ZEDZ offering priority kerbside access for zero-emission delivery vehicles. These initiatives have focused more on delivery vehicles than on heavy freight.¹¹²

Los Angeles has pursued changes to parking and loading regulations to incentivise zero-emission delivery activity and improve access in high-demand areas.¹¹³

Shenzhen, China

Shenzhen introduced “Green Logistics Zones” in 2018. These zones cover around 1.1% of the city and permit only electric freight vehicles to operate. Prior to implementation, the government provided significant financial support, including upfront purchase subsidies and operating cost incentives, making electric freight vehicles cost-competitive with diesel alternatives.

Additional measures include free kerbside parking for electric freight vehicles within the zones. At the time of introduction, approximately 20% of the logistics fleet was already electric, supporting a smoother transition.¹¹⁴

KEY TAKEAWAYS: Zero Emission Zones/Low Emission Zones

Zero emission zones for freight have not yet been established in Australia, though several state governments are examining frameworks for low-emission delivery zones.

The Dutch ZEZ-F model combines national framework legislation with local implementation discretion, industry engagement, and a four-year transition period.

¹¹¹ Transport Scotland. (n.d.). *About low emission zones*. Low Emission Zones Scotland. <https://lowemissionzones.scot/about>; Department for Environment, Food & Rural Affairs. (2020, January 28). *Driving in a clean air zone*. UK Government. <https://www.gov.uk/guidance/driving-in-a-clean-air-zone>

¹¹² Carey, C. (2024, January 17). US cities join zeroemissions delivery challenge. *Cities Today*. <https://cities-today.com/us-cities-join-zero-emissions-delivery-challenge/>

¹¹³ Steimer, H. & Kothari, V. (2022). Zero-emission delivery zones: A new way to cut traffic, air pollution and greenhouse gases. *World Resources Institute*. <https://www.wri.org/insights/zero-emission-delivery-zones-traffic-pollution>

¹¹⁴ Xue, L. (2021, March 11). Lessons from Shenzhen's green logistic zones: Fast-tracking zero-emissions freight. *The CityFix*. <https://thecityfix.com/blog/shenzhens-green-logistic-zones-fast-tracking-zero-emission-freight/>

5. Energy Policies

Introduction

Energy policy and EV policy are increasingly interconnected as transport electrification makes vehicle owners and drivers more dependent on the electricity system for mobility. How the electricity system is planned, managed, and regulated directly affects the cost, reliability, and sustainability of EV charging. At the same time, rising EV uptake will increasingly influence electricity demand, network planning, and renewable energy integration. The research in the section focuses on grid integration and capacity, tariffs, connections, network visibility, and equity and access.

Tariffs and network connections

Tariff design and grid connection arrangements influence the degree of consumer participation in managed charging and the efficiency of EV charging more broadly. This includes evolving residential and commercial time-of-use (ToU) tariffs, dynamic pricing, virtual power plants (VPPs), and vehicle-to-grid V2G business models, with consumer consent remaining central. Improving connection timeframes, enhancing network capacity and visibility, and addressing equity concerns in access to energy and charging infrastructure are also key priorities. International experience from Europe and North America around costs, data granularity, and regulatory frameworks can offer some useful lessons to inform Australia's approach.

Australia

In 2017, the Australian Energy Market Commission (AEMC) implemented several reforms from its 2012 Power of Choice review. The review sought major tariff reform to give consumers more control over their energy use and costs. Key recommendations included transitioning to more cost-reflective network tariffs (such as ToU and demand-based tariffs), expanding options for consumers to manage their energy use (e.g. smart meters and demand response), and introducing clearer price signals to shift consumption away from peak periods.¹¹⁵

Since then, retailers and DNSPs have developed new tariffs to encourage energy use when it is most beneficial (for example, consuming surplus solar generation in the middle of the day or reducing demand during evening peaks). However, retail tariffs do not always directly mirror network tariffs because they incorporate additional components such as wholesale energy costs, retailer margins, environmental levies, and service fees. The Australian Energy Regulator (AER) estimates that in 2024, almost 40% of residential customers were on cost-reflective tariffs, up six percentage points from the previous year.¹¹⁶

For EVs, dedicated EV tariffs are becoming more common for residential consumers who charge at home. These tariffs incentivise charging outside the evening peak, typically late morning to mid-afternoon, overnight from around 9pm, or on weekends. Solar-soaker tariffs offer low or free electricity during peak solar hours (e.g., 10am–3pm).¹¹⁷

¹¹⁵ Australian Energy Market Commission. (n.d.). *Power of choice review: Final report information sheet*. Australian Government. <https://www.aemc.gov.au/sites/default/files/content/54d4b4bd-33ab-46e7-9367-aa4288399181/Final-report-Information-sheet.pdf>

¹¹⁶ Australian Energy Regulator. (n.d.). *Network tariff reform*. Australian Government. <https://www.aer.gov.au/about/strategic-initiatives/network-tariff-reform>

¹¹⁷ Emodi, N. V., Dwyer, S., Nagrath, K., & Alabi, J. (2022). Electromobility in Australia: Tariff design structure and consumer preferences for mobile distributed energy storage. *Sustainability*, 14(11), 6631. <https://doi.org/10.3390/su14116631>

From July 2026, the Federal Government's Solar Sharer Offer (announced in November 2025) will guarantee at least three hours of free electricity each day for customers in NSW, South Australia, and Southeast Queensland under the Default Market Offer (DMO). Expansion to other jurisdictions may occur from 2027. A June 2025 consultation paper notes that the initiative aims to encourage households to shift usage toward periods of low-cost solar generation.¹¹⁸ This may benefit households with an EV and a smart meter who can schedule daytime charging but cannot install rooftop PV (for example, renters, apartment residents, those in heritage-listed properties). The overall value will depend on tariff rates outside the free period and the household's flexibility.

Examples of flexible demand tariffs include¹¹⁹:

- **ToU/Solar soaker tariffs:** Ausgrid's Residential ToU tariff and Essential Energy's Sun Soaker Residential tariff typify many DNSP ToU structures. They feature significantly higher rates during morning and evening peaks and lower, flatter rates at other times. Essential Energy's standard Residential ToU follow a similar structure but with less pronounced peak prices.
- **Two-way tariffs:** Some DNSPs (for example, Ausgrid and Essential Energy) are trialling two-way residential load and generation tariffs for households with solar-battery systems. These tariffs offer higher payments for exports during the evening peak and apply charges to discourage exports at other times.
- **EV tariffs:** Retailers including AGL, Energy Australia, Origin Energy, and Ovo offer low-cost overnight charging windows to EV-driving households. Powershop provides discounted two-hour daytime charging and an additional four-hour overnight window. Origin Energy offers low overnight rates and may also automate daytime charging at lower dynamic prices.
- **Wholesale pricing:** Retailers such as Amber Electric and Flow Power pass through wholesale electricity prices to customers, with the former doing so as part of a membership model. Prices can vary significantly during high- and low-demand periods, especially during extreme events such as power station outages or major infrastructure failures.

Ausgrid is trialling flexible load tariffs to better understand small business EV charging behaviour.¹²⁰ These include Tariff EA964 (Small Business Flexible Load - primary circuit) and EA965 (Residential Flexible Load - secondary circuit). Both offer very low charging prices of around 1c/kWh. However, during severe network congestion, a Critical Peak Price (CPP) of 139c/kWh may be triggered, with up to 40 hours of CPP exposure per year. Customers receive one-day-ahead notification. Trials indicate that CPP signals can help reduce grid stress during high-risk periods, such as extreme heat events that may approach thermal limits on conductors.¹²¹

¹¹⁸ Department of Climate Change, Energy, the Environment and Water. (2025). *Review outcomes: 2025 reforms to the default market offer*. Australian Government.

¹¹⁹ University of Technology Sydney. (2024, June). *Flexible demand: State of play in Australia*. Australian Renewable Energy Agency. <https://arena.gov.au/assets/2024/06/UTS-Flexible-Demand-State-of-Play-in-Aust-Report.pdf>

¹²⁰ Ausgrid. (2025, February). *Trial tariff notification*. Australian Government. <https://www.aer.gov.au/system/files/2025-03/Ausgrid%20-%20Tariff%20trial%20notification%20-%202025-26.pdf>

¹²¹ Ausgrid. (2025). *Ausgrid network price list 2025-26*. <https://www.ausgrid.com.au/-/media/Documents/Regulation/Pricing/PList/Ausgrid-Network-Price-List-2025-26.pdf>

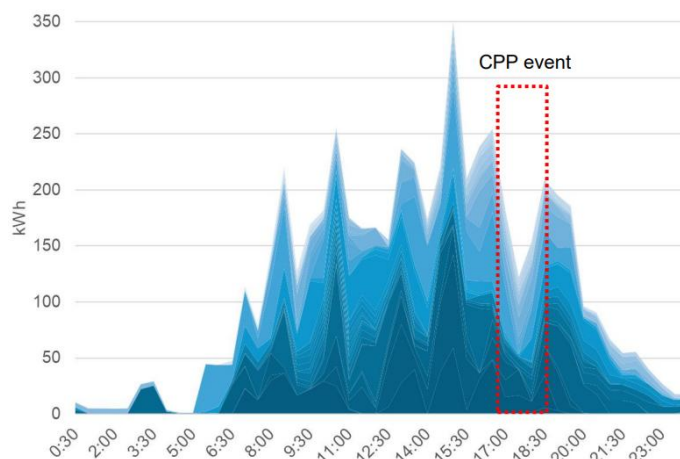


Figure 5. 75 EV charging customers with EA964 on 27 December 2024 when the temperature reached 37°C.¹²²

At the end of 2025, the AER granted a ring-fencing waiver to CitiPower, Powercor and United Energy to conduct a kerbside charging trial. As part of this trial, the distributors will introduce and test a new ToU tariff specifically designed for kerbside charging, as the existing small business network tariff was considered unsuitable. The proposed tariff offers low usage rates during the middle of the day and provides export rewards during peak load periods. The export reward is 7c/kWh between 4pm and 9pm, while the off-peak import tariff is 1c/kWh between 11am and 4pm. A seasonal export credit also applies during December to February and June to August between 4pm and 9pm.¹²³

DNSPs are shifting away from uniform, network-wide tariff approaches toward location- and time-specific incentives designed to optimise unused network capacity and manage local constraints caused by varying levels of distributed energy resource (DER) uptake. Mechanisms being explored include:

- **Dynamic, real-time pricing:** Under the National Electricity Rules (NER), network tariffs are set using long-run marginal cost pricing, which reflects projected long-term costs of serving customers. Dynamic, real-time pricing instead adjusts network prices based on real or near-real-time costs to supply customers.
- **Dynamic Operating Envelops (DOEs):** DOEs set flexible limits on how much electricity customers can import from or export to the grid. By tailoring limits dynamically, DOEs help manage local network conditions while enabling services such as flexible connections. DNSPs have trialled DOEs in initiatives such as Ausgrid's Project Edith and AEMO's Project EDGE.
- **Flexible connection:** Under a flexible connection agreement, customers can nominate the proportion of their total load or export capacity that is flexible. This approach is intended to enable new loads to connect without triggering costly network upgrades. For example, SA Power Networks offers commercial and industrial customers lower augmentation charges and lower ongoing tariffs in exchange for reducing load or

¹²² EVX Australia. (2025, October 30). Responses to the Victorian Parliament inquiry: Electricity supply for electric vehicles. Victorian Parliament. https://www.parliament.vic.gov.au/493303/contentassets/4fo44546coef45f48bdac42c4bd783c4/o71-evx_redacted.pdf

¹²³ Australian Energy Regulator. (2025, December). *Kerbside EV charging trial network tariff*. Australian Government. <https://www.aer.gov.au/system/files/2025-12/CP%20RRP%20ATT%20SE%2003%20E2%80%93%20Kerbside%20EV%20charging%20trial%20network%20tariff%20E2%80%93%20Dec2025%20E2%80%93%20Public.pdf>

exports in response to the DOE. Other DNSPs offering dynamic or flexible connections include SA Power Networks (SAPN), Essential Energy and Energex.¹²⁴

ARENA has funded several major residential EV orchestration pilots examining the impacts of different EV tariffs and connection settings. These include projects led by AGL, Origin Energy, Jemena, Ergon/Energex and Amber Electric. Key findings include¹²⁵:

- Home charging demand was diverse and didn't correlate strongly with the evening peak, contrary to expectations.
- Solar households responded well to charging incentives during peak solar hours, although the AGL trial found most households still preferred overnight charging.
- There was strong consumer participation and satisfaction with ToU tariffs, controlled charging and wholesale-linked pricing, although participants tended to be innovators and early adopters.
- Amber Electric found challenges in coordinating home batteries and EV charging for households with both technologies.¹²⁶

Commercial and fleet EV orchestration has not been trialled to the same extent as residential projects, although more activity is expected. The Origin trial included fleets, though no operational data was released beyond fleet manager attitudes. The ActewAGL REVS project aimed to deliver FCAS using a V2G-capable government fleet, but immaturity of the technology and standards meant no FCAS services were delivered. Zenobe completed an electric bus trial (with a delivery truck project underway) and found that co-located battery storage could be used to arbitrage ToU tariffs when charging the buses, resulting in operational savings.¹²⁷

Multiple public charging pilots have been funded by ARENA, providing insights from CPOs on the development and operation of fast charging sites. Key findings include¹²⁸:

- Pricing strategies should reflect the true cost of providing charging services.
- Early and close engagement with DNSPs is essential for establishing or upgrading sites. One CPO reporting waiting up to two years for their ultra-fast sites to progress from connection application to final energisation.
- Load management is critical, requiring dynamic approaches to manage peak demand and avoid network augmentation.
- Tariff structures may not be cost-reflective for high-powered charging. Evie Networks noted that long-run marginal cost methodologies do not adequately account for the low utilisation of ultra-fast chargers, with peak EV charging times often not aligning with system peak demand and most sites having sufficient headroom for additional load.
- Kerbside charging can involve lengthy approval processes. Intellihub found that 6-9 months should be budgeted to navigate local government, DNSP and energy retailer

¹²⁴ SA Power Networks. (n.d.). *Flexible connections for commercial and industrial customers*. <https://www.sapowernetworks.com.au/connections/new-connections/commercial-industrial-and-developer-new-connections-greater-than-100amps/flexible-connections-for-commercial-and-industrial-customers/>

¹²⁵ University of Technology Sydney. (2024, June). *Flexible demand: State of play in Australia*. Australian Renewable Energy Agency.

<https://arena.gov.au/assets/2024/06/UTS-Flexible-Demand-State-of-Play-in-Aust-Report.pdf>

¹²⁶ Amber. (2024, October 22). *Automating EV charging in line with wholesale pricing: Lessons learnt report 1*. <https://arena.gov.au/knowledge-bank/amber-automatic-ev-charging-in-line-with-wholesale-pricing-lessons-learnt-report-1/>

¹²⁷ Deby, S & Serag, Y. (2023). *Next generation electric bus depot: Final report*. <https://arena.gov.au/assets/2023/08/PUBLIC-Final-Report-2020ARPo18-Next-Gen-Electric-Bus-Depot.pdf>

¹²⁸ Energeia. (2024). *Insights from ARENA's public charging projects*. Australian Renewable Energy Agency. <https://arena.gov.au/knowledge-bank/insights-from-arenas-public-charging-projects/>

approvals for power/light pole installations.¹²⁹ For ultra-fast charging, Evie Networks reported that a typical connection process takes around one year.¹³⁰

- Regulatory and process differences across DNSPs create variability in installation times. EVX highlighted substantial disparities between DNSP regions. In NSW, once approvals are secured, installation and activation can typically be completed in around four hours. In Victoria, the process can take up to two weeks. These differences are driven by varying approaches to contestable and non-contestable works, which influence how many agencies and contractors must be involved, and ultimately affect site activation timelines.¹³¹

International

Internationally, energy-market and network policies are evolving rapidly in response to rising EV uptake. Countries are experimenting with new tariff structures, grid-connection processes and flexibility programs to ensure that EVs can be efficiently integrated to support (rather than strain) local, regional, and national electricity systems.

United Kingdom

In the UK, the availability of ToU tariffs has grown rapidly alongside increasing uptake of EVs and smart heating technologies. The number of EVs on the road doubled from around 250,000 in 2024 to 500,000 in 2025. This growth has led to new tariffs tailored to different technologies and, in some cases, specific brands.¹³²

For example, EDF Energy offers the *FreePhase Dynamic* tariff, providing three daily rates based on day-ahead wholesale prices. So Energy offers *So Unique*, a personalised tariff with peak, off-peak, and super off-peak periods tailored to an individual household's usage profile. For households with V2G-capable vehicles and chargers, Octopus Energy offers the *Octopus Power Pack*, which it says configures charging and discharging to minimise energy costs and maximise carbon savings. Participation requires customers to allow energy export from their EV for at least 12 hours per day, 20 days per month.¹³³

In addition to tariff developments, UK CPOs report that grid connection timelines typically range from 12 to 15 months, with approximately 10 weeks spent waiting for the initial connection offer from the utility.¹³⁴

United States

Across the US, grid connection times for EV charging infrastructure vary significantly. According to the Interstate Renewable Energy Council, from application to energisation, Level 2 AC charging sites typically require between one day and six months, while DC fast charging sites generally take between six months and two years.¹³⁵

¹²⁹ Intellihub. (2024, June). *Simplify your energy transitions*. Australian Renewable Energy Agency. <https://arena.gov.au/assets/2024/12/Intellihub-Intellihub-Street-Power-Pole-EV-Charger-with-Grid-Integration-Lessons-Learnt-Report-3.pdf>

¹³⁰ Evie Networks. (2019, December). *Lessons learnt report*. Australian Renewable Energy Agency. <https://arena.gov.au/assets/2019/05/evie-networks-lessons-learnt-report-december-2019.pdf>

¹³¹ Nagrath, K, Dwyer, S, Forster, A, Beletich, S, (2025). *ChargeKonnnect kerbside EV charging project: Lessons learnt report 1*. Australian Renewable Energy Agency. <https://arena.gov.au/assets/2025/09/EVX-ChargeKonnnect-Kerbside-EV-Charging-Project-Lessons-Learnt-Report-1.pdf>

¹³² LCP Delta. (2025, December). *Beyond tariffs: GB household flexibility propositions*. <https://insights.lcp.com/lrs/032-PAO-331/images/LCP-Delta-Beyond-Tariffs-GB-household-flexibility-propositions-Dec-2025.pdf>

¹³³ Octopus Energy. (n.d.). *Octopus power pack: The UK's firsts vehicle-to-grid tariff*. <https://octopus.energy/power-pack/>

¹³⁴ Competition and Markets Authority. (2021). *Electric vehicle charging market study*. Department for Transport. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1012617/EVC_MS_final_report_--.pdf

¹³⁵ Hernandez, M. (2022). *Emerging best practices for electric vehicle charger interconnection*. Interstate Renewable Energy Council. https://irecusa.org/wp-content/uploads/2022/06/EV-Paper-3-Charger-Interconnection_compressed.pdf

California

In 2025, the California Public Utilities Commission issued guidance for utilities to design dynamic hourly price for electricity to shift electricity demand and provide large energy consumers with dynamic tariff options.¹³⁶ Several pilot programs have since been launched, including Hourly Flex pricing pilots and the California Community Choice Aggregators EV Charging Pilot. In terms of V2G, Wallbox has launched a pilot program offering incentives for EV owners who provide grid support services.¹³⁷

Canada

In Canada, some utilities (such as Nova Scotia Power) offer Critical Peak Pricing (CPP) under pilot tariffs. During CPP events, held for four-hour windows between November and March with one day's notice, electricity is priced significantly higher than the standard flat rate to discourage demand during critical periods.¹³⁸

New Zealand

New Zealand's Electricity Authority is proposing to mandate that retailers offer pricing structures that provide cheaper rates for off-peak consumption, as well as export rewards during peak periods for households with rooftop solar or batteries. These changes are intended to be available by July 2026. Some retailers also offer special EV plans, including a 50% discounted day rate or an initial six months of free charging.¹³⁹

Norway

Norway does not offer EV-specific tariffs. Instead, consumers can access dynamic pricing linked to hourly spot electricity prices.¹⁴⁰ An electricity support scheme (*Strømsstøtte*) helps protect households from price volatility. In 2025, Norway introduced a new policy, *Norgespris*, enabling customers to purchase electricity at a flat rate to shield against price spikes.

KEY TAKEAWAYS: Tariffs and network connections

Australia is progressing on EV-specific electricity tariffs and managed charging frameworks, with several network businesses running trials.

International evidence, particularly from Denmark's dynamic tariff system and New Zealand's time-of-use programs, suggests that genuinely cost-reflective, real-time EV tariffs will require more ambitious regulatory settings and stronger coordination between network businesses and charge point operators.

under some managed-charging tariff structures.

¹³⁶ California Public Utilities Commission. (n.d.). *CPUC issues guidance for utility dynamic hourly rates*. State of California. <https://www.cpuc.ca.gov/news-and-updates/all-news/cpuc-issues-guidance-for-utility-dynamic-hourly-rates>

¹³⁷ Norman, W. (2025, October 23). Wallbox launches multi-state bidirectional charging pilot in California and Connecticut. *EV Infrastructure News*. <https://www.evinfrastructurereports.com/ev-technology/wallbox-launches-multi-state-bidirectional-charging-pilot-in-california-and-connecticut>

¹³⁸ Nova Scotia Power. (n.d.). *Critical peak pricing*. <https://www.nspower.ca/your-home/residential-rates/critical-peak>

¹³⁹ Meridian Energy. (n.d.). *EV plan*. <https://www.meridianenergy.co.nz/for-home/ev-plan>

¹⁴⁰ Vibb. (n.d.). *Strøm*. <https://vibb.no/strom>

Network visibility

Australia

A key challenge in improving visibility of the low-voltage (LV) network is the lack of comprehensive measurement data across distribution systems. Existing metering points are sparse, and the data available is often insufficient for detailed operational analysis. Advancements in grid-digitisation technologies present opportunities to address these limitations and enhance LV visibility.¹⁴¹

Dynamic network operations rely on access to accurate data and a clear understanding of real-time grid conditions. However, improving transparency at the LV level is costly. DNSPs and other stakeholders generally agree that Australia's LV network has low visibility due to several factors, including incomplete data coverage. For example, a hosting-capacity study prepared for Essential Energy by ZepBen found that almost 20% of feeders contained missing data, affecting LV management and the estimation of hosting capacity.¹⁴² This lack of visibility makes it more challenging for DNSPs to accurately estimate or increase hosting capacity. One study found that costs associated with strengthening distribution networks (ranging from infrastructure expansion to the deployment of management and control technologies) could reach A\$600 million by 2030 and A\$1 billion by 2050 (NPV).¹⁴³

Low or no visibility often results in more conservative constraints on customers connecting or operating DER than is technically necessary. Technologies such as smart meters, phasor measurement units (which can monitor large end-user loads including clusters of EV chargers), and energy management systems (at the household or inverter level) are being used to improve LV monitoring capabilities.¹⁴⁴

Over the past decade, numerous Australian projects and initiatives have examined the impact of DER (including EVs) on the LV network and hosting capacity. These include SAPN's *Advanced VPP Grid Integration Project*, the University of Queensland's *Increasing Visibility of Distribution Networks* project, ZepBen's *evolve DER* initiative, GreenSync's *deX platform*, UTS's *Network Renewed* project, Ausgrid's *Project Edith*, and AEMO's *Project EDGE*.¹⁴⁵

International

Many countries with higher levels of EV penetration are investing in improved network visibility to better understand real-time conditions across LV networks. These initiatives aim to support smarter planning, reduce augmentation costs, and enable more flexible management of EV charging demand.

¹⁴¹ RACE for 2030. (2021). N2 opportunity assessment: Low voltage network visibility and optimising DER hosting capacity-final report. <https://www.racefor2030.com.au/content/uploads/N2-OA-Project-FINAL-Report-2021.pdf>

¹⁴² Zepben. (2022, April). *Essential enegy hosting capacity study*. Australian Energy Regulator.

<https://www.aer.gov.au/system/files/Essential%20Energy%20-%207.01.01%20Hosting%20Capacity%20Study%20-%20Zepben%20-%20Apr22%20-%20Public.pdf>

¹⁴³ Graham, P., Brinsmead, T., Spak, B., & Havas, L. (2019). *Review of cost-benefit analysis frameworks and results for DER integration*. CSIRO.

https://www.aemo.com.au/-/media/files/electricity/nem/der/2019/oen/csiro_cbareviewreport_13-05-2019.pdf

¹⁴⁴ RACE for 2030. (2021). N2 opportunity assessment: Low voltage network visibility and optimising DER hosting capacity-final report. <https://www.racefor2030.com.au/content/uploads/N2-OA-Project-FINAL-Report-2021.pdf>

¹⁴⁵ RACE for 2030. (2021). N2 opportunity assessment: Low voltage network visibility and optimising DER hosting capacity-final report.

<https://www.racefor2030.com.au/content/uploads/N2-OA-Project-FINAL-Report-2021.pdf>; Ausgrid. (n.d.). *Project Edith*. <https://www.ausgrid.com.au/About-Us/Future-Grid/Project-Edith>; Australian Energy Market Operator. (n.d.). *Project EDGE*. <https://www.aemo.com.au/initiatives/major-programs/nem-distributed-energy-resources-der-program/der-demonstrations/project-edge>

Denmark

In Denmark, Ravdex has been using smart meters and advanced data analytics to deliver real-time visibility of the LV network in preparation for increasing EV charging demand. The initiative has achieved several positive outcomes, including improvements in voltage and power quality, enhanced error prediction, and more effective load shifting.¹⁴⁶

Norway

In Norway, the largest Distribution System Operator partnered with technology company Heimdall Power in 2023 to undertake real-time grid monitoring to identify system-level capacity for EV charging. This approach replaces Elvia's conventional calculation methods with a sensor- and software-driven system that provides real-time insights into available capacity.¹⁴⁷

United Kingdom

In the UK, the My Electric Avenue project (2013–2015) found that up to \$2.2 billion in network costs could be avoided by 2050, given that 32% of LV networks would require augmentation once 40–70% of households adopt EVs.¹⁴⁸ Several Distribution Network Operator (DNO) projects have also assessed the impact of EVs on LV networks. For example, UK Power Networks' *Envision* project (2020–2022) developed a machine learning tool to more rapidly and cost-effectively assess LV impacts from DER, including EV charging.¹⁴⁹

KEY TAKEAWAYS: Network visibility

Australia's progress on EV charging data and network visibility is improving but remains fragmented across jurisdictions.

The Danish model integrates aggregated real-time charging data into active grid management, a level of integration not currently in operation in Australia, though Australian trials are underway.

AEMO's Project EDGE demonstrates appetite for advancing this capability in Australia.

¹⁴⁶ Networked Energy Services. (n.d.). *RAVDEx Denmark grid visibility*. <https://www.networkedenergy.com/en/success/ravdex-denmark-grid-visibility>

¹⁴⁷ Heimdall Power. (n.d.). *System-wide with Elvia*. <https://www.heimdallpower.com/news/system-wide-with-elvia>

¹⁴⁸ My Electric Avenue. (n.d.). *My electric avenue*. <https://myelectricavenue.info/>

¹⁴⁹ UK Power Networks. (n.d.). *Envision*. <https://innovation.ukpowernetworks.co.uk/projects/envision>

Access, equity, and social equity

There is no single global standard for access and equity in EV regulatory frameworks, but key concepts are increasingly defined in international standards and regional regulations. Access and equity are distinct yet interconnected principles that underpin a just energy transition. They move beyond simple equality (treating everyone the same) to recognise differences in consumer circumstances, starting points, and needs.¹⁵⁰

Table 5. Definitions and relevance for EV sector for Access and Equity

Concept	Definition	Relevance to EVs
Access	The ability of individuals or groups to obtain and use a service, product, or resource, focusing on physical availability and practical usability.	The ability for individuals and households (such as lower-income users, Culturally and Linguistically Diverse (CALD) communities, those with limited mobility, or people living in rural areas, rental properties, or apartments) to physically and conveniently access EVs and charging infrastructure.
Equity (equitable access) - charging	Fairness in the distribution of resources, opportunities, and benefits, focusing on achieving comparable outcomes when it comes to EV charging rather than uniform treatment.	The ability to achieve the same charging outcomes (e.g., reliability, convenience, cost) regardless of where someone lives, works, or charges.
Equity (equitable access) – EV ownership	Fairness in the distribution of resources, opportunities, and benefits, focusing on achieving comparable outcomes when it comes to EV owning/driving rather than uniform treatment.	The ability to access the same EV ownership outcomes (e.g., reliability, convenience, cost) regardless of household income.
Social equity of energy access	A broad concept encompassing distributional, procedural, and recognitional fairness in the energy transition, ensuring all groups have safe, reliable, affordable energy and do not bear disproportionate burdens.	The ability to access affordable, reliable and clean energy for EV charging regardless of where someone lives or charges, and ensuring vulnerable households are not disproportionately exposed to higher electricity costs or grid-upgrade passthroughs.

Access

Access refers to the ability of individuals or groups to obtain and use a service, product, or resource.¹⁵¹ In the context of energy and EVs, it describes the physical and practical ability to use EV charging infrastructure or energy services, taking into account factors such as location,

¹⁵⁰ Heffron, R. J., & McCauley, D. (2017). The concept of energy justice across the disciplines. *Energy Policy*, 105, 658-667. <https://doi.org/10.1016/j.enpol.2017.03.018>; Carley, S., & Konisky, D. M. (2020). The justice and equity implications of the clean energy transition. *Nature Energy*, 5(8), 569-577. <https://doi.org/10.1038/s41560-020-0641-6>

¹⁵¹ Penchansky, R., & Thomas, J. W. (1981). The concept of access: definition and relationship to consumer satisfaction. *Medical Care*, 19(2), 127-140. International Energy Agency (IEA). (2020). *Defining energy access: 2020 methodology*. Paris: IEA.

availability, and convenience.¹⁵² Policy mechanisms typically aim to ensure that infrastructure is physically available to all users, including those without off-street parking, and those with disabilities or limited mobility.

Equity (Equitable Access) - Charging

Equity (Equitable Access) – Charging refers to fairness in the distribution of resources, opportunities, and benefits, with a focus on outcomes rather than uniform treatment.¹⁵³ For EV charging, this means ensuring that households without dedicated home charging can achieve comparable charging outcomes (such as reliable and cost-effective charging) to those with home chargers. Relevant policy mechanisms seek to address the structural barriers that prevent this outcome.¹⁵⁴ Recent Australian inquiries have highlighted that renters and regional communities often lack these opportunities.¹⁵⁵ Consequently, federal strategies have begun prioritising targeted programs for lower-income users to avoid subsidies disproportionately benefiting higher-income households.¹⁵⁶

Equity (equitable access) – EV ownership

Equity (equitable access) – EV ownership concerns fairness in who can access the benefits offered to those that can own an EVs. EV uptake is currently concentrated among higher-income households, raising concerns about a two-tiered transport system.¹⁵⁷ Achieving equitable ownership requires policy measures that reduce total cost of ownership for a broader range of consumers.

The high upfront purchase price of new EVs remains the primary barrier.¹⁵⁸ Targeted initiatives (such as tax concessions, MRSP caps, and fleet incentives) play an important role in catalysing the second-hand market and expanding access to lower-income households. Evidence also supports redistributing incentives toward those most in need, including subsidies for second hand vehicle and charging costs.¹⁵⁹¹⁶⁰

While EV subsidies are considered a relatively expensive policy support mechanism, they are important to encourage early adopters and generate medium-term spillover effects as knowledge and experience spreads.¹⁶¹

International studies show:

¹⁵² Hall, D., & Lutsey, N. (2017). Emerging best practices for electric vehicle charging infrastructure. *The International Council on Clean Transportation (ICCT)*: Washington, DC, USA, 54.

¹⁵³ Jenkins, K., McCauley, D., Heffron, R., Stephan, H., & Rehner, R. (2016). Energy justice: A conceptual review. *Energy Research & Social Science*, 11, 174-182. <https://doi.org/10.1016/j.erss.2015.10.004>

¹⁵⁴ Consumer Policy Research Centre (CPRC). (2022). *The barriers and potential enablers of electric vehicle uptake in Australia*. Melbourne: Consumer Policy Research Centre. https://cprc.org.au/wp-content/uploads/2022/11/EV_WorkingPaper_Final.pdf

¹⁵⁵ Parliament of New South Wales. (2025). *Infrastructure for electric and alternative energy source vehicles in NSW*. Sydney: Legislative Assembly Committee on Transport and Infrastructure. <https://www.parliament.nsw.gov.au/committees/inquiries/Pages/inquiry-details.aspx?pk=3095>

¹⁵⁶ Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2025). *National Electric Vehicle Strategy: Annual Update 2024-2025*. Canberra: Australian Government; Productivity Commission. (2023). *Updated submission to national electric vehicle strategy consultation*. Canberra: Australian Government.

¹⁵⁷ Deloitte Access Economics. (2024). *Electric vehicle uptake*. Sydney: Deloitte.

Mitchell, D., & Monterosso, R. (2021, December). Modelling small-area electric vehicle uptake across Australia. *Proceedings of the Australasian Transport Research Forum (ATRF)*, 86-1, Brisbane, Australia.

¹⁵⁸ Consumer Policy Research Centre (CPRC). (2022). *The barriers and potential enablers of electric vehicle uptake in Australia*. Melbourne: Consumer Policy Research Centre; Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2025). *National electric vehicle strategy: Annual update 2024-2025*. Canberra: Australian Government.

¹⁵⁹ Nunes, A., Woodley, L., & Rossetti, P. (2022). Re-thinking procurement incentives for electric vehicles to achieve net-zero emissions. *Nature Sustainability*, 5(6), 527-532.

¹⁶⁰ Guo, S., & Kontou, E. (2021). Disparities and equity issues in electric vehicles rebate allocation. *Energy Policy*, 154, 112291.

¹⁶¹ Sheldon, T. L., & Dua, R. (2024). The dynamic role of subsidies in promoting global electric vehicle sales. *Transportation Research Part A: Policy and Practice*, 187, 104173.

- A €1,000 increase in incentives can raise BEV/PHEV registrations by 5-7%.¹⁶²
- A 10% increase in monetary incentives can increase BEV sales by 3%.¹⁶³

However, prematurely withdrawing support can create market volatility, slow uptake, and limit accessibility. Regional and rural communities face additional barriers due to infrastructure gaps or “charging deserts”, where limited public charging availability exacerbates range anxiety and discourages potential EV buyers.¹⁶⁴

Social Equity - Energy Access

Social equity (energy access) is a broader concept that encompasses the distributional, procedural, and recognitional dimensions of the energy transition.¹⁶⁵ It is based on the principle that all members of society (regardless of income, location, housing type, tenure, or demographic group) should have safe, reliable, and affordable access to modern energy services, and should not disproportionately bear the environmental or economic burdens of energy production and use.¹⁶⁶

In the context of EVs, this means ensuring that the shift to electrified transport does not increase energy poverty for vulnerable households, such as through the need to use more expensive public fast charging, or through grid upgrade costs passed through to those consumers.¹⁶⁷ It also includes ensuring fair access to renewable energy and grid-optimisation benefits, such as managed charging and cost reflective tariffs.¹⁶⁸

KEY TAKEAWAYS: Access, equity, and social equity

Access and equity considerations are becoming increasingly apparent in international policy frameworks where EV ownership is growing beyond early adopters.

Inequity and lack of access will impact most on apartment dwellers, regional areas, CALD communities, and lower-income brackets who lack access to home charging and will face significantly higher per-kilometre costs through public infrastructure.

Jurisdictions whose EV markets have moved beyond early adopters have introduced explicit equity-focused interventions, including targeted social leasing schemes (France), public-charging accessibility measures, and tariff protections for lower-income households.

¹⁶² Münzel, C., Plötz, P., Sprei, F., & Gnann, T. (2019). How large is the effect of financial incentives on electric vehicle sales? A global review and European analysis. *Energy Economics*, 84, 104493.

¹⁶³ Yan, S. (2018). The economic and environmental impacts of tax incentives for battery electric vehicles in Europe. *Energy Policy*, 123, 53-63.

¹⁶⁴ Parliament of Victoria. (2025). *Inquiry into electricity supply for electric vehicles*. Melbourne: Legislative Council Economy and Infrastructure Committee.

¹⁶⁵ McCauley, D. A., Heffron, R. J., Stephan, H., & Jenkins, K. (2013). Advancing energy justice: the triumvirate of tenets. *International Energy Law Review*, 32(3), 107-110.

¹⁶⁶ Sovacool, B. K., & Dworkin, M. H. (2015). Energy justice: Conceptual insights and practical applications. *Applied Energy*, 142, 435-444.

¹⁶⁷ Australian Council of Social Service (ACOSS). (2018). *Energy Stressed in Australia*. Sydney: ACOSS.

¹⁶⁸ RACE for 2030. (2021). *Electric vehicles and the grid*. Sydney: RACE for 2030.

6. Charging Policies

Introduction

Expanding and optimising EV charging infrastructure supports large-scale EV uptake. Policy must address multiple dimensions, including the expansion of DC fast-charging and charging hubs, overcoming distribution network barriers, and incentivising workplace and home charging solutions. Local governments also play a pivotal role by enabling public access through signage, dedicated parking, streamlined approvals, and hosting of suitable sites.

Australia's EV infrastructure rollout continues to accelerate, with federal and state programs supporting a wide range of charging use cases, including ultra-fast highway charging, apartments, charging hubs, fleets, and kerbside solutions. Insights from international jurisdictions and Australian experience can help guide which approaches are most effective as the market scales.

Roadmaps and charging strategies

Australia

Australia has adopted various EV strategies at both federal and state levels. While these strategies include commitments to EV charging infrastructure within them, no dedicated national charging roadmap or strategy currently exists. Internationally, countries and jurisdictions (particularly the EU, UK, and United States) have taken a variety of approaches to charging infrastructure planning and implementation, with diverse programs and funding mechanisms tailored to local contexts.

International

Countries are increasingly developing national charging strategies and long-term EV roadmaps to guide infrastructure rollout, coordinate stakeholders and ensure charging supply keeps pace with growing demand. These plans vary in scope and ambition but share a common goal of aiming to enable a reliable, affordable and accessible EV charging network.

European Union

Europe has proposed an EV Charging Masterplan to outline how its EV charging infrastructure must scale to meet the EU's 2030 road transport emission targets. The Masterplan sits within the Alternative Fuels Infrastructure Regulation (AFIR), adopted in 2024 as part of the EU's 'Fit for 55' package.

The AFIR seeks to address the deployment of charging infrastructure (both public and private), alongside the necessary upgrades to electricity networks, and the expansion of renewable energy generation to ensure EVs are powered by clean electricity.

Key mandates include:

- Fast chargers for every 60km of core roads by 2025
- 3.5 million public charge points by 2030¹⁶⁹

¹⁶⁹ European Automobile Manufacturers' Association. (2023). *A European EV charging infrastructure masterplan*. <https://www.acea.auto/files/Research-Whitepaper-A-European-EV-Charging-Infrastructure-Masterplan.pdf>

Progress has been uneven across EU member states, with the pace of deployment currently too slow to meet 2030 requirements, which is one of the issues the AFIR aims to correct.¹⁷⁰

Germany

Germany released its Charging Infrastructure Master Plan 2030 in November 2025. The National Centre for Charging Infrastructure coordinates the planning (demand estimation and site selection), funding (for public and non-public chargers) and implementation across the country.¹⁷¹ The site identification was undertaken by the Centre based on a comprehensive transport planning needs analysis. It provides funding for home and workplace charging, as well as customer car parks, kerbside, and charging hubs.

Key features include:

- A needs-based approach to infrastructure development.
- A national 'Tool Box' to support capacity building for local governments and site hosts
- A digital platform that matches site owners with investors to streamline site selection.
- Responsibility for the Deutschlandnetz (Germany Network), which aims to have 1,100 locations and 9,000 fast charging points across Germany by 2026 (including 900 urban/rural sites and 200 unstaffed highway sites).
- Chargers with a nominal charging capacity of 200 kW and a maximum capacity of 300 kW. Ten operators have been contracted to deliver the network.

Germany is also expanding charging for heavy vehicles within the Deutschlandnetz through a €400 million program for fast charging sites along freight corridors, with future provision for Megawatt Charging Systems. Regional charging hubs are being rolled out in twenty-three locations across six regions. Each hub will have between 4 and 16 fast charging points.

Netherlands

The Netherlands launched its National Charging Infrastructure Agenda in 2019, a multi-year and multi-stakeholder program focussed on building an extensive and accessible charging network. The agenda is supported by data-driven planning and transparent access to information to guide decision-making.¹⁷²

Working groups with participation from public and private stakeholders address:

- Regional planning and mapping
- Coordination between local government and CPOs
- Protocols for data sharing and cybersecurity
- Cooperation with electricity network operators
- Collaboration with the logistics-sector, particularly for zero emission zones.

United Kingdom

The UK's national EV Charging Infrastructure Strategy aims to achieve 300,000 public charge points by 2030. Current numbers are around 82,000 with an additional 100,000 expected by 2030 through the Local EV Infrastructure Fund and private investment.

¹⁷⁰ DataPulse. (n.d.). *Europe EV charging infrastructure*. <https://www.datapulse.de/en/europe-ev-charging-infrastructure/>

¹⁷¹ National Centre for Charging Infrastructure. (n.d.). *Funding*. NOW GmbH. <https://nationale-leitstelle.de/en/foerdern/>

¹⁷² Netherlands Agenda Laadinfrastructuur. (2022, September). *Dutch national charging infrastructure agenda*. Government of the Netherlands. <https://english.rvo.nl/sites/default/files/2023-07/Brochure%20Dutch%20National%20Charging%20Infrastructure%20Agenda%20online.pdf>

Funding announced under the UK's 2025 Spending Review includes¹⁷³¹⁷⁴:

- £400 million to support rapid-charging rollout
- Programs for workplace and kerbside charging
- Approved funding for councils to implement cross-pavement charging solutions
- Additional funding to support electrification of National Health Service vehicles and facilities.

United States

In the US, The Bipartisan Infrastructure Law (BIL) introduces substantial new investment in EV charging infrastructure. Key programs administered by the U.S. Department of Transportation (USDOT) include the US\$5 billion National Electric Vehicle Infrastructure (NEVI) Formula Program and the US\$2.5 billion Discretionary Grant Program for Charging and Fueling Infrastructure. NEVI is embedded within the broader Bipartisan Infrastructure Law and Buy America framework; its conditional co-funding and manufacturing-origin requirements reflect industrial-policy objectives alongside the charging-network build-out. The legislation also allows EV charging installations to qualify under the Surface Transportation Block Grant Program. Beyond charging infrastructure, the BIL allocates funding across USDOT, the Department of Energy, and the Environmental Protection Agency for initiatives such as electric school buses and ferries, port electrification, domestic battery-supply-chain development, and battery recycling.¹⁷⁵

The NEVI Formula Program provides the federal foundation for developing a nationwide fast-charging network. It establishes a consistent baseline for technical and equity standards while giving states flexibility in how they design and implement projects. The program was initially criticised for its complexity (including new contracting and performance requirements) which contributed to a slow start. Although announced in 2021, implementation did not begin until 2024. After eight months of rollout, 40 states were in the application process, and 32 had received approvals.¹⁷⁶ Up to date state-level implementation can be found at: evstates.org/awards-dashboard/

A study comparing NEVI implementation in California, Texas, and New York found that the program is well designed to foster innovation and enable tailored state approaches. However, this flexibility also creates risks of fragmentation in service quality, user experience, and access across the national network.¹⁷⁷

¹⁷³ Department for Transport. (n.d.). *New £63 million boost for Britain's electric vehicle revolution*. GOV.UK. <https://www.gov.uk/government/news/new-63-million-boost-for-britains-electric-vehicle-revolution>

¹⁷⁴ Department for Transport. (n.d.). *UK electric vehicle infrastructure strategy*. GOV.UK. <https://www.gov.uk/government/publications/uk-electric-vehicle-infrastructure-strategy>

¹⁷⁵ U.S. Department of Transportation. (n.d.). *Federal funding programs*. Rural EV Toolkit. <https://www.transportation.gov/rural/ev/toolkit/ev-infrastructure-funding-and-financing/federal-funding-programs>

¹⁷⁶ Bikales, J. (2023, May 12). Congress provided \$7.5B for electric vehicle chargers. Built so far: Zero. *Politico*. <https://www.politico.com/news/2023/12/05/congress-ev-chargers-billions-00129996>; Bikales, J. (2025, May 10). 1 Biden green program gets new life under Trump. *Politico*. <https://www.politico.com/news/2025/10/05/states-scramble-for-charger-cash-despite-trumps-chill-on-evs-00585857>

¹⁷⁷ Attari, H., & Tayarani, H. (2025). State-level implementation of the National Electric Vehicle Infrastructure (NEVI) program: A comparative analysis of California, Texas, and New York. *Transportation Research Interdisciplinary Perspectives*, 34, 101717. <https://doi.org/10.1016/j.trip.2025.101717>

Table 6. Comparing NEVI implementation in the US (Attari & Tayarani, 2025).

Category	California	Texas	New York
EV adoption	Anticipatory build-out tied to ZEV mandate	Market-driven; reduce range anxiety	Focus on upstate and rural adoption to meet targets
Climate goals	Integrated with climate policy (e.g., GHG, grid)	Not directly linked to climate; focus on energy independence	Strong CLCPA alignment; ties to clean grid
Equity & Rural Access	Justice40, tribal and rural equity focus	Geographic inclusion; rural corridor priority	Justice40, rural communities, affordability
Private Sector Role	CEC-guided grants with co-funding	Competitive grants; private-led model	NYSERDA + NYPA hybrid model with state support

Individual states that have been successful in developing their own NEVI plans include:

- Massachusetts developed its NEVI Plan with a vision to deliver a financially sustainable, equitable and complete fast charging network that supports long distance travel. The plan includes current-state assessments and demand forecasts and is reviewed every two years.¹⁷⁸
- Texas has produced a multi-year plan to support EV drivers to travel across the state for while generating local economic benefits. First established in 2022 and updated in 2025, the plan prioritises interstate routes, followed by off-interstate and urban areas. It was developed through collaboration across state and regional agencies including the Texas Commission on Environmental Quality, State Energy Conservation Office, Texas Parks and Wildlife, Texas Department of Transportation, the Electric Reliability Council of Texas, the Public Utility Commission, local governments, utilities, energy service providers, and advocacy groups. Charger locations and configurations are determined by factors such as equipment cost, access to power, identified community needs, and typical parking dwell times. Overarching goals include redundancy, adequate power, pull-through capability, standardisation, education, and ongoing evaluation.¹⁷⁹ The Texas Plan seeks to:
 - Enable 50-mile spacing of DC fast chargers on major highways.
 - Allow 70-mile spacing in rural counties and mixed charger types in urban areas.
 - Locate chargers within 1 mile of interstate exits.
 - Ensure chargers are 150 kW or higher.

¹⁷⁸ Massachusetts Department of Transportation. (n.d.). *Deployment plan for Massachusetts*. Mass.gov. <https://www.mass.gov/info-details/deployment-plan-for-massachusetts>

¹⁷⁹ Texas Department of Transportation. (2022, June 16). *Texas EV infrastructure plan*. <https://www.txdot.gov/projects/hearings-meetings/transportation-planning/archive/texas-ev-infrastructure-plan-06-16-22.html>

KEY TAKEAWAYS: Roadmaps and charging strategies

The jurisdictions with the highest EV uptake have devoted significant policy attention to expanding and optimising charging infrastructure.

While Australia has a national EV charging roadmap, the international evidence points to areas for strengthening binding minimum reliability and uptime standards (AFIR), conditional co-funding tied to technical performance (US NEVI), and explicit corridor planning for regional and remote areas.

Strengthened policy design, with measures such as binding uptime requirements and conditional co-funding, is being pursued as direct responses to these issues..

Charging hubs and Megawatt charging

Australia

In Australia, several projects are being funded to establish charging hubs through the ARENA Driving the Nation Program under the Federal Government's Driving the Nation Program. This includes current projects led by Mondo (A\$27.7 million total cost for a heavy truck charging hub with 350kW chargers in Melbourne), and Zenobe (A\$19 million total cost for a delivery truck charging hub with 120kW chargers in Sydney).^{180,181} Further charging hub projects are anticipated, with some expected to include Megawatt charging as suppliers indicate availability of those systems in Australia from 2026.¹⁸²

International

Internationally, governments are shifting from light-vehicle charging to large-scale freight infrastructure, with a strong emphasis on high-power hubs and early MCS-ready sites. These national strategies are also preparing for high-capacity corridor networks capable of supporting long-haul zero-emission trucking.

European Union

The EU has approved over €600 million for 70 projects to build new heavy vehicle charging corridors and hydrogen refuelling stations. This includes 2,000 new heavy vehicle charging points with future Megawatt Charging System (MCS) capability across Poland, France, Germany, Italy, Spain, Romania and Hungary.¹⁸³ From 2025, the Alternative Fuels Infrastructure Regulation (AFIR) mandates for fast electric truck charging (350kW or more) for every 60km along the core road network (or 100km along the wider network) by 2030, with implementation supported by EU grants.¹⁸⁴

¹⁸⁰ Australian Renewable Energy Agency. (n.d.). *Mondo Power: Melbourne electrified freight hub*. Australian Government. <https://arena.gov.au/projects/mondo-power-melbourne-electrified-freight-hub/>

¹⁸¹ Australian Renewable Energy Agency. (n.d.). *Zenobe: EV delivery truck charging facility*. Australian Government. <https://arena.gov.au/projects/zenobe-ev-delivery-truck-charging-facility/>

¹⁸² Sibbald, M. (2025, November 28). Megawatt charging is coming to Australia — Delta says within 12 months. *Fleet EV News*. <https://fleetevnews.com.au/megawatt-charging-is-coming-to-australia-delta-says-within-12-months/>

¹⁸³ Zsófia, P. (2025, November 18). EU invests €600m in new electric truck corridors and hydrogen stations across Europe. *Trnas.info*. <https://trans.info/en/eu-electric-truck-corridors-440450>

¹⁸⁴ European Commission. (n.d.). *Alternative fuels infrastructure*. https://transport.ec.europa.eu/transport-themes/clean-transport/alternative-fuels-sustainable-mobility-europe/alternative-fuels-infrastructure_en; Last Mile Solutions. (n.d.). *Alternative fuels infrastructure regulation (AFIR): Its impact on the e-mobility sector*. <https://www.lastmilesolutions.com/insights/blogs/alternative-fuels-infrastructure-regulation-afir/>

Sweden

Sweden opened the first of ten planned heavy-vehicle charging hubs in late 2024 to support electric freight transport along the Gothenburg–Malmö corridor. The hubs are being developed through the joint venture *Milence*, involving multiple OEM and logistics partners. The first site includes driver amenities, sustainable building features, 400 kW chargers, and is planned for future MCS installation.¹⁸⁵

Norway

Norway's charging hubs, such as the *Fastcharge Brobekkveien* site, currently include 400–600 kW chargers capable of serving up to ten vehicles, with optional future upgrades for MCS. Heavy-vehicle charging is supported through grants covering 40% to 80% of costs for chargers of 350 kW or higher, up to a maximum of NOK 5 million.^{186,187}

United Kingdom

The UK's *Electric Freightway Project* aims to install heavy-vehicle charging hubs at motorway service stations and truck stops, including more than 200 chargers rated at 350 kW and two megawatt-ready units. Data collection will run from 2025 to 2030, with around 140 heavy vehicles expected to access the network. The project received £63 million in funding from the Department for Transport and Innovate UK, and is delivered by an industry-led consortium including developers, technology firms, logistics companies, hauliers, leasing companies and OEMs.¹⁸⁸

United States

In the United States, the Federal Highway Administration (FHWA) is implementing the National Zero-Emission Freight Corridor Strategy (2024), identifying priority EV freight routes within the National Highway Freight Network. The approach begins with establishing high-capacity charging hubs in strategic locations and subsequently connecting these hubs into a continuous national system. To accelerate deployment of zero-emission medium- and heavy-duty infrastructure, the strategy assesses key investment factors across freight corridors and associated ecosystems. Implementation is structured in four consecutive phases starting in 2024 and ending in 2040.¹⁸⁹

¹⁸⁵ Milence. (2024, October 10). *Milence expands operations to the Nordics with the opening of the new charging Hub in Varberg, Sweden*. <https://milence.com/press-release/forsta-svenska-labbhubben-for-lastbilar-nu-igang-i-varberg/>

¹⁸⁶ Kempower. (2025, August). *A case study: Fastcharge Brobekkveien, Norway*. Kempower Mediabank. <https://mediabank.kempower.com/l/k-sbddPhFfRd>

¹⁸⁷ Norwegian Ministry of Transport. (2022). *National charging strategy*. Government.no. <https://www.regjeringen.no/en/documents/national-charging-strategy/id2950371/>

¹⁸⁸ Gridserve. (n.d.). *Electric freightway*. <https://www.gridserve.com/electric-freightway/>

¹⁸⁹ Joint Office of Energy and Transportation. (2024, March). *National zero-emission freight corridor strategy*. U.S. Department of Energy & U.S. Department of Transportation. <https://driveelectric.gov/files/zef-corridor-strategy.pdf>

KEY TAKEAWAYS: Charging hubs and megawatt charging

Australia's long driving distances and road freight dynamics make Megawatt charging capability particularly important for some key routes and task types.

The EU's AFIR mandates for heavy vehicle MCS-capable infrastructure on freight corridors are relevant to Australia but require a level of coordination at the national level to encompass the states and territories.

Several jurisdictions (notably Sweden through Milence, and the UK's Electric Freightway) are investing in MCS-ready infrastructure ahead of widespread MCS-capable vehicle availability.



Charging hubs, kerbside, and DC fast charging

Australia

In Australia, support for fast DC charging has been provided at both the federal and state levels. State governments have co-funded fast-charging sites in NSW, Victoria, Western Australia and Queensland. NSW remains the only jurisdiction still offering grants through its EV Fast Charging Program, with its most recent round targeting charging blackspots in both regional and metropolitan areas.¹⁹⁰

At the federal level, the Commonwealth has partnered with the NRMA through the Driving the Nation Fund to deliver 100 EV charging stations along key highway routes at approximately 150-kilometre intervals. A further \$40 million was committed at the end of 2025 to support additional fast-charging sites, including kerbside charging.

Technical Standards, SOCI Obligations, and DNSP-Owned Kerbside EVCI

In April 2026, the Federal Government's DCCEEW submitted a rule change request to the AEMC proposing the Accelerating EV Charging Program, a \$40 million competitive grants program enabling DNSPs to deploy kerbside and regional EV charging infrastructure directly. Under the proposed rules, DNSP-deployed assets would enter their Regulatory Asset Base (RAB) and be recovered from electricity consumers over regulatory depreciation cycles of 15–20 years. The program sits at the intersection of two regulatory frameworks that impose significant obligations on the technical design of funded assets.

Security of Critical Infrastructure obligations.

All major Australian DNSPs are responsible entities under the Security of Critical Infrastructure (SOCI) Act 2018 and carry an obligation to maintain a written Critical Infrastructure Risk Management Program (CIRMP) addressing cyber, physical, personnel, and supply chain hazards. When EV charging infrastructure enters the DNSP RAB and connects to network management systems, its communications and control interfaces fall within the scope of those obligations.

A charger running the older OCPP 1.6 protocol (which carries no mandatory Transport Layer Security requirement, no Public Key Infrastructure-based device authentication, and no device management capability) represents a potential attack surface on assets already classified as critical infrastructure. For regional blackspot DC chargers co-located with zone substations and connected to DNSP operational technology networks, the risk profile is acute.

DNSPs that are designated Systems of National Significance face additional Enhanced Cyber Security Obligations, including real-time information sharing with the Australian Signals Directorate. Installing non-compliant assets would create SOCI Act exposure. The minimum defensible standard for new program installations is OCPP 2.0.1, which mandates TLS-encrypted communications and certificate-based authentication at both the charger-to-CSMS layer and, through ISO 15118, at the EV-to-charger layer.

¹⁹⁰ NSW Climate and Energy Action. (n.d.). *Electric vehicle fast charging grants*. NSW Government. <https://www.energy.nsw.gov.au/business-and-industry/programs-grants-and-schemes/electric-vehicles/fast-charging-grants>

Prudent and efficient investment obligations.

The National Electricity Rules require that DNSP capex reflect what a prudent operator would incur, assessed by the AER at each regulatory determination. Civil works, pole upgrades, and connection infrastructure associated with kerbside EV charging infrastructure are long-lived assets. If installed without forward-compatibility for ISO 15118-20 (the standard governing vehicle-to-grid integration) the AER would be required at the next regulatory determination to accept ongoing operating expenditure for functionally limited assets or require upgrades at consumer expense. Specifying obsolete communications standards on RAB-recovered assets with a 15–20-year depreciation life is unlikely to constitute prudent and efficient, and grant guidelines that do not resolve this effectively pass the risk to future regulatory determinations.

International

In other jurisdictions, governments are adopting structured strategies to scale DC fast-charging and deliver accessible, high-quality charging hubs along major transport corridors. These approaches are aiming to address earlier gaps in coverage, interoperability and reliability to ensure that public charging can be ready to support mass-market EV uptake.

Europe

Under the EU's Alternative Fuels Infrastructure Regulation (AFIR), member states must ensure that fast public charging (minimum 150 kW) is available every 60 km along the core road network by 2030. AFIR also sets minimum requirements such as at least 98%, interoperability, and fair pricing.¹⁹¹

The AFIR was developed to address earlier findings (EU special report, 2021) which identified the lack of a clear and coherent EU-wide charging infrastructure targets, inconsistent national plans, uneven deployment across member states, and lack of harmonised payment systems. It noted that while the funding support from the Connecting Europe Facility (CEF) did indeed support charging station deployments, there was no comprehensive infrastructure gap analysis to help the EU direct where funding was needed most. In addition, funding was not made conditional on uptime or equitable access. Implementation delays and low utilisation was found to be ubiquitous among the co-funded stations.¹⁹²

Although Europe surpassed 1 million public charging points in 2024 (a 35% increase from 2023), deployment remains highly uneven, with 61% located in Germany, France and the Netherlands. Meeting the EU's goal of 3.5 million public chargers by 2030 requires installing around 2.6 million additional chargers in five years—an average of 520,000 per year, compared with 153,000 installed in 2023.¹⁹³

The AFIR is expected to accelerate progress through conditional co-funding, covering 50–70% of project costs via blended grants and private or debt financing supported by the European Investment Bank.¹⁹⁴

¹⁹¹ European Commission. (n.d.). *Alternative fuels infrastructure*. https://transport.ec.europa.eu/transport-themes/clean-transport/alternative-fuels-sustainable-mobility-europe/alternative-fuels-infrastructure_en

¹⁹² European Court of Auditors. (2021). *Special report: Infrastructure for charging electric vehicles*. More charging stations but uneven deployment makes travel across the EU complicated. https://www.eca.europa.eu/Lists/ECADocuments/SR21_05/SR_Electrical_charging_infrastructure_EN.pdf

¹⁹³ EIT Urban Mobility & European Union. (2025, August 22). *Startups boosting EV charging infrastructure network in Europe*. <https://www.eiturbanmobility.eu/ev-charging-infrastructure-solutions/>

¹⁹⁴ International Energy Agency. (2025). *Global EV outlook 2025: Electric vehicle charging*. <https://www.iea.org/reports/global-ev-outlook-2025/electric-vehicle-charging>

Sweden

Sweden's *Klimatklivet* program, administered by the Environmental Protection Agency, previously offered up to 70% of investment costs for public chargers. Since 2025, support has been reduced to 50% and now requires at least four charging points (10–50 kW) for light vehicles. The revised scheme had been updated to make it simpler, remove the need for investment calculations, and is now open to “densification,” allowing funding for new chargers in areas where infrastructure already exists (unlike prior rounds which prioritised rural and underserved areas).¹⁹⁵

United Kingdom

The 2025 UK Spending Review announced £400 million for charging infrastructure under the *EV Charging Infrastructure on the Strategic Road Network* policy, covering parts of England's road network. This policy replaces the previous Rapid Charging Fund (RCF), announced in 2020, which ran a 2023 grid-upgrade pilot at motorway service areas but did not result in awarded funding (likely due to implementation delays). Current UK Government focus is directed more towards supporting charging in workplaces, schools, landlords' properties, rental housing, apartment complexes and on-street residential areas, rather than expanding fast or ultra-fast charging.

United States

At the U.S. state level, multiple programs support planning and deployment of EV charging infrastructure. The Infrastructure Investment and Jobs Act (IIJA) (Public Law 117-58) provide significant funding for the national charging network. States play a central role by preparing implementation plans and administering incentive programs.¹⁹⁶

IIJA programs are delivered through the U.S. Department of Transportation's Federal Highway Administration (FHWA), including:

- National EV Infrastructure (NEVI) Formula Program
 - US\$5 billion for charging along corridors and interstates
 - Up to 80% coverage of installation, connection, operation and maintenance
 - Long-term data-sharing requirements
- Charging and Fueling Infrastructure (CFI) Grants
 - US\$1.25 billion for charging on public roads, schools, parks and public parking
 - Prioritises rural areas, neighbourhoods with high levels of on-street parking, low-to moderate-income communities, and apartment-dense areas
 - Grants range from US\$500,000 to US\$15 million per application

One example is the Texas Department of Transportation, which partners with third-party contributors to fund the non-federal share of NEVI projects. Operation and Maintenance funding is available for the first five years, after which third-party developers collect charging-station revenue and assume responsibility for ongoing maintenance from the first day of operation.¹⁹⁷

¹⁹⁵ Swedish Environmental Protection Agency. (2026, January, 23). *Laddstationer öppna för allmänheten* [Charging stations open to the public]. Naturvårdsverket. <https://www.naturvardsverket.se/amnesomraden/klimatomstallningen/klimatklivet/laddinfrastruktur/laddstationer-oppna-for-allmanheten/>

¹⁹⁶ Alternative Fuels Data Center. (n.d.). *State planning and funding for electric vehicle charging infrastructure*. U.S. Department of Energy. <https://afdc.energy.gov/fuels/electricity-infrastructure-state-planning>

¹⁹⁷ Texas Department of Transportation. (2025, August). *Texas electric vehicle infrastructure plan*. TxDOT. <https://ftp.txdot.gov/pub/txdot/get-involved/statewide/EV%20Charging%20Plan/TexasElectricVehicleChargingPlan.pdf>

Table 7. Estimated cost to develop a NEVI compliant EV charging networks in Texas (Texas Department of Transportation, 2025).

Description	Sites	DC Fast Ports*	Level II	Federal	Private Sector	O&E (Fed)
Alt Fuel Corridors	84	380	0	US\$76.18	US\$15.20	US\$16.40
County Seats	190	835	0	US\$100.20	US\$25.05	US\$31.31
Inside MPOs**	TBD	TBD	TBD	US\$147.12	US\$36.78	US\$31.52
Totals	274	1,215	TBD	US\$323.50	US\$77.03	US\$79.23

Note: All dollar units in million

*150kW minimum on Alt Fuel Corridors and County Seats, could vary based on situation, estimated at US\$150K per connector.

**MPOs will propose the quantity of DC or Level II locations in their areas up to the target dollar amount, estimate for DC stations inside MPOs is 50K per connector at 50kW max power, Level II is estimated at 5K per connector at 10kW max power.

KEY TAKEAWAYS

Australia's public DC fast charging network is expanding but remains thin relative to the size of the driving task, particularly in regional and remote areas.

The NEVI and AFIR programs combine conditional co-funding with minimum site density and interoperability standards, in contrast to earlier EU programs without such performance conditions, which were associated with uneven deployment quality across member states.

Incorporating uptime and reliability requirements would address some user experience concerns around public EV charging infrastructure.

Investment from DNSPs into public EV charging infrastructure should take account of existing regulatory requirements on DNSPs such as the SOCI act and rules regarding prudent and efficient investment as they materially impact the infrastructure being deployed and costs passed onto the consumer. More evidence and data from ongoing infrastructure deployment will be important to support any major changes that could negatively impact consumers.

Networks, distribution level coordination, and barriers

Grid constraints remain a significant challenge for rolling out EV charging infrastructure, particularly fast charging. These challenges are compounded by long lead times for connection requests. In Europe, the average timeline for connecting an EV charging station has increased from approximately six months to around two years as of 2025.¹⁹⁸

Australia

In Australia, CPOs installing kerbside chargers require Facilities Access Agreements with the relevant DNSPs. Trials have shown that the current process requires streamlining, including consistent and comparable terms across jurisdictions, to strengthen the commercial viability of public charging. Some DNSPs have begun exploring new approaches, though further harmonisation is needed to reduce administrative burden and accelerate deployment. Several DNSPs have also received trial waivers from the AER to allow them to install chargers on power or light poles.

International

Many countries are placing growing emphasis on improving coordination between charging providers and electricity networks. International experience shows that clearer processes, better data sharing and more flexible grid-connection arrangements are becoming essential to support timely and cost-effective infrastructure deployment.

Europe

A 2025 roundtable involving European CPOs, electricity utilities, and distribution system operators identified several recommendations for improving grid-connection processes for charging infrastructure. These included:

- Establishing a single point of contact within Distribution System Operators (DSOs) for connection requests
- Harmonising information flows and communication channels
- Adopting a preset data framework to improve transparency on grid capacity and available headroom.

These measures would aim to reduce uncertainty, shorten connection timelines, and enable more predictable investment planning.¹⁹⁹

Germany

Germany's Charging Infrastructure Master Plan includes several measures to enhance grid integration of EV charging. These include:

- Digitalising connection processes.
- Publishing local grid capacity information.
- Introducing mandated response deadlines for DSOs.

The National Centre for Charging Infrastructure has also developed a decision-making tool to support planning for the expansion of the charging network.

¹⁹⁸ Serrano, J. (2025, September 12). From niche to norm: Europe's EV charging infrastructure in 2025. *Rabobank*. <https://www.rabobank.com/knowledge/do11497508-from-niche-to-norm-europes-ev-charging-infrastructure-in-2025>

¹⁹⁹ Mobility Portal Europe. (2025, May 16). *Europa avanza para simplificar la conexión a la red para la infraestructura de carga de vehículos eléctricos* [Europe moves to simplify grid connection for EV charging infrastructure]. <https://mobilityportal.eu/europe-simplify-grid-connection-charging-infrastructure/>

Netherlands

In the Netherlands, transmission and distribution system operators have trialed flexible grid contracts for both high-voltage and low-voltage charging stations. These time-block contracts provide reduced capacity during peak congestion hours, offering a way to manage network stress while allowing charging infrastructure to connect sooner without requiring immediate grid upgrades.

KEY TAKEAWAYS: Networks, distribution level coordination, and barriers

Connection delays and network upgrade costs remain a key barrier to charging deployment internationally and in Australia.

Some jurisdictions, including the Netherlands, are moving towards standardised, digitised grid connection processes and smart-grid integration frameworks.

Current connection processes and cost-allocation rules will require streamlining and calibration for the scale of charging infrastructure that will be required over the medium to long term (to 2030, 2035, and beyond).



Workplace and home charging

Australia

In Australia, support for workplace and home charging is limited but is available in some states and local government areas. WA's Charge Up Workplace Grants offers 50% co-funding while the NT's EV Charger Grants Scheme offers A\$1,000 for a home and A\$2,500 for a business.

There is also funding at the Local Government level, with one council (City of Adelaide) offering 50% of the costs towards a A\$1,000 charging station (7kW to <50kW) and 25% of up to A\$2,000 for 'smart' (capable of demand management or bidirectional charging) charging stations. These rebates are part of Adelaide's broader *Sustainability Incentives Scheme*, which also supports solar, batteries, electrification, resource recovery, and active transport.

International

Countries are increasingly maintaining or expanding support for home and workplace charging to complement their public charging networks and accelerate EV adoption. These initiatives are evolving to help lower installation barriers, improve access for renters and apartment dwellers, and encourage businesses to invest in charging for their staff and fleet charging.

Ireland

In Ireland, renters and homeowners can access a grant for €300 for installing a home charge point. Applications must be submitted by registered Third Parties on behalf of households. Only smart chargers listed on the approved register maintained by the Government agency are eligible. Funding is provided by *Zero Emissions Vehicle Ireland* within the Department of Transport and administered by the Sustainable Energy Authority of Ireland (SEAI).²⁰⁰

The Netherlands

The *Private Charging Infrastructure at Business Subsidy Scheme* (SPRILA) provides business owners with advice and financial support for installing EV charging at their business premises. Eligible costs include external consultancy and installation fees. Car parks must be privately accessible so available to employees, business owners, and visitors during specified hours. A calculation tool is offered to check eligibility for receiving up to EUR25,000 (with the subsidy applied retrospectively) or more than EUR25,000 (with the subsidy applied for in advance).²⁰¹

Sweden

Sweden's *Klimatklivet* program provides up to 50% of investment costs for home, workplace and semi-private charging, with a maximum grant of SEK15,000. Only housing associations, organisations, and companies can apply on behalf of residents or employees. From 2026, changes in the program will allow larger businesses to apply for more charging points and larger grants than previously permitted.²⁰²

²⁰⁰ Sustainable Energy Authority of Ireland. (n.d.). *Electric vehicle home charger grant*. <https://www.seai.ie/grants/electric-vehicle-grants/electric-vehicle-charging/electric-vehicle-home-charger-grant>

²⁰¹ Netherlands Enterprise Agency. (n.d.). *Subsidy scheme for private charging infrastructure at companies (SPRILA)*. Business.gov.nl. <https://business.gov.nl/subsidies-and-schemes/sprila/>

²⁰² Swedish Environmental Protection Agency. (n.d.). *Ladda bilen* [Charge the car]. Naturvårdsverket. <https://www.naturvardsverket.se/bidrag/ladda-bilen/>

United Kingdom

In the UK, grants are available for funding charging infrastructure for workplaces, schools and educational providers, landlords, renters, apartment owners, and households without off-street parking. The support includes:

- Businesses: £350 per socket or up to £15,000 per site; £500 per enabled parking space.
- Education providers: £2,500 per socket, up to 40 sockets across all sites.
- Landlords, households, apartment dwellers and renters: £300 per socket.

United States

In the United States, federal tax credits support both residential and commercial charging installations.²⁰³

- Consumers: A federal tax credit covers 30% of the cost of a home charger, including parts and labour, up to US\$1,000.
- Businesses: Businesses can claim a 6% credit on the cost of eligible property (including charging ports, energy storage, ancillary equipment, and labour) up to US\$100,000 per item. A credit of up to 30% is available if wage and apprenticeship requirements are met.
- Tax-exempt entities: State and local governments, First Nations, territories and nonprofit organisations can receive direct payment in place of the tax credit under similar conditions.

KEY TAKEAWAYS: Workplace and home charging

International examples show a maintaining or expansion of support for home and workplace solutions to accompany and complement further expansion of public charging networks. Ireland, Netherlands, Sweden, UK and the US all offer meaningful incentives such as upfront subsidies or tax breaks.

As Australia sees a growing proportion of its population living in multi-unit dwellings, home charging access depends more on collective decision making and shared burden on the cost and benefit of infrastructure upgrades. Funding programs have existed to help both homes and businesses cover the cost but these are applied inconsistently and been available sporadically.

Tenant and building-owner incentive schemes, combined with simplified approval processes, are common to the home- and workplace-charging support models reviewed across Ireland, Netherlands, Sweden, UK and the US.

²⁰³ Alternative Fuels Data Center. (n.d.). *Tax credits for electric vehicles and charging infrastructure*. U.S. Department of Energy. <https://afdc.energy.gov/laws/ev-tax-credits>

Local government support

Australia

Local governments in Australia have supported the EV transition by investing in public charging infrastructure. Several leading councils have developed EV transition and charging strategies that outline their approach to providing accessible charging options to citizens. For example, Lake Macquarie City Council's EV Charging Strategy provides a pathways and principles to install EV chargers across the council area. Some councils are specifying parking spots for active EV charging, with fines for ICE or non-charging EV vehicles.

Councils are increasingly partnering with CPOs to avail state government grants to install public chargers, particularly kerbside chargers and destination chargers. They often act as site hosts, while CPOs build, own and operate the chargers.

International

Many countries are relying on councils and municipalities to expand their public charging coverage, support their residents without off-street parking, and implement place-based incentives. These locally driven approaches often fill gaps left by national programs and helping meet their own local sustainability goals, while also responding directly to community needs.

Netherlands

The Dutch national government has rolled back financial support for charging infrastructure. Municipalities are now playing a critical role in expanding the charging network. Residents and local businesses can request public chargers close to their location and municipalities offer free or discounted installation. They also provide access to subsidised advisory for housing complexes to install chargers in apartment complexes. Other local incentives include preferential parking for EVs, and low emission zones.²⁰⁴



²⁰⁴ Pizarro, J. C. (2025, August 21). Netherlands nears 200,000 chargers: SGovernment aims to support EV adoption. *Mobility Portal*. <https://www.mobilityportal.eu/en/notes/netherlands-nears-200000-chargers>

Norway

Norwegian EV related policies are legislated at the national level but allow for local variations. Cities like Oslo and Bergen offer discounts on toll roads and parking fees for EVs. Exemptions for EVs were introduced at a national level but were rolled back slightly in 2016. Both cities also made substantial improvements to the public charging infrastructure either through partnerships with private providers or with energy companies. The city of Oslo offered financial support to housing associations installing chargers.²⁰⁵

United Kingdom

UK's Local EV Infrastructure (LEVI) fund²⁰⁶ provided capital funding for public chargers to local government between 2023 and 2025. It focused on slow chargers to benefit residents without off street parking. After the submission of EOIs, applicants also received support to submit full applications. A final step was the assessment of the contract between the local government authority and the private sector partners. In addition to capital funding, LEVI also included a capability fund to help local authorities develop their EV infrastructure strategies.

Councils are also part of the Electric Street campaign. The campaign run by Vauxhall and three CPOs crowdsources potential locations for public chargers and councils help deploy them with the CPOs.²⁰⁷

United States

Many American cities have public private partnerships with energy utilities and charge point operators to deploy kerbside charging. There is a range of revenue sharing agreements from leasing suitable sites for a fee to 50/50 revenue sharing after project costs are met.

The US Department of Energy organised a knowledge sharing initiative in 2023 between local and regional governments on developing public EV charging infrastructure plans. Fairfax County, Virginia's Charge Up Fairfax Program, provides engineering site assessments to buildings that offer common area parking.²⁰⁸

KEY TAKEAWAYS: Local government support

Australian local councils are active in deploying kerbside charging and facilitating EV infrastructure, but their capacity and resource base is highly variable

capability fund supporting council-level infrastructure planning. The capability fund component was a design response to capacity constraints identified in earlier UK programs.

²⁰⁵ Bjerkan, K. Y., Bjørge, N. M., & Babri, S. (2021). Transforming socio-technical configurations through creative destruction: Local policy, electric vehicle diffusion, and city governance in Norway. *Energy Research & Social Science*, 82, 102294. <https://www.sciencedirect.com/science/article/pii/S2214629621003868>

²⁰⁶ Office for Zero Emission Vehicles. (2023, February 21). *Apply for local electric vehicle infrastructure (LEVI) funding*. GOV.UK. <https://www.gov.uk/guidance/apply-for-local-ev-infrastructure-levi-funding>

²⁰⁷ Vauxhall. (n.d.). *Electric streets of Britain*. <https://www.vauxhall.co.uk/electric/electricstreets.html>

²⁰⁸ National Laboratory of the Rockies. Lessons learned from the Clean Energy to Communities (C2C) peer-learning cohort on planning and funding for electric vehicle charging infrastructure deployment. U.S Department of Energy. <https://docs.nrel.gov/docs/fy24osti/89491.pdf>

7. Enabling and Supporting Industries

Introduction

Enabling and Supporting Industries focuses on those policy areas concerned with unlocking value beyond raw material extraction and supporting a thriving and resilient EV ecosystem. Key priorities include financing solutions for emerging industries, support for local mineral processing and manufacturing, the development of advanced recycling capabilities, investment in workforce skills and training, and EV-tailored financing, leasing, and insurance products.

Australia has a well-developed financial sector, strong mineral resources, and growing consumer demand for battery technologies. While historically positioned as a “dig and ship” economy, the transition to electrification presents opportunities to capture more value domestically through local processing, recycling, manufacturing, and workforce development. Realising these opportunities will require targeted skills investment, coordinated policy, and support for emerging downstream industries.

Insurance

Australia

Vehicle electrification is reshaping automotive insurance models. Premiums for traditional ICE vehicles are expected to decline by 2030, while EVs bring new risk profiles, unfamiliar costs, and evolving consumer expectations.²⁰⁹ The Insurance Council of Australia (ICA) describes the next decade as a “critical window of opportunity for the insurance industry” to support the EV transition. It recommends that enhanced driver education, partnerships between industry stakeholders, and tailored insurance products informed by evidence-based risk modelling.²¹⁰

Munich RE, a leading international provider of insurance and reinsurance, several EV-specific challenges: 30% more expensive to repair, incur 15% longer repair times, have a high OEM parts utilisation at 90% (compared with 65% for ICE), suffer from a shortage of technicians and equipment, and are exposed to more single country dominated spare parts supply chain.²¹¹

International survey results show EV owners prioritise coverage for charging equipment, incidents involving charging cables, and roadside battery boost support.²¹²

The Insurance Council of Australia recommends insurers explore innovative product offerings, including²¹³:

- EV-tailored cover (battery degradation, charging-related fire, charging-bay incidents).
- Usage-based insurance (telemetry-based premiums).
- Specialised cover for battery OEMs (warranty protection).
- EV-specific roadside assistance.
- Cyber insurance (especially for fleet operators).

²⁰⁹ Catlin, T., Kelkar, A., McElhaney, D., & Paterakis, D. (2024, April 3). *Navigating unknowns: Auto insurance questions in a new mobility era*. McKinsey & Company. <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/navigating-unknowns-auto-insurance-questions-in-a-new-mobility-era>

²¹⁰ Insurance Council of Australia. (2024, May). *Charging ahead: Electric vehicles & insurance*. https://insurancecouncil.com.au/wp-content/uploads/2024/05/EV-Industry-Paper-final-FINAL_MAY2024.pdf

²¹¹ Munich RE. (n.d.). *Insurance consulting*. <https://www.munichre.com/en/solutions/reinsurance-property-casualty/insurance-consulting/electric-vehicles.html>

²¹² GlobalData. (2025, August 19). UK insurers face challenges in EV adoption. *Life Insurance International* <https://www.lifeinsuranceinternational.com/analyst-comment/uk-insurers-ev-adoption/?cf-view>

²¹³ Insurance Council of Australia. (2024, May). *Charging ahead: Electric vehicles & insurance*. https://insurancecouncil.com.au/wp-content/uploads/2024/05/EV-Industry-Paper-final-FINAL_MAY2024.pdf

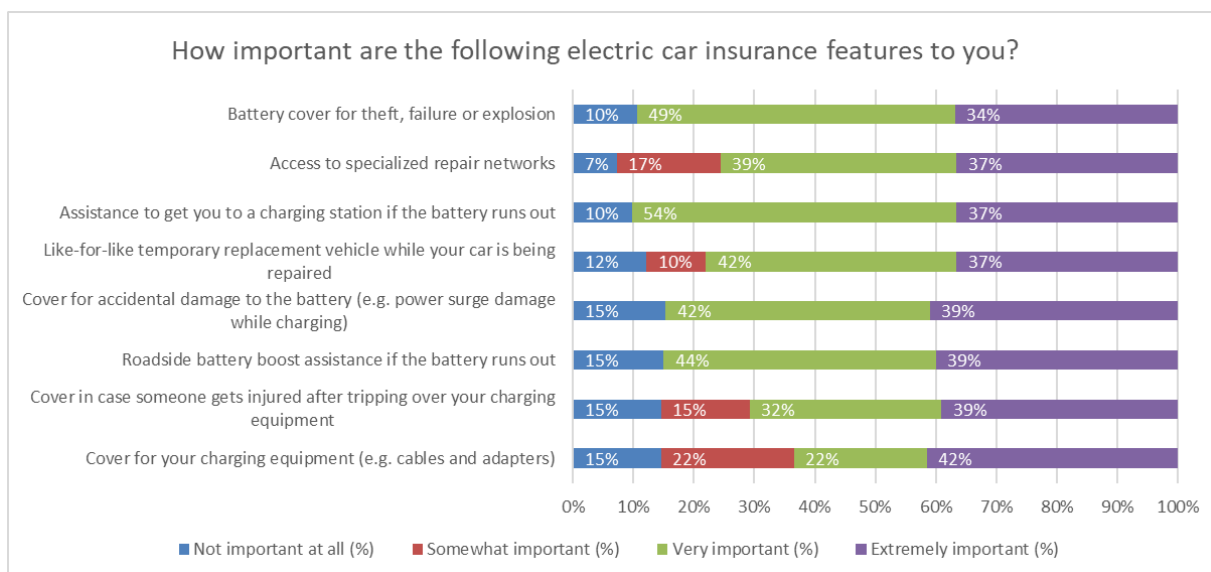


Figure 6. How important are the Survey results on EV driver insurance cover preferences (GlobalData, 2025)

Innovative offerings have been offered in the Australian market from both start-ups and established players. Koba was an Insurtech company that sought to use technology to automate and improve insurance for EV drivers with more tailored coverage to reduce costs and risk. Allianz offered tailored insurance for Tesla drivers while others have offers available to any driver regardless of EV make. Such EV specific cover typically insures against damage to batteries from charging, charging accessories, provide access to EV certified repairers, and offer electric replacement vehicles if yours is out of action. All other providers insure EVs but under policies that are broadly no different to ICE vehicles.

Case study: Koba EV Insurance

Koba was an Insurtech company that sought to use technology to automate and improve insurance for EV drivers with more tailored coverage to reduce costs and risk. It launched in 2021 with a product aimed at Uber Carshare (formerly car next door) and used car driving data from a smart phone to calculate distances and charged a per km rate with a fixed cost for when the vehicle was parked. In early 2024 it launched a product aimed at Tesla drivers and offered other features such as access to an approved specialist repair network, charging equipment cover, and replacement EV. It went into administration later that year shortly after Uber wound down its Carshare business.

International

Insurance markets around the world are beginning to adapt to more EVs on the roads, shifting risk models, coverage structures and incentives to reflect changing technologies and customer needs. These developments span new coverage products, targeted EV incentives and evolving responses to climate-related risk

United States

Insurance markets are shifting coverage from personal to commercial in response to autonomous driving and shared mobility trends. Climate-driven weather events continue to increase claims.

UK and Canada

Insurer Aviva offered a £2,000/C\$2,000 incentive for customers upgrading from an ICE to an EV after a total loss, plus an additional 10% discount on the premium and coverage for charging equipment (including for flooding, fire, and accidental damage in the case of businesses). Around 850,000 vehicles are written off in Australia each year, either from being at the end of their life or through accidents.²¹⁴ The insurer Allianz also offers EV cover for a range of fleet sizes, with driver training and education also included.

KEY TAKEAWAYS: Insurance

There remains limited Australian actuarial data on EV repair costs, battery degradation, and thermal event risk contributing to relatively high premiums.

International experience indicates that EV insurance premiums typically moderate as claims data accumulates.

The second-hand EV fleet will grow as business fleet vehicles and as novated leases come to the end of their terms. These must be affordably insurable to ensure equity implications are adequately considered.

Finance

Australia

Financial innovation is critical for lowering barriers to EV adoption, particularly for middle- and lower-income households. Financing models help distribute upfront costs, link subsidies with vehicle acquisition, and provide bundled services. Typical finance mechanisms include:

- Low-interest “green loans” (EVs and chargers)
- Novated leasing / salary packaging
- Subscription and “bundled mobility” models
- Social leasing schemes targeting lower-income households.

The Federal Government’s “Electric Car Discount” exempts eligible EVs (below the LCT threshold) from Fringe Benefits Tax. This has made novated leasing one of the most effective financial mechanisms in Australia allowing employees to pay for the vehicle and running costs from pre-tax salary, potentially saving an average employee around, \$4,000-\$5,000 annually compared to financing a car with post-tax income.

Green loans are offered by major banks and lenders (e.g., Commonwealth Bank, Plenti).²¹⁵ They offer discounted interest rates for EV purchases, often significantly lower than standard personal loans. These are frequently supported by funding from the Clean Energy Finance

²¹⁴ Federal Chamber of Automotive Industries. (2024). *End of life vehicles*. <https://www.fcai.com.au/policy-priorities/end-of-life-vehicles/>

²¹⁵ Commonwealth Bank of Australia. (n.d.). *Electric vehicle loan*. <https://www.commbank.com.au/personal/loans/electric-vehicle-loan.html>; Plenti. (n.d.). *EV loans*. <https://www.plenti.com.au/car-loans/ev>

Corporation (CEFC), which provides low-cost wholesale finance to lenders to pass on to consumers.²¹⁶

In addition, several companies (from major utilities to EV leasing specialists) offer flexible EV subscriptions in Australia. These enable a wide range of drivers (such as individuals, employees, businesses, and rideshare drivers) to access an EV with a monthly fee that covers insurance, registration, and maintenance, removing the risk of long-term ownership and resale value concerns for hesitant buyers.

International

As countries seek to overcome affordability barriers, a range of innovative financing models are emerging, from subsidised social leasing programs to tax-effective salary-sacrifice arrangements and instant rebates. These approaches are proving effective in reaching income-constrained households and stimulating early-market adoption.

France

France has pioneered social leasing (*leasing social*) as a targeted mechanism to address affordability barriers for low- and middle-income households. Launched in January 2024, the initial scheme offered EVs for €100–€150 per month with no upfront deposit, supported by government subsidies of up to €13,000.²¹⁷ The scheme proved highly successful, receiving 90,000 applications within six weeks, more than triple the initially planned 25,000 beneficiaries.²¹⁸ The government subsequently doubled the target to 50,000 approved contracts, reallocating €650 million from other vehicle electrification programmes.

Analysis of the first 25,000 beneficiaries revealed that:

- 40% had annual reference tax incomes per household unit below €10,200,
- Two-thirds were in the lowest four income deciles.
- Beneficiaries were younger (average age 40) than typical new BEV buyers in France (average age 49). This demographic profile suggests the scheme successfully reached populations otherwise excluded from the new EV market.

A revised version of the scheme was relaunched in September 2025. While maintaining the programme's core structure, government contributions were reduced to a €7,000 cap, with monthly payments capped at €200, and some models priced below €140 per month.²¹⁹ The 2025 iteration again targets 50,000 vehicles, with approximately €370 million allocated. To support long-term sustainability, funding has shifted from the national budget to the Energy Saving Certificate (CEE) scheme, which obliges energy suppliers to finance energy-efficiency actions.

United Kingdom

In the UK, salary-sacrifice schemes (similar to what Australia calls “novated leasing”) are widely used to support EV uptake. The attractiveness of these schemes is driven by low

²¹⁶ Clean Energy Finance Corporation. (n.d.). *Where we invest: Transport*. Australian Government. <https://www.cefc.com.au/where-we-invest/investment-focus-areas/transport/>

²¹⁷ Wappelhorst, S. (2025, June 12). Two recent successes with “social leasing program” for zero-emission vehicles. *The International Council on Clean Transportation*. <https://theicct.org/two-recent-successes-with-social-leasing-programs-for-zero-emission-vehicles-jun25/>

²¹⁸ Transport and Environment. (2024, October). *Social leasing: A key measure for national social climate plans*. <https://www.transportenvironment.org/articles/social-leasing-a-key-measure-for-national-social-climate-plans>

²¹⁹ Directorate for Legal and Administrative Information. (2025, July 21). *The social leasing of electric cars soon back: What will be the modalities?* Service-Public.fr.

Benefit-in-Kind (BiK) tax rates, currently 2% (with gradual increases planned).²²⁰ These rates make leasing a company-provided EV significantly more cost-effective than private purchase. This policy approach has contributed to a high proportion of EV sales occurring through fleets and company-car channels, which in turn accelerates the supply of used EVs into the market. It also reflects the UK Government's broader strategy of leveraging its large fleet sector to drive early-market adoption and improve long-term affordability through second-hand supply.

United States

Under the Inflation Reduction Act, the \$7,500 Clean Vehicle Tax Credit can be transferred directly to dealers at the point of sale.²²¹ This transforms a credit traditionally claimed during tax return season into an instant purchase price discount, lowering financing requirements. This reform particularly benefits low- and middle-income households, who often lack sufficient tax liability to claim the full credit or cannot afford to wait months for reimbursement.

Washington States *Electric Vehicle Instant Rebate* program also incorporated social leasing provisions.²²² Running from August to October 2024 until funds were exhausted, key outcomes included:

- More than 4,000 residents accessed the leasing option, representing 68% of total programme funds.
- Average household income for recipients was nearly \$54,000 (substantially below the state's 2024 average of approximately \$123,00).
- 89% of recipients indicated they would not have been able to purchase or lease a BEV without the rebate.

These findings demonstrate the programme's effectiveness in reaching income constrained households.

KEY TAKEAWAYS: Finance

Financing products remain underdeveloped in Australia, which could help expand the market to more potential buyers, both in terms of residential and businesses consumers.

The ADEME green loan framework and the UK's green finance instruments are examples of targeted financial products developed to lower the effective cost of EV financing.

EV supply chain

The global EV supply chain remains dominated by China. However, the EU, India, North America and others are taking steps to expand their role in battery and vehicle manufacturing. In Australia, cost-competitive manufacturing is challenged by several structural and market factors and the industrial ecosystems seen in larger, more diversified economies are largely absent. Key constraints include a relatively small domestic market, high wages and input costs, long distances from major export markets, a complex regulatory environment, comparatively

²²⁰ Government UK. (2024). *Tax on company benefits: Tax on company cars*. GOV.UK. <https://www.gov.uk/tax-company-benefits/tax-on-company-cars>

²²¹ Internal Revenue Service. (2024). *Instructions for Form 8936 – Introductory Material*. U.S. Department of the Treasury. <https://www.irs.gov/instructions/i8936>

²²² Wappelhorst, S. (2025, June 12). Two recent successes with “social leasing program” for zero-emission vehicles. *The International Council on Clean Transportation*. <https://theicct.org/two-recent-successes-with-social-leasing-programs-for-zero-emission-vehicles-jun25/>

low R&D spending, and declining productivity.²²³ These factors have contributed to a decade of declining manufacturing performance and stagnation in business services. Despite this, there are emerging opportunities for Australia to play a stronger role beyond raw material extraction and export.

Australia

Australia has the highest per capita rooftop solar PV capacity in the world, with more than a third of homes (4.2 million) having it installed as of mid-2025.²²⁴ The country is also a rapidly-growing market for battery energy storage systems (BESS), driven by federal and state subsidies for home, small business, and community-scale installations.

Australia is the tenth largest consumer of batteries globally, with strong and growing demand for consumer devices, stationary storage, and electric vehicles.²²⁵ Australia is the tenth largest consumer of batteries with strong and growing demand for consumer devices, stationary energy storage systems, and electric vehicles. An Australian battery industry could support more than 61,000 jobs by 2030.²²⁶ Battery component and cell manufacturing has mostly occurred overseas although Australian capability is emerging, with several of those companies integrating imported cells into locally manufactured modules and controlling them with locally developed Battery Management Systems (BMS). The assembly of battery packs for EVs does not currently occur in Australia. End-of-life battery management, dismantling, and recycling are also viewed as areas of significant domestic potential.²²⁷

A recent study identified some relevant opportunities for Australia to become a “renewable energy powerhouse”, including onshore battery cell manufacturing as well as end-of-life battery management and recycling, and the domestic production of electric heavy vehicles for both local use and export. Key recommendations the study authors made to government included the development of a coherent national industry policy and growth roadmap, adopting a coordinated national approach to local content requirements, investing in workforce and skills development, establishing a scale-up fund for Australian firms targeting export markets, and leveraging government procurement to stimulate domestic demand.²²⁸

Powering Australia (an industry growth centre focussed on supporting clean tech industries and improving outcomes for First Nations people) released its draft sector competitiveness plan for transport decarbonisation in 2025. The plan highlights manufacturing, assembly and customisation of electric heavy vehicles (including freight, specialist mining, and defence vehicles) as a priority opportunity. Four main policy actions were identified: Investing in R&D and pilot projects for on- and off-road applications, attracting international capability to meet

²²³ Powering Australia, Cyan Ventures, & Deloitte. (2025, May). *Horizon 2035: A path to low-emissions transport*. Powering Australia. <https://poweringaustralia.com.au/wp-content/uploads/2026/01/Horizon-Transport-Mini-VFINALp.pdf>

²²⁴ Clean Energy Council. (2025). *Rooftop solar and storage report: January—June 2025*. https://cleanenergycouncil.org.au/getmedia/4bb1033a-e903-4dd7-a30c-5de488de1b97/cec_rooftop-solar-and-storage-report_jan_june2025.pdf

²²⁵ Langdon, R, Dominish, E., & Lara, H. (2023). *B-cycle benchmarking program: Market analysis & fate mapping, and life cycle analysis*. Institute for Sustainable Futures. <https://bcycle.com.au/wp-content/uploads/2023/05/Battery-MA-Report-FINAL-20230927.pdf>

²²⁶ Australian Industry Energy Transitions Initiative. (2023, February). *Skilling Australian industry for the energy transition*. Australian Renewable Energy Agency. <https://arena.gov.au/assets/2023/02/skilling-australian-industry-for-the-energy-transition-accenture-report-for-australian-industry-eti-phase-3.pdf>

²²⁷ Powering Australia. (2025). *Battery powered pathways: A guide to VET roles, courses and microcredentials*. <https://poweringaustralia.com.au/wp-content/uploads/2025/10/PA-Battery-Powered-Pathways.pdf>

²²⁸ Gill, J., Briggs, C., Feenstra, M., Dwyer, S., Dominish, E., Zhou, T., Phua, R., & Davies, H. (2023). *Towards a renewable energy superpower: Industry opportunities for Australia to embrace the clean energy revolution*. SGS Economics and Planning & UTS Institute for Sustainable Futures. <https://sgsep.com.au/assets/main/SGS-Economics-and-Planning-Renewable-Energy-Superpower-Report.pdf>

rising domestic demand, expanding existing incentives, and supporting skills development and retraining for the transition from ICE to BEV.²²⁹

International

As global competition intensifies, many jurisdictions are implementing wide ranging measures to secure EV supply chains, from upstream critical-minerals extraction to cell fabrication, module assembly and end-of-life recycling. These policies reflect growing concerns around geopolitical risk, economic competitiveness and the need for more sustainable, circular production systems.

European Union

The EU is actively pursuing domestic battery production through initiatives such as the European Battery Alliance (EBA) and the Battery Booster Package, which together provide billions of euros to support gigafactories, localised production, and import reduction.²³⁰ The Battery Booster Package (stemming from the European Commission's Industrial Action Plan 2025 for its automotive sector), includes funding programs, local content requirements, and proposed standardisation interventions intended to improve competitiveness.²³¹

The Critical Raw Materials Act (CRMA) sets targets for sourcing, processing and recycling of critical minerals within Europe to reduce geopolitical and supply chain risks.²³² The EU has also imposed tariffs of 17% to 35% on Chinese EV imports in response to what it calls “unfair subsidisation”, aiming to protect its domestic automotive manufacturing base.²³³

United Kingdom

The UK's *Battery Strategy* commits £2 billion in capital and R&D funding to 2030 to build a domestic supply chain, including gigafactories, advanced materials production, and recycling infrastructure. The strategy follows a *Design-Build-Sustain* framework: design next-generation batteries that are smaller, lighter, and more efficient; build a resilient domestic manufacturing base through industry and global partnerships; sustains growth through regulation, support for circularity, and investment in end-of-life recycling. The *Battery Innovation Program* provides nearly £0.5 billion for business-led innovation and skills development for scaling next-generation battery technologies.²³⁴

United States

In the US, the *Inflation Reduction Act* (IRA) and *Bipartisan Infrastructure Law* (BIL) have been used to increase investments in battery manufacturing since 2023, including grants and tax credits for cells, module, and components.²³⁵ However, the current Trump administration has attempted to reverse some IRA measures.²³⁶ The *Promoting Resilient Supply Chains Act* aims

²²⁹ Powering Australia, Cyan Ventures, & Deloitte. (2025, May). *Horizon 2035: A path to low-emissions transport*. Powering Australia. <https://poweringaustralia.com.au/wp-content/uploads/2026/01/Horizon-Transport-Mini-VFINALp.pdf>

²³⁰ EIT InnoEnergy. (n.d.). *European Battery Alliance (EBA250)*. <https://www.eba250.com/>

²³¹ International Energy Agency. (2025, May 5). *Battery booster package: Industrial action plan for the European automotive sector*. <https://www.iea.org/policies/26762-battery-booster-package-industrial-action-plan-for-the-european-automotive-sector>

²³² European Commission. (n.d.). *Critical raw materials act*. https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/critical-raw-materials-act_en

²³³ European Commission. (2024, October 29). *EU imposes duties on unfairly subsidised electric vehicles from China while discussions on price undertakings continue*. https://ec.europa.eu/commission/presscorner/detail/en/ip_24_5589

²³⁴ Department for Business and Trade. (n.d.). *UK battery strategy*. GOV.UK. <https://www.gov.uk/government/publications/uk-battery-strategy>

²³⁵ Environmental Protection Agency. (n.d.). *Summary of Inflation Reduction Act provisions related to renewable energy*. United States Government. <https://www.epa.gov/green-power-markets/summary-inflation-reduction-act-provisions-related-renewable-energy>

²³⁶ Guarna, O. & Turner, A. (2025, April 29). *100 days of Trump 2.0: The Inflation Reduction Act*. Columbia Law School. <https://blogs.law.columbia.edu/climatechange/2025/04/29/100-days-of-trump-2-0-the-inflation-reduction-act/>

to increase domestic production of critical components, such as batteries and microchips. It establishes a *Supply Chain Resilience Working Group*, mandates the mapping of critical supply chains, identifies vulnerabilities and associated impacts, and promotes collaboration across government and international partners.²³⁷ High tariffs on Chinese EVs and battery components also remain in place under both the current and previous administrations.

China

China remains the global leader in the EV supply chain, following decades of investment in mining, refining, manufacturing, and industrial infrastructure. However, concerns about supply-chain security, competitiveness, sustainability, and ethical standards have prompted other jurisdictions to pursue greater autonomy and diversification.

India

India's PLI-ACC Scheme offers incentives for establishing local battery manufacturing, targeting 50GWh of production capacity by 2026. Although high import duties apply to batteries and components, local-content requirements have reportedly prevented incentive payouts to date, despite 30 GWh of allocations being awarded to three firms.²³⁸

KEY TAKEAWAYS: EV supply chain

Australia occupies a distinctive position in the global EV supply chain. This offers many potential benefits but the structural challenges won't be insignificant to overcome.

The EU, US, and UK have introduced explicit supply chain localisation policies, including OEM incentive conditions tied to local content or processing requirements. These policies are oriented primarily toward industrial competitiveness and supply-chain security objectives, of which EV adoption is one component.

Australia can choose to be more active in aiming to capture downstream value beyond raw material extraction and export but national coordination and efforts will be required beyond the EV sector alone.

²³⁷ Promoting Resilient Supply Chains Act of 2025, S. 257, 119th Cong. (2025). <https://www.congress.gov/bills/119/congress/senate/bills/257>

²³⁸ Ministry of Heavy Industries. (n.d.). *PLI scheme for national programme on advanced chemistry cell (ACC) battery storage*. Government of India. <https://heavyindustries.gov.in/en/pli-scheme-national-programme-advanced-chemistry-cell-acc-battery-storage>; Konda, C. (2025, August 14). India's battery storage boom: Getting the execution right. *Energy Storage News*. <https://www.energy-storage.news/indias-battery-storage-boom-getting-the-execution-right/>

Battery recycling and manufacturing

Insufficient collection and recycling of EV batteries, and the associated risks of stockpiling or inappropriate disposal, can create significant environmental, economic, and social impacts.

Incorrect disposal or stockpiling can lead to toxic metals contaminating soil and water while poor handling practices can expose workers and the public to hazardous chemicals. Recycling lithium-ion batteries substantially reduces environmental impacts compared with mining and refining virgin materials, emitting up to 60-80% less CO₂ and using 80-90% less energy.²³⁹ Relying on mining rather than recovered materials increases costs, whereas recycling has been found capable of reducing demand for key raw materials. One study calculated that it could reduce demand by 25% for lithium, 35% for cobalt and nickel, and 55% for copper by 2040.²⁴⁰

Although compliance across the EV value chain can be complex, there are benefits. Improved organisational data management and enhanced profitability have both been identified, with one study finding that optimised reuse and recycling could increase profits by 58% for lithium iron phosphate batteries and 19% for lithium nickel manganese cobalt oxide batteries.²⁴¹

There are several ways to reduce the need for mining raw materials for EV batteries. These include improved product design (to extend battery life or enhance suitability for refurbishment and recycling), second-life applications, and recovery of materials at end-of-life. Reducing private vehicle dependence (by supporting active, shared, and public transport) also helps to reduce overall material demand.

Australia

In Australia, an estimated 30,000 tonnes of EV batteries will reach end of life by 2030. This is expected to increase to 360,000 tonnes by 2040 and 1.6 million tonnes by 2050.²⁴²

Product stewardship is a key enabler of a circular economy, delivering both environmental and economic benefits.²⁴³ A product stewardship scheme ensures all parties involved in a product's lifecycle shares responsibility for minimising environmental and health impacts. These schemes, which can be voluntary, mandatory, or industry led, aim to ensure environmentally sound management throughout a product's useful life and at end of life.

Australia's official product stewardship scheme for batteries is called *B-cycle*, launched in 2022 and operated by the *Battery Stewardship Council* with support from the federal and state governments and authorised by the *Australian Competition and Consumer Commission* (ACCC).²⁴⁴ B-cycle doesn't currently cover EV batteries but has indicated an interest in working with industry to expand its scope from household batteries (such as those in mobile phone and laptops) to emerging types (including EV batteries, residential storage, and large-scale grid energy).

²³⁹ Machala, M. L., Chen, X., Bunke, S. P., Forbes, G., Yegizbay, A., de Chalendar, J. A., ... & Tarpeh, W. A. (2025). Life cycle comparison of industrial-scale lithium-ion battery recycling and mining supply chains. *Nature Communications*, 16(1), 988. <https://doi.org/10.1038/s41467-025-56063-x>

²⁴⁰ Dominish, E., Florin, N., & Wakefield-Rann, R. (2021). *Reducing new mining for electric vehicle battery metals: Responsible sourcing through demand reduction strategies and recycling*. UTS Institute for Sustainable Futures.

²⁴¹ Ma, R., Tao, S., Sun, X., Ren, Y., Sun, C., Ji, G., ... & Zhou, G. (2024). Pathway decisions for reuse and recycling of retired lithium-ion batteries considering economic and environmental functions. *Nature Communications*, 15(1), 7641. <https://doi.org/10.1038/s41467-024-52030-0>

²⁴² Langdon, R., Dominish, E., & Lara, H. (2023). *B-cycle benchmarking program: Market analysis & fate mapping, and life cycle analysis*. Institute for Sustainable Futures. <https://bcycle.com.au/wp-content/uploads/2023/05/Battery-MA-Report-FINAL-20230927.pdf>

²⁴³ Department of Climate Change, Energy, the Environment and Water. (2024). *Australia's circular economy framework: Doubling our circularity rate*. Australian Government. <https://www.dcccew.gov.au/sites/default/files/documents/australias-circular-economy-framework.pdf>

²⁴⁴ Battery Stewardship Council. (n.d.). *About B-Cycle*. B-Cycle. Battery Recycling. <https://bcycle.com.au/about/battery-stewardship-council/>

Product stewardship practices can include designing for recyclability and reuse, incorporating recycled materials, reducing resource use, and limiting hazardous substances. These approaches align with Australia's *National Circular Economy Framework* and its national targets, which aims to double the circularity of the economy by 2035, reducing the material footprint by 10%, increasing material productivity by 30%, and safely recovering 80% of resources.²⁴⁵

Australia is home to several companies already recycling EV and energy storage batteries. Industry bodies (such as the Association for the Battery Recycling Industry), research organisations (including the former Future Battery Industries Cooperative Research Centre), and government initiatives (such as Powering Australia) further support capability development.²⁴⁶

In 2024, the Federal Chamber of Automotive (FCAI) and the Motor Trades Association of Australia (MTAA) conducted a study on motor vehicle end-of-life arrangements. It highlighted Australia existing extensive vehicle dismantling and recycling sector and identified differences across jurisdictions in how end of life vehicles are processed, traded, and handled, including the treatment of their batteries.

The study also identified several sector challenges, such as Australia's diverse vehicle fleet, a fragmented dismantling and recycling industry, lack of viable recycling capability for high volumes of non-metal materials, and the lack of a domestic vehicle manufacturing industry to directly support reuse of materials. A key recommendation was the establishment of a product stewardship scheme to increase material recovery rates, prevent interstate leakage of vehicles, and reduce landfill. However, the study concluded that no international scheme is directly suitable for implementing in Australia without significant adaption.²⁴⁷

International

Countries are strengthening their battery-recycling frameworks to support the rapid growth of EVs and reduce dependence on imported raw materials. International approaches increasingly focus on recycled-content requirements, producer-responsibility schemes, and investments in advanced recycling technologies.

European Union

The Council of the European Union has adopted *Regulation (EU) 2023/1542* on batteries and waste batteries. The regulation requires batteries from various applications (including EVs) meet to meet minimum recycled-content thresholds (16% cobalt, 85% lead, 6% lithium, and 6% nickel). These measure support EU circular economy objectives and require full compliance documentation.²⁴⁸ The Regulation sits alongside the EU Critical Raw Materials Act and Chinese-EV tariffs; its circular-economy requirements form part of a wider set of measures aimed at reducing EU exposure to non-EU supply chains.

²⁴⁵ Department of Climate Change, Energy, the Environment and Water. (2024). *Australia's circular economy framework: Doubling our circularity rate*. Australian Government. <https://www.dceew.gov.au/sites/default/files/documents/australias-circular-economy-framework.pdf>

²⁴⁶ Association for the Battery Recycling Industry. (n.d.). *Battery types*. <https://www.batteryrecycling.org.au/about-us/>; Powering Australia. (n.d.). *Powering Australia*. <https://poweringaustralia.com.au/>

²⁴⁷ Motor Trades Association of Australia (2024, August). *The outlook for end-of-life vehicles in Australia*. Federal Chamber of Automotive Industry. https://www.fcai.com.au/wp-content/uploads/2024/08/ELV-Summary-report_August-2024.pdf

²⁴⁸ European Parliament & Council of the European Union. (2023). *Regulation of the European Parliament and of the Council concerning batteries and waste batteries*. <https://data.consilium.europa.eu/doc/document/PE-2-2023-INIT/en/pdf>

The regulation also introduces the *EU Battery Passport*, considered a significant innovation as part of this. From 18 February 2027, all EV, light transport, and industrial batteries above 2 kWh must have a digital passport providing detailed information. The passport will act as a digital identity for each battery and will contain detailed information such as manufacturer details, technical specifications, carbon footprint, recycled content-levels, supply chain due diligence information, lifecycle performance, and end-of-life instructions.

China

China remains the leader in the battery supply chain. However, interest in battery manufacturing and the securing of domestic supply chain have become priorities for others, including the EU, North America, Japan, and India (Powering Australia, Battery Pathways 2025).

India

India's *Battery Waste Management Rules (2022)* regulate for the collection, recycling, and management of all battery types, including those from EVs. The rules mandate minimum recycled material content, increasing from 5% in 2027-28, 10% in 2028-9, 15% in 2029-30, and 20% from 2030-31 and onwards.²⁴⁹ They also require EV-battery producers to meet escalating collection targets, currently set at 80% in 2025-26, and increasing to 90% from 2026-27 onwards (India Government 2022).

Under the *FAME II (Faster Adoption and Manufacturing of EVs in India)* scheme, the government provides incentives for EV purchases but requires minimum levels of domestically produced content. In addition, the *PLI-ACC (Production Linked Incentive Scheme for Automobile and Auto Component) Scheme* provides incentives for companies establishing local gigafactories to produce lithium ion and other advanced chemistry batteries.²⁵⁰

Japan

Japan, both a major producer and consumer of battery products, is expected to introduce a battery stewardship scheme from 2026. Currently, approaches taken vary across battery types, municipalities, and businesses.²⁵¹ Japan's battery strategy focusses on increasing domestic manufacturing of EV and grid scale batteries, with significant investment in solid-state battery technologies to regain market leadership lost to Chinese and South Korean companies in lithium-ion batteries. Having designated batteries as a critical resource, the strategy also includes initiatives to develop recycling technology to reduce its dependence on raw materials.²⁵²

In 2024, Japan announced US\$2.4 billion for EV-battery initiatives to increase domestic capacity to 100GWh by 2030, with a long-term goal of 150GWh annually. Funding covers raw material production, manufacturing equipment, and support for domestic producers of battery cells.²⁵³

²⁴⁹ Ministry of Environment, Forest and Climate Change. (2022). *Notification on battery waste management rules, 2022*. Ministry of New and Renewable Energy. <https://mnre.gov.in/en/document/notification-on-battery-waste-management-rules-2022-by-ministry-of-environment-forest-and-climate-change/>

²⁵⁰ Ministry of Heavy Industries. (n.d.). *PLI scheme for automobile and auto component industry*. Government of India. <https://heavyindustries.gov.in/en/pli-scheme-automobile-and-auto-component-industry>

²⁵¹ Kang, T. (2025, October 31) Japan to join global race to recycle lithium batteries and curb e-waste hazards. *Eco-Business*. <https://www.eco-business.com/news/japan-to-join-global-race-to-recycle-lithium-batteries-and-curb-e-waste-hazards/>

²⁵² Ministry of Economy, Trade and Industry. (2022, April 22). *Battery industry strategy*. Government of Japan. https://www.meti.go.jp/english/report/pdf/0520_001a.pdf

²⁵³ Maekawa, Y. (2024, September 6). Japan approves \$2.4bn for EV battery projects. *Argus Media*. <https://www.argusmedia.com/en/news-and-insights/latest-market-news/2605605-japan-approves-2.4bn-for-ev-battery-projects>

KEY TAKEAWAYS: Battery recycling and manufacturing

Australia's battery recycling framework is at an early stage but various initiatives are already underway. Lessons can be learnt from the solar PV and home battery sectors, although these are also still relatively early in introducing and proving circular and product stewardship principles.

The EU Battery Regulation and India's Battery Waste Management Rules apply extended producer responsibility requirements ahead of large-scale EV battery waste streams emerging.

Skills training and workforce development

Skills training and workforce development are critical to supporting growth in the battery and electric-vehicle sectors. This includes technician training and retraining in battery systems, high-voltage charging infrastructure, and EV servicing and maintenance. Both government-led initiatives and industry-driven models provide lessons for building a workforce capable of meeting future demand.

Australia

Although mass passenger-vehicle manufacturing has ceased, Australia still has a substantial automotive operational workforce of around 330,000 people. This includes approximately 40,000 in manufacturing, 121,000 in retail and wholesale, and 171,000 in repair and maintenance, generating more than \$180 billion in sector revenue.²⁵⁴ This compares strongly against the renewables energy sector (33,000²⁵⁵) coal industry (50,600²⁵⁶), the university sector (143,268²⁵⁷), broader mining (235,800) and financial and insurance services sector (533,200²⁵⁸).

A 2022 report by the Australia Institute found that Australia has strong potential to participate in sustainable EV manufacturing. Contributing factors include access to key raw materials (lithium and rare metals), an established industrial base, a skilled workforce, existing training capacity, abundant renewable-energy resources, and latent consumer demand.²⁵⁹

The *Mining and Automotive Skills Alliance (AUSMASA) 2025 Automotive Workforce Plan* identifies major challenges for the auto repair and maintenance workforce as EV uptake increases. These include expanding EV-focused training and apprenticeships, retraining existing workers, and broadening the labour pool to support the transition to net zero. The Plan also highlights opportunities in automotive manufacturing arising from transport electrification. Potential growth areas include local EV-component manufacturing (including batteries) and

²⁵⁴ Australian Mining and Automotive Skills Alliance. (n.d.). *2025 Workforce plan – Evolving Together*. <https://ausmasa.org.au/workforce-plan/>

²⁵⁵ Clean Energy Council. (2025, August 1). *Renewable energy: Powering jobs and regional communities*. <https://cleanenergycouncil.org.au/for-consumers/fact-sheets/recycling-get-the-facts/recycling-wind-turbines-solar-panels-batteries/renewable-energy-jobs-regional-communities>

²⁵⁶ Minerals Council of Australia. (n.d.). *Coal: Building Australia's future*. <https://minerals.org.au/about/mining-facts/mineral-coal/>

²⁵⁷ Department of Education. (2024). *Key finding from the 2024 higher education staff statistics*. Australian Government. <https://www.education.gov.au/higher-education-statistics/staff-data/selected-higher-education-statistics-2024-staff-data/key-findings-2024-higher-education-staff-statistics>

²⁵⁸ Australian Bureau of Statistics. (2025, September). *Labour account Australia*. Australian Government. <https://www.abs.gov.au/statistics/labour/labour-accounts/labour-account-australia/latest-release>

²⁵⁹ Dean, M. (2022, February). *Rebuilding vehicle manufacturing in Australia: Industrial opportunities in an electrified future*. Centre for Future Work. https://australiainstitute.org.au/wp-content/uploads/2022/02/Rebuilding_Vehicle_Manufacturing_in_Australia_FINAL_march.pdf

increased demand for new roles such as EV technicians, programming specialists, and diagnostics experts.

The Australia Institute Report (*Rebuilding Vehicle Manufacturing in Australia: Industrial Opportunities in an Electrified Future*, 2022) recommended several actions to support domestic EV manufacturing. These include establishing an EV Manufacturing Industry Commission, providing tax incentives for mineral extraction linked to local manufacturing capabilities, expanding long term vocational training for skills sought by EV manufacturers, offering incentives for manufacturers to establish operations in regions transitioning away from carbon intensive industries, and introducing local procurement requirements for government fleets.

International

As countries accelerate their clean-energy and transport transitions, many are expanding workforce and skills-development programs to ensure they have the labour capacity needed under a net zero pathway. The IEA estimates that 14 million new jobs could be created globally in clean energy technologies, with 16 million additional workers (30 million in total) needed for associated roles in vehicle manufacturing, construction and energy efficiency.²⁶⁰

International initiatives are increasingly focusing on reskilling workers, supporting emerging industries and creating new employment opportunities in manufacturing, installation and energy services.

European Union

The EU Green deal is the continent's primary growth strategy and policy framework for achieving climate neutrality by 2050, supported by €1 trillion in funding. Several mechanisms support employment and local manufacturing, including:

- The Green Deal Industrial Plan targeting net zero technologies manufacturing.
- Net Zero Industry Act which supports domestic manufacturing of clean technologies.

The Just Transition Fund allocates €20 billion for diversifying economies and reskilling workers in vulnerable regions.²⁶¹ It emerged principally from the political economy of EU coal-region transitions and its EV-workforce relevance draws on that broader framework rather than reflecting an EV-specific skills instrument.

Canada

Under its Sustainable Jobs Plan, Canada has introduced workforce programs to expand clean-energy job opportunities for under-represented groups, including young people, women, and Indigenous communities.²⁶²

India

India established the *Skill Council for Green Jobs* as an independent, nationwide, industry-led initiative focussed on skills development and entrepreneurship for clean energy industries.²⁶³

²⁶⁰ International Energy Agency. (2021, May 18). *Net zero by 2050*. <https://www.iea.org/reports/net-zero-by-2050>

²⁶¹ European Commission. (n.d.). *The European green deal: Striving to be the first climate-neutral continent*. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

²⁶² Natural Resources Canada. (2023). *Sustainable jobs plan*. Government of Canada. <https://natural-resources.canada.ca/corporate/planning-reporting/sustainable-jobs-plan>

²⁶³ Skill Council for Green Jobs. (n.d.). *Skill Council for Green Jobs*. Ministry of Skill Development and Entrepreneurship. <https://sscgi.in/>

South Africa

South Africa mandates local content requirements under its *Renewable Energy Independent Power Producer Procurement Program (RE4P)*. This has resulted in an estimated 18,000 jobs in manufacturing, installation and maintenance, with education and skills development included as contractual obligations. The subsequent *Battery Energy Storage Independent Power Producer Procurement Program (BESIP)* contains similar requirements, including a commitment to local job creation and allocating 20% of total project costs to domestically produced content during construction and operation.²⁶⁴

KEY TAKEAWAYS: Skills training and workforce development

Australia has strong potential to participate in sustainable EV manufacturing beyond current activity.

The EU's Just Transition Fund and Canada's Sustainable Jobs Plan are examples of workforce frameworks that explicitly integrate retraining for workers in declining ICE-related industries alongside skills development for emerging EV roles.

The TAFE system and apprenticeship frameworks provide a foundation but require investment, as there will be competing demands for electrical trades across large scale renewables and supporting industries.



²⁶⁴ IPP Office. (n.d.). *Our Programmes*. Independent Power Producers Procurement Programme, Department of Mineral Resources and Energy. <https://www.ipp-projects.co.za/programmes/>

8. Consumer Adoption and Education

Introduction

Understanding consumer behaviour beyond early adopters is essential for accelerating EV uptake. A growing body of literature examines consumer preferences, decision-making, purchasing trends, barriers to adoption, and evolving attitudes as the technology matures and model availability expands. Much of this research still focuses on early adopters, even though several markets are now moving into the early-majority phase. This is largely due to the lag between market developments, data availability, and the publication of research findings, as well as uneven rates of EV adoption within national markets.

Evidence on the effectiveness of demand-side policies is also expanding. However, because these policies are usually implemented as a suite of measures, it can be difficult to identify which instruments drive the greatest impact. The role of information flows, consumer education, and market visibility in shaping adoption is increasingly recognised, while considerations around charging are consistently found to influence purchase decisions. A behavioural lens is therefore critical, as policy success relies on aligning incentives, infrastructure, and communication strategies with real-world consumer motivations and constraints.

Purchasing trends

Australia

At the time of writing, EVs account for around 12% of new-vehicle sales in Australia. According to the classic technology adoption curve, this places the Australian market beyond the innovator stage (2.5%) but still within the early-adopter phase (13.5%). Recent geopolitical events in the Middle East and the associated increase in fuel prices, have doubled consumer interest in electrified vehicles²⁶⁵²⁶⁶. This suggests adoption may accelerate further if these conditions persist.

Australia's preference for large SUVs has extended into the EV market, the result of multiple factors. While concerns have been raised about the safety of larger, heavier, and quieter vehicles, recent UK research suggests that BEV are no more dangerous to pedestrians than ICE vehicles, though interestingly hybrids were found to pose a higher risk.²⁶⁷

As more competitively priced BEVs enter the market across multiple segments, options for cost-sensitive buyers are expanding. Entry-level ICE vehicles no longer cost substantially less than entry-level EVs. For example, the BYD Atto 1 is priced from A\$25,200, comparable to the Kia Picanto Sport at A\$21,000–23,000 drive-away. While a small price differential remains, it is narrowing and may be manageable for many buyers.

International

International purchasing trends show that EV uptake is now shaped less by early-adopter enthusiasm and more by the needs and expectations of mainstream consumers. As markets

²⁶⁵ EV Council (2026). EVs hit 36% market share as Tesla Model Y becomes Australia's best-selling car for second consecutive month, 3 July 2026.

<https://electricvehiclecouncil.com.au/media-releases/evs-hit-36-market-share-as-tesla-model-y-becomes-australias-best-selling-car-for-second-consecutive-month/>

²⁶⁶ FCAI (2026). Electrified vehicle sales hit 46% in May. 3 June 2026. <https://www.fcai.com.au/electrified-vehicle-sales-hit-46-per-cent-in-may/>

²⁶⁷ Wadud, Z. (2025). Comparing pedestrian safety between electric and internal combustion engine vehicles. *Nature Communications*, 16(1), 10824. <https://doi.org/10.1038/s41467-025-66463-8>

enter the early-majority phase, differences in demographics, driving habits and regional infrastructure are becoming more pronounced, underscoring the need for tailored approaches to sustain growth.

In post-early adoption (i.e. early majority) markets such as the UK, US, Canada, and parts of Europe, several lessons have emerged that can support greater consumer confidence and sustained EV uptake. While global EV sales continue to rise, progress varies: some major car markets, including Japan and India, are lagging, and even within high-adoption countries there are substantial regional differences (e.g. variations between U.S. states, rural and urban areas, or between EU member states).

McKinsey's 2025 international *Mobility Consumer Pulse Survey* found that EV purchase intent was found to be strongest among individuals with prior EV driving experience, including households owning both ICE and BEV vehicles. Among respondents planning to buy a BEV next, China leads with 45%, followed by Europe at 23% and the United States at 12%. Significant variation was found to exist within regions and countries, whether it's between EU member states, between Germany's eastern and western states, across U.S. states, and between metropolitan and rural areas. This reflects differences in demographics, age, education, and location and thus these variations reinforce the importance of tailoring EV policies and marketing strategies to specific consumer segments.

The top concerns among those considering an EV were range, price, and charging availability. Individuals without EV driving experience tended to overestimate their required driving range by around 10% compared with experienced EV users.²⁶⁸

A systematic review of international EV research (1990–2023) found that increased environmental awareness, greater understanding of EV technical features and fuel-cost savings, age, and higher levels of education all contribute to improved adoption rates.²⁶⁹

In Europe, the preference for electric SUVs has been growing. In 2023, the average electric SUV sold had a battery almost twice the size of a small EV, or roughly 25% larger than a medium electric SUV offering the same range.²⁷⁰

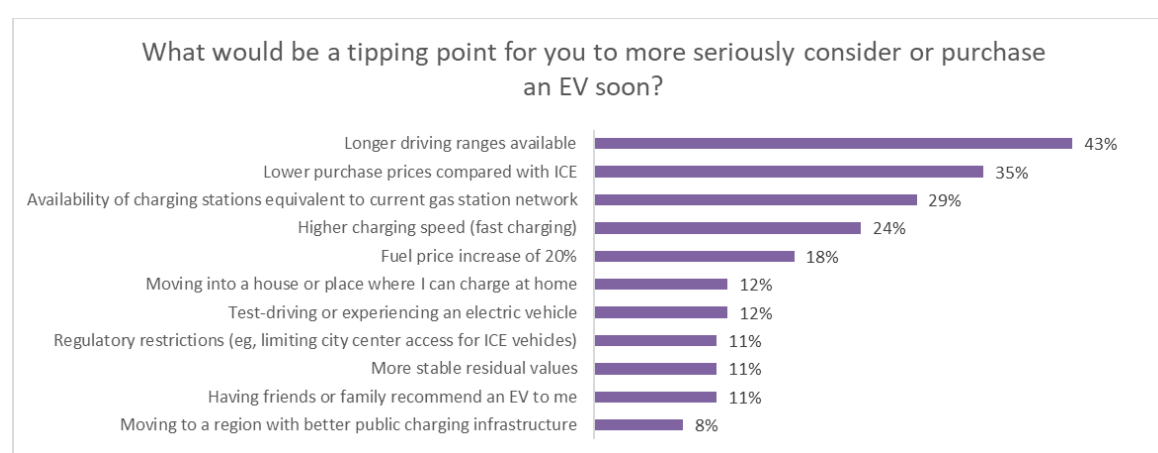


Figure 7. Factors influencing EV purchases among non-EV owners in France, Germany, Italy, UK, US and China (McKinsey & Company, 2024).

²⁶⁸ McKinsey & Company. (2024). *New twists in the electric vehicle transition: A consumer perspective*. <https://www.mckinsey.com/features/mckinsey-center-for-future-mobility/our-insights/new-twists-in-the-electric-vehicle-transition-a-consumer-perspective>

²⁶⁹ Wang, Y., & Witlox, F. (2025). Global trends in electric vehicle adoption and the impact of environmental awareness, user attributes, and barriers. *Energy Reports*, 13, 1125-1137. <https://doi.org/10.1016/j.egy.2024.12.054>

²⁷⁰ International Energy Agency. (2024). *Trends in electric cars*. Global EV Outlook 2024. <https://www.iea.org/reports/global-ev-outlook-2024/trends-in-electric-cars>

KEY TAKEAWAYS: Purchasing trends

Australia's early EV purchasing data is broadly consistent with international patterns from many of the international jurisdictions leading EV adoption.

As markets approach saturation among early adopters, the international evidence indicates that purchase patterns shift, with mainstream buyers and harder-to-reach demographic groups becoming more influential to overall uptake trajectories.

An international toolkit for this includes targeted social leasing, point-of-sale subsidies accessible to lower-income households, targeted consumer awareness programs, and risk-removal measures such as guaranteed buy-back schemes.



Demand side policies – status and evaluation

Australia

Attributing adoption outcomes to a single policy is challenging due to the way measures are typically implemented in combination. However, a study by Australian researchers assessed six common policies using a Delphi panel, a vehicle-purchase decision model, and risk-adjusted cost-benefit analysis. Each measure was evaluated on its impact on adoption, emissions reduction, and economic efficiency. The authors concluded that effective EV policy design must align with local infrastructure, behavioural patterns, and market characteristics.²⁷¹ Other key findings included:

- BEV rebate: A one-off A\$7,000 incentive is able to turbo-charge BEV adoption with immediate benefits from emissions reduction. However, it is found to have weak financial returns under the cost-benefit analysis with potential concerns around the free-rider effect and the narrowing price gap between ICE and EVs.
- Home charger rebate: Offering a A\$2,000 rebate for home or workplace charger installation delivered the highest BEV adoption, strong financial returns, and long-term energy security benefits. Despite the highest implementation cost, it was considered the most effective option, benefiting consumers and domestic suppliers with positive spillovers for local industry.
- Public charging rebate: A A\$15,000 subsidy for DC fast-charging infrastructure produced modest increases in BEV uptake and favourable cost-benefit outcomes, although higher subsidy levels delivered diminishing returns. These measures helped address range anxiety and improve rural connectivity, with benefits primarily accruing to charging-service providers rather than consumers.
- Operating cost incentives: Measures such as toll or parking waivers produced limited cost-benefit outcomes but delivered consumer-facing advantages. These incentives apply not only to new EV purchases but also to existing EV owners, supporting broader social acceptance and inclusivity.
- Consumer education: A A\$50 million, five-year education and behaviour-change program was assessed as a cost-effective strategy to increase consumer familiarity with EVs and support the supply chain. Such campaigns are found to complement other measures by delivering factual information, countering misinformation, and highlighting other economic and technological benefits.

KEY TAKEAWAYS: Demand side policies

Evidence from Australia's demand-side EV policies is thin compared to its international peers.

The FBT exemption is the primary demand lever at the federal level, with state incentives largely wound back.

²⁷¹ Anilan, V., Vij, A., Connor, J., Barrie, H., & Ardeshiri, A. (2025). Evaluating battery electric vehicle policies: a benefit-cost analysis framework. *Transportation*, 1-30. <https://doi.org/10.1007/s11116-025-10690-x>

Australia's focus on supply-side standards through the NVES is a necessary but insufficient condition for mainstream adoption.

Beyond early adopters

International

As EV markets mature and move beyond early adopters, consumer motivations become more diverse and practical concerns more influential. International research highlights that preferences, barriers and policy needs differ markedly across demographic groups, regions and levels of prior EV experience.

Germany

In Germany, a 2025 discussion paper by two climate and transport think tanks (*Zukunft Klima Sozial* and *Agora Verkehrswende*) recommended measures to increase access to affordable EVs for lower- and middle-income households. It proposed a two-phase funding model. Phase 1 would introduce income-based EV subsidies. Phase 2 would provide increased support for households more affected by rising carbon prices. Implementation could involve a mix of leasing subsidies, purchase loans, and point-of-sale grants, with amounts varying according to vehicle price and household income. Because the subsidy is income-based, the authors suggest it could be implemented using existing income-tax assessment mechanisms or via employment contracts.²⁷²

Norway

A 2025 Norwegian study (1,200 respondents surveyed between December 2020 and January 2021) examined factors influencing BEV uptake in a mature market by analysing three consumer groups: EV adopters, consumers intending to adopt, and consumers with no intention to adopt. The results showed that economic incentives remain important for current EV owners, while dissatisfaction with driving range and charging infrastructure was common across all groups, though more pronounced among those not intending to purchase an EV.²⁷³

While Norway provides a valuable case for understanding BEV user intentions, the context is unique. The country has a small population, long-standing EV incentives, a highly developed welfare system, strong public support for climate policy, an almost fully renewable electricity mix, and consumer preferences that favour smaller cars and sedans. These factors do limit the generalisability of findings to Australia and other markets.

United States

A 2022 study using data from a national survey of new-car buyers (2017–2018) sought to identify and quantify key variables influencing future EV demand. It found that hyperlocal factors influenced model preferences. For example, sedans were more popular in coastal, politically liberal states, while utes/light trucks dominated in more conservative interior regions. Higher EV demand also correlated with higher income, higher education levels, and stronger

²⁷² Zukunft KlimaSozial Institute for Social Climate Policy. (n.d.). Solutions for a climate-neutral and socially just future.

<https://zukunft-klimasozial.de/zukunft-klimasozial-agora-verkehrswende-analyse-bezahlbare-elektroautos-in-die-breite-bringen/>

²⁷³ Bøyum, L. (2025). Consumer preferences for battery electric vehicles: Comparing Norwegian consumer groups. Transportation Research Part D: Transport and Environment, 148, 104982. <https://doi.org/10.1016/j.trd.2025.104982>

beliefs in climate change. The study also found that price changes had the greatest influence on consumers who were already close to deciding to purchase an EV.²⁷⁴

A separate study (2020) of EV buyers between 2004 and 2015 reached similar conclusions: consumers nearing a decision point could be influenced by targeted messaging, including campaigns highlighting fuel-economy savings for ICE drivers at key decision moments and through channels they were most likely to engage with.²⁷⁵

Canada

A Canadian study compared consumer preferences for purchasing pre-owned EVs and found that many of the same factors influencing new-vehicle buyers also apply (i.e., range, price, and access to charging). Interest in used EVs was similar across genders, though slightly higher among women and younger adults.

Decisions were shaped primarily by concerns about battery health and range anxiety, charging access, purchase price and depreciation, environmental considerations, and worries about unfamiliar technology. Newer drivers tended to prioritise affordability and preferred sedans and home-charging availability, whereas experienced drivers prioritised performance and technology features. Financial incentives that reduced the upfront cost of a used EV were found to be a significant motivator for potential buyers.²⁷⁶

Demand side policies – status and evaluation

International

It is difficult to isolate which individual policies or programs are most effective, as they are generally implemented and evaluated as part of a broader suite of measures. Evidence on the effects of withdrawing support is limited, with most empirical studies coming from China, leaving a gap in the international literature. However, some examples can be found in Germany and Sweden, which responded to concerns that high subsidy costs are no longer justified as EV prices fall and become more affordable.²⁷⁷ In both cases, EV sales saw substantial reductions and new and modified schemes have been planned for reintroduction from 2026.

Germany

In Germany, all EV subsidies were discontinued in 2023 following a ruling on the Climate and Transformation Fund during a national budget crisis. EV sales fell by almost 30% the following year.²⁷⁸ A new subsidy program launched on 1 January 2026 and running until 2029 will offer a base subsidy of between €3000 and €6000 for BEV (depending on income and household size), and €4500 for PHEV new vehicle purchases.²⁷⁹

²⁷⁴ Archsmith, J., Muehlegger, E., & Rapson, D. S. (2022). Future paths of electric vehicle adoption in the United States: Predictable determinants, obstacles, and opportunities. *Environmental and Energy Policy and the Economy*, 3(1), 71-110. <https://doi.org/10.1086/717219>

²⁷⁵ Dua, R., & White, K. (2020). Understanding latent demand for hybrid and plug-in electric vehicles using large-scale longitudinal survey data of US new vehicle buyers. *Energy Efficiency*, 13(6), 1063-1074. <https://doi.org/10.1007/s12053-020-09865-5>

²⁷⁶ Mashrur, S. M., & Mohamed, M. (2025). Uncovering factors affecting consumers' decisions for pre-owned electric vehicles. *Transportation Research Part D: Transport and Environment*, 139, 104555. <https://doi.org/10.1016/j.trd.2024.104555>

²⁷⁷ Lundberg, L., Bengtsson, G., Sprei, F., Fernqvist, N., & Zetterholm, J. (2026). Charging forward or falling behind? Effects of electric vehicle subsidy removal. *Transportation Research Part D: Transport and Environment*, 151, 105126. <https://doi.org/10.1016/j.trd.2025.105126>

²⁷⁸ AFP. (2025, January 6). Germany's EV sales crash as buyers abandon electric cars in droves. *Fortune*. <https://fortune.com/2025/01/06/germanys-ev-sales-crash-electric-cars-tesla-volkswagen/>

²⁷⁹ h Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz. (2026, January 19). *Neues E-Auto-Förderprogramm mit sozialer Staffelung: Zuschüsse für Neuzulassungen ab 1. Januar 2026* [New electric car subsidy program with social tiering: Subsidies for new registrations from 1 January 2026]

Sweden

Sweden removed its low-emission bonus and ICE-vehicle tax in 2022. This resulted in an initial surge of purchases prior to the incentive ending, followed by an approximately 85% decline in registrations and rising lease prices. Leasing was found to play a critical role in expanding EV access, particularly for smaller models and lower-income households. Sweden now plans to introduce a targeted EV bonus scheme from March 2026 for new and used BEVs for lower-income buyers and residents in rural areas.²⁸⁰

Middle East

In the Middle East, Jordan has the highest share of EV sales at 45%. This is supported by a variety of different incentives, including lower import duties for EVs relative to ICE vehicles, special ToU tariffs for home charging, and free first-year registration. This next highest EV adopter, the United Arab Emirates, only reached 14% sales in 2024 with a more modest mix of incentives that included discounted parking, registration, and tolls.²⁸¹

KEY TAKEAWAYS: Beyond early adopters

Research in markets at a similar stage to Australia consistently finds that the barriers to moving beyond early adopters are not primarily technical but attitudinal and experiential: including concerns about charging access, range adequacy, and uncertainty about resale.

Interventions can seek to reduce perceived risk, including public charging density improvements, structured test drive programs, and used EV quality assurance schemes.

]. <https://www.bundesumweltministerium.de/pressemitteilung/neues-e-auto-foerderprogramm-mit-sozialer-staffelung-zuschuesse-fuer-neuzulassungen-ab-1-januar-2026>

²⁸⁰ Lundberg, L., Bengtsson, G., Sprei, F., Fernqvist, N., & Zetterholm, J. (2026). Charging forward or falling behind? Effects of electric vehicle subsidy removal. *Transportation Research Part D: Transport and Environment*, 151, 105126. <https://doi.org/10.1016/j.trd.2025.105126>

²⁸¹ International Energy Agency. (2024). *Trends in electric cars*. Global EV Outlook 2024. <https://www.iea.org/reports/global-ev-outlook-2024/trends-in-electric-cars>



Information flows and communication, misinformation and disinformation

Clear, reliable information for EV buyers is essential to support policy objectives. Without accessible and accurate communication, EV adoption is likely to be significantly slower than projected without clear communication of the policies and regulations to the public.²⁸²

Misinformation and disinformation involve the spread of false or misleading information. Misinformation refers to false information shared without knowledge of its inaccuracy, while disinformation involves deliberate creation and dissemination of false information. These terms encompass the majority of research in this area.²⁸³

The increasing presence of misinformation creates competing narratives that can undermine the effectiveness of policy interventions and depress adoption rates.²⁸⁴ Research on EV misinformation is limited with existing studies largely focused on understanding what leads individuals to accept false claims and on evaluating the effectiveness of countermeasures.

Australia, Austria, Germany, United States

An Australian-led study of 6,341 respondents from four countries (Australia, Austria, Germany and the United States) found that interventions such as fact sheets and dialogues with

²⁸² Qadir, S. A., Ahmad, F., Al-Wahedi, A. M. A., Iqbal, A., & Ali, A. (2024). Navigating the complex realities of electric vehicle adoption: A comprehensive study of government strategies, policies, and incentives. *Energy Strategy Reviews*, 53, 101379. <https://doi.org/10.1016/j.esr.2024.101379>

²⁸³ Broda, E., & Strömbäck, J. (2024). Misinformation, disinformation, and fake news: lessons from an interdisciplinary, systematic literature review. *Annals of the International Communication Association*, 48(2), 139–166. <https://doi.org/10.1080/23808985.2024.2323736>

²⁸⁴ Fitzpatrick, A. C. (2025). *Understanding electric vehicle adoption: the role of information frictions and heterogeneous beliefs*. SAFE Working Paper No. 453. <http://dx.doi.org/10.2139/ssrn.5391851>

ChatGPT reduced susceptibility to misinformation, increased support for pro-EV policies, and strengthened EV purchase intentions.²⁸⁵

Other international - Germany

A recent study involving 5,500 German consumers examined the relationship between accurate information, policy awareness, and susceptibility to misinformation. The findings highlighted a clear need for consistent, accessible information to counter disinformation and increase the likelihood of consumers choosing an EV.²⁸⁶

KEY TAKEAWAYS: Information flows, misinformation, and disinformation

Misinformation about EV technology remains a significant barrier to mainstream adoption

Direct experience with EVs and the provision of trusted counter-information are the most consistently supported interventions in the literature for reducing acceptance of EV-related misinformation

Public awareness campaigns

Australia

Australia has seen a mix of government-led and private-sector campaigns aimed at increasing EV awareness. In 2025, Destination NSW launched the *Recharged Here* campaign to promote EV-friendly road trips across the state. The campaign featured dedicated branding, EV-friendly itineraries, interactive maps, and a webpage hosted on VisitNSW.com. It ran from February to March across outdoor, audio, print, and social media channels, targeting both current and prospective EV owners.²⁸⁷

On 8 December of the same year, the NRMA launched its *Join the Charge* campaign, which has already received an award recognising its sustainability production approach. Broadcast on national broadcaster, SBS, the campaign showcased EV drivers travelling across Australia and charging along the way. The messaging focused on normalising EVs, demonstrating the extent of NSW's charging network, regional connectivity, cost savings, and environmental benefits.²⁸⁸

International

Across global markets, governments and industry partners are using targeted public-awareness campaigns to accelerate EV uptake by improving understanding, reducing perceived risks and normalising new behaviours. Evidence from the UK and India demonstrates the value of coordinated messaging that reflects local market conditions.

²⁸⁵ Bretter, C., Pearson, S., Hornsey, M. J., MacInnes, S., Sassenberg, K., Wade, B., & Winter, K. (2025). Mapping, understanding and reducing belief in misinformation about electric vehicles. *Nature Energy*, 10(7), 869-879. <https://doi.org/10.1038/s41560-025-01790-0>

²⁸⁶ Fitzpatrick, A. C. (2025). *Understanding electric vehicle adoption: the role of information frictions and heterogeneous beliefs*. SAFE Working Paper No. 453. <http://dx.doi.org/10.2139/ssrn.5391851>

²⁸⁷ Green, R. (2025, February 18). Destination NSW powers up EV-friendly road-tripping in new 'Recharge Here' campaign. *Campaign Brief*. <https://campaignbrief.com/destination-nsw-powers-up-ev-friendly-road-tripping-in-new-recharge-here-campaign/>

²⁸⁸ NRMA. (2025, December 8). The NRMA sets new benchmark for sustainable advertising with new EV campaign. <https://www.mynrma.com.au/about/media/press-releases/2025/the-nrma-sets-new-benchmark-for-sustainable-advertising-with-new-ev-campaign>

United Kingdom

Public awareness campaigns in the UK have been tailored to local circumstances and market maturity. *Go Ultra Low*, a joint government and automotive-industry campaign (2021), aimed to increase understanding of EV benefits, cost savings, and capabilities. It provided guidance on EV adoption, including how to select home-charging tariffs.²⁸⁹

The initiative also included sub-campaigns:

- *Go Ultra Low Companies*, recognising businesses who electrified their fleet.
- *Go Ultra Low Cities*, showcasing diverse approaches taken by eight exemplar councils.

One council (Milton Keynes) delivered a behaviour-change program with marketing, expert-staffed EV experience centres, display vehicles, and test drives. Another based their communications around their experience that businesses were most receptive to hearing directly from peers who had already electrified their fleets. Several councils also broadened their engagement to promote wider sustainable-mobility options beyond just EVs, including public transport, micromobility, and active transport.²⁹⁰

India

In India, the *Switch Delhi* campaign was launched in 2021, aiming to accelerate city-wide EV adoption. It was implemented alongside the incentive program for two-, three-, and four-wheelers and the waiving of road tax and registration fees.²⁹¹

KEY TAKEAWAYS: Public awareness campaign

Australia's public awareness landscape for EVs is fragmented with a mix of short-term campaigns, narrow stakeholder involvement, and static information sources.

The UK's 'Go Ultra Low' program was a sustained, joint government-industry campaign with dedicated sub-campaigns for fleet operators and local councils, and has been referenced as a model of coordinated multi-year communications investment

²⁸⁹ International Energy Agency. (2019). *Go Ultra Low Partnership between government and OEMs*. <https://www.iea.org/policies/3001-go-ultra-low-partnership-between-government-and-oems>

²⁹⁰ Energy Saving Trust. (2021, January 20). *Lessons learned from the Go Ultra Low Cities scheme*. <https://energysavingtrust.org.uk/lessons-learned-from-the-go-ultra-low-cities-scheme/>

²⁹¹ Times News Network. (2021, February 5). *Switch hit: Mass campaign to popularise electric vehicles in Delhi*. *The Times of India*. <https://timesofindia.indiatimes.com/city/delhi/switch-hit-mass-campaign-to-popularise-e-vehicles/articleshow/80695293.cms>



9. Cross-cutting insights and policy implications

International experience shows that accelerating EV uptake requires coordinated policy packages that address affordability, infrastructure availability, supply-chain resilience, and consumer confidence. Rather than focusing on individual instruments, this section synthesises common themes emerging across leading EV jurisdictions and considers their relevance to the Australian context.

Sequencing, certainty, and policy durability

Across jurisdictions, the sequencing and longevity of policy interventions matter as much as their design. Markets that have sustained EV uptake typically provide clear long-term signals to manufacturers, investors, infrastructure providers, and consumers. These signals reduce investment risk and support orderly adjustment as technologies and costs evolve.

International evidence also shows that poorly timed policy withdrawal or abrupt changes can undermine confidence and stall adoption, even where headline ambition remains high. Effective EV strategies therefore emphasise policy durability, transparency, and future planning, particularly as markets transition from early adopters to the mainstream.

Coordinated national-to-local charging infrastructure frameworks

A consistent finding across other EV markets is the importance of nationally coordinated charging strategies delivered through local implementation. Programs such as the EU's Alternative Fuels Infrastructure Regulation, Germany's Charging Infrastructure Masterplan, and the United States' NEVI program demonstrate how national targets, minimum technical standards, conditional co-funding, and mandated uptime requirements can improve network consistency and reliability.

Local governments play an increasingly important role, particularly in facilitating kerbside charging, supporting apartment residents, and streamlining planning processes. However, international experience suggests that delegating EV charging strategy without strong national coordination risks fragmented outcomes and inefficient investment. Given the inherently cross-jurisdictional nature of road travel, harmonisation across borders and coordinated investment signals are critical.

Equity by design

As EV markets mature, equity considerations become central to sustaining adoption. Without deliberate intervention, EV uptake risks remaining concentrated among higher-income households and well-served urban areas.

In response, many jurisdictions are adapting affordability measures to reach low- and middle-income households through targeted incentives, social leasing programs, salary-sacrifice schemes, and fleet-focused subsidies. For heavy vehicles, targeted grants, feebates, and purchase incentives are emerging as key tools to overcome high upfront costs. These approaches highlight that equity is not an ancillary concern, but a core design feature of effective EV transition policy.

Australia's changing position in the international system

Australia's role as a rule taker in vehicle regulation is becoming increasingly challenging. The composition of vehicle imports is changing, and the modern vehicle is now as much a software and data platform as a mechanical asset. Connectivity, over-the-air updates, cybersecurity, interoperability, and data governance are now integral to vehicle performance, safety, and consumer trust.

International experience underscores the importance of active engagement in global regulatory and standards-setting forums. Jurisdictions that fail to do so risk delaying the adoption of emerging energy and data-enabled services enabled through our vehicles and reducing influence over the shaping of future enabling technologies. For Australia, a more proactive international posture is increasingly linked to competitiveness, system resilience, consumer choice, and consumer protection.

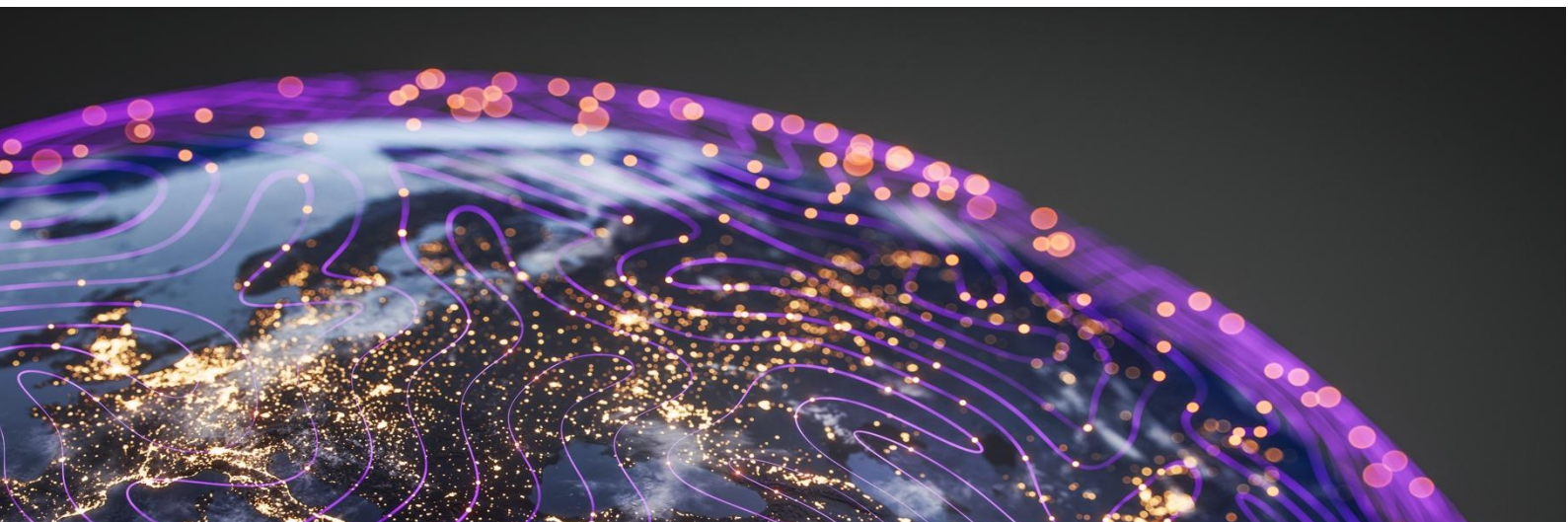
Conclusions and next steps

The international evidence reviewed in this report reinforces the value of well-coordinated EV transition strategies that operate across policy domains and levels of government. Jurisdictions making the most progress are those that combine targeted financial incentives, nationally consistent charging frameworks, consumer-focused communication strategies, supply-chain and circular-economy policies, and forward-looking workforce planning.

For Australia, these insights suggest several priorities for the next phase of policy development:

- Strengthening long-term policy certainty and sequencing to support investment and consumer confidence.
- Improving national coordination of charging infrastructure standards, targets, and funding signals.
- Embedding equity considerations into EV policy design as markets move beyond early adopters.
- Increasing engagement in international regulatory and standards-setting processes to address emerging software, cybersecurity, technology, consumer, and data-governance risks.

This analysis could be built upon through deeper examination of specific policy instruments against suitable evaluation frameworks and methodologies, closer tracking of implementation outcomes over time, and stronger integration with energy-system and digital-governance planning. As Australia approaches key emissions-reduction milestones, maintaining an evidence-led and internationally informed approach will be critical to achieving an efficient, equitable, and resilient transport transition.



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