

Submission to Victorian Economy and Infrastructure Committee inquiry  
Victorian Parliament:  
**Harmonising Electric Vehicles with Electricity Supply and Demand**

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# Submission to the Inquiry into Harmonising Electric Vehicles with Electricity Supply and Demand

## 1. Overview

Electric vehicles (EVs) are an essential driver of decarbonisation and the optimisation of the energy system. Their integration with the electricity network presents not only a challenge for transport but also a significant opportunity for the electricity system. When managed effectively, increased EV adoption will enhance grid stability, accelerate the deployment of renewables thus providing cost reductions for the grid, reduce costs for all consumers, and deliver substantial climate benefits.

Using a truth-over-noise approach, this submission emphasises evidence-based, system-efficient strategies for integrating EVs with the grid. This approach deliberately counters persistent myths such as claims that EVs threaten grid stability, drive up prices, or create unsustainable load growth. In practice, EVs function as smart, flexible loads that can reinforce the grid, improve infrastructure management and utilisation, lower wholesale electricity prices, and speed up the integration of renewables. Policy options to enable this transition are suggested.

## 2. Introductory and Background Commentary: EVs, Renewables, and the Energy Market EVs as a Catalyst for the Energy Transition

Future Transport as electric vehicles is rapidly emerging (Figure 1)

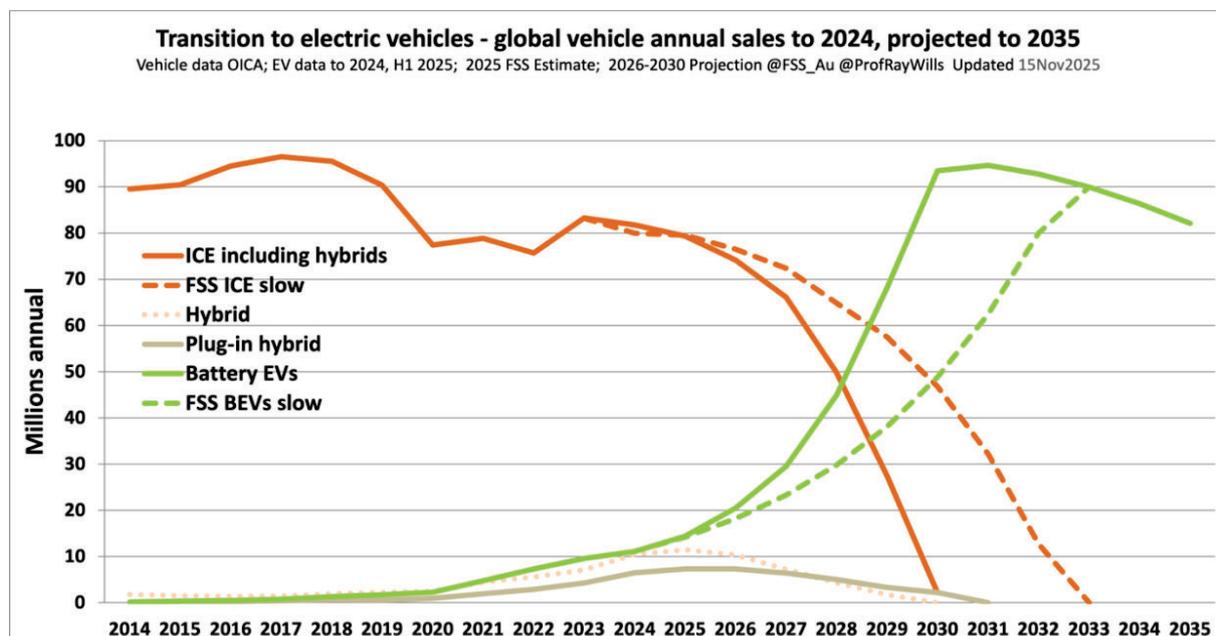


Figure 1. Future Smart Strategies projection for the continuing transformation of annual sales in vehicles – including a slow case, which current adoption rates make less likely.

The electrification of transport is a pivotal force driving the renewable energy transition. Rather than simply swapping one type of drivetrain for another, electric vehicles (EVs) form the most significant accelerator of the move towards clean energy. They create flexible and predictable demand for electricity, directly linking to the clean energy economy and stimulating investment in solar, wind, and storage. They also provide for a renewal of national fleets. This is coincident with a range of improvements in technologies including Advanced Driver Assist and moving forward to autonomy causing a newer, safer vehicle fleet to arrive on our roads. This dynamic interconnection has a multi-faceted impact and transforms the transport and electricity sectors from distinct entities into a unified, circular energy and sustainable ecosystem with substantial economic and climate benefits.

**As we ‘electrify everything’, the decarbonisation of the economy is most effective when electricity becomes the universal energy medium, replacing fossil fuels across mobility, heating, and industry. EVs are the visible embodiment of this systemic redesign of the whole of the economy.**

#### Truth Over Noise: Debunking Myths Around EVs and the Grid

The adoption of electric vehicles in Australia is accelerating (Figure 2).

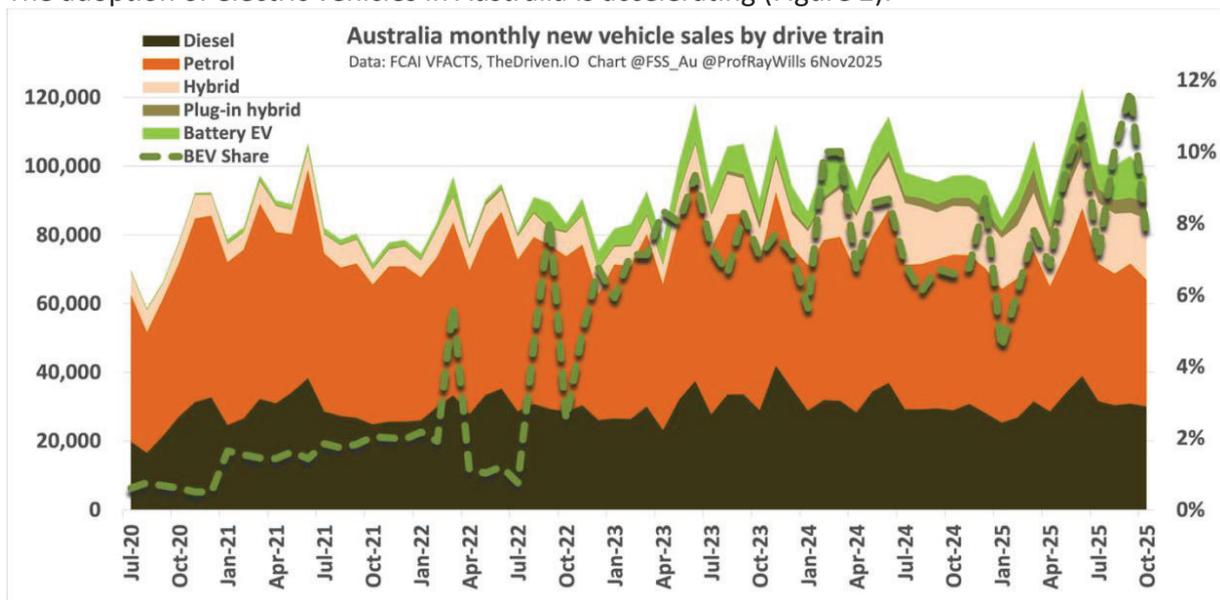


Figure 2. Monthly sales of vehicles by drivetrain in Australia: electric vehicles ~8.2% share in 2025

There are frequent claims suggesting that widespread EV adoption would strain the electricity grid, raise costs, or cause instability. However, current data robustly disproves these concerns. The key ‘truths over noise’ are:

- In Australia’s National Electricity Market (NEM), higher renewable penetration is bringing sharply lower generation costs. Data from the Australian Energy Market

Operator (AEMO) via [Open Electricity](#) consistently demonstrates that increased [renewables drive down the volume-weighted price of electricity](#), while fossil fuel sources such as gas contribute to price volatility.

- [EVs as flexible, off-peak loads](#) supporting renewables, flattening demand profiles, and decreasing reliance on costly peaking supply are part of the solution to grid stability and balance.
- Higher overall consumption on our existing grids driven by electric vehicles means infrastructure utilisation improves, reducing overall network costs per unit of transmission.
- Managed intelligently, EV charging does not threaten grid stability. On the contrary, with distributed vehicle-to-grid (V2G) integration, EVs become [part of the solution for grid stability](#).

Combining these four ‘truths over noise’ suggests the following key principle that will be illustrated in greater depth in the rest of this submission below:

**Burning fuels is expensive, but using electricity is comparatively cheap. By expanding renewable generation and matching it with distributed, smart EV loads, the system can achieve lower costs and lower emissions.**

#### [EVs as Distributed Batteries: Turning Mobility into Energy Infrastructure](#)

The growing fleet of EVs in Australia, and projected future growth (Figure 3), represents the nation’s largest potential distributed energy resource (DER) to date. Each EV adds substantial battery storage capacity to the grid (typically 60–100 kWh per vehicle for cars, and a substantially higher capacity of commercial and industrial fleets are electrified and adding to that storage).

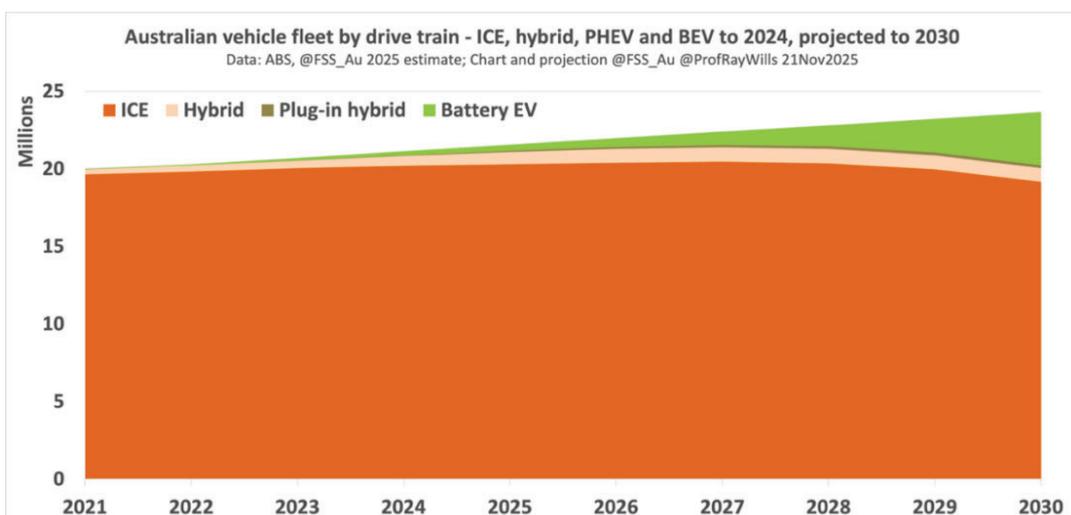


Figure 3. The global growth of battery utilisation estimates by category to 2025 (estimates by Future Smart Strategies based on reported battery volumes where available).

Victoria’s electricity generation in the past 12 months was 47% renewable (Figure 4). At the same time EVs are offering controllable demand to absorb excess solar or wind generation to the utility operators, reducing electricity generation ‘losses’ currently forgone through curtailment (9.6% of wind and solar curtailed in October 2025). These vehicles also provide something more for the consumer: resilience through V2G and vehicle-to-home (V2H) functionalities for households, communities, and businesses.

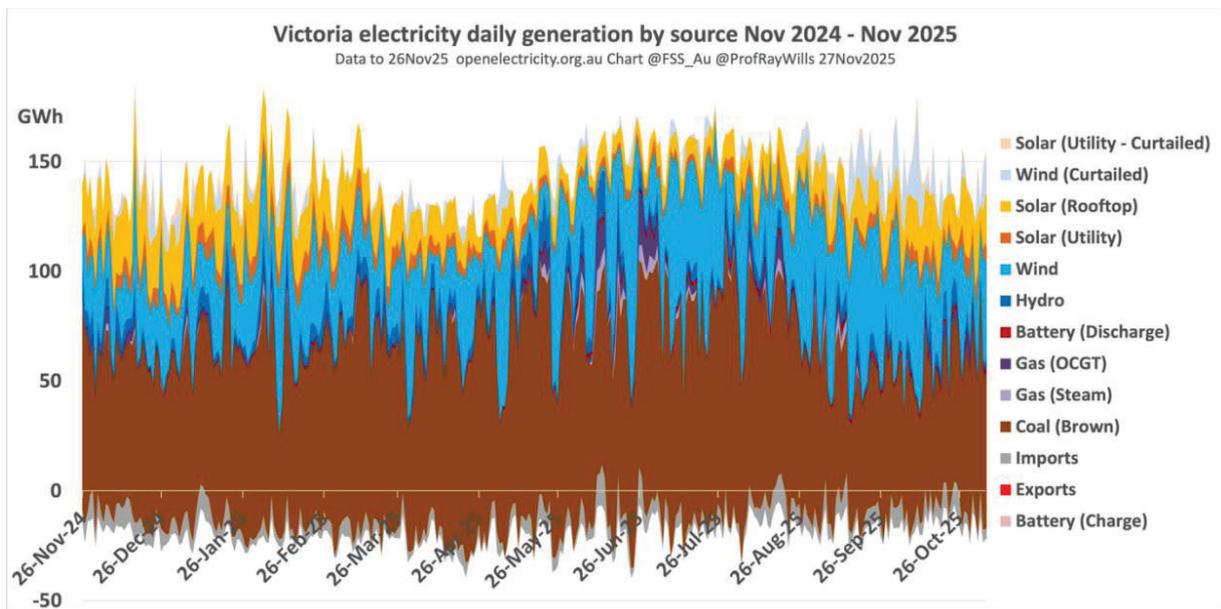


Figure 4. Victorian electricity generation by source, including imports and exports, and wind and solar curtailment (Data [Open Electricity](#), Graph Future Smart Strategies).

When considered in aggregate, global electric vehicle adoption exceeded the capacity of all other battery applications around 2020 and currently surpasses utility-scale batteries (Figure 5). This trend is projected to continue well into the 2030s (see Figure 6).

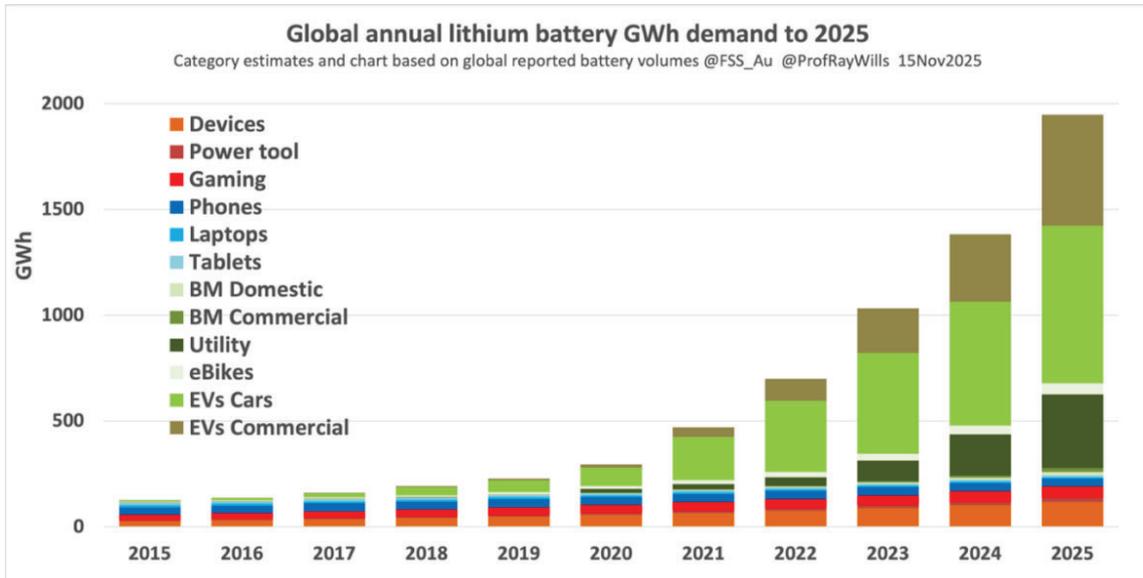


Figure 5. The global growth of battery utilisation estimates by category to 2025 (estimates of category quantities by Future Smart Strategies based on reported battery volumes as available).

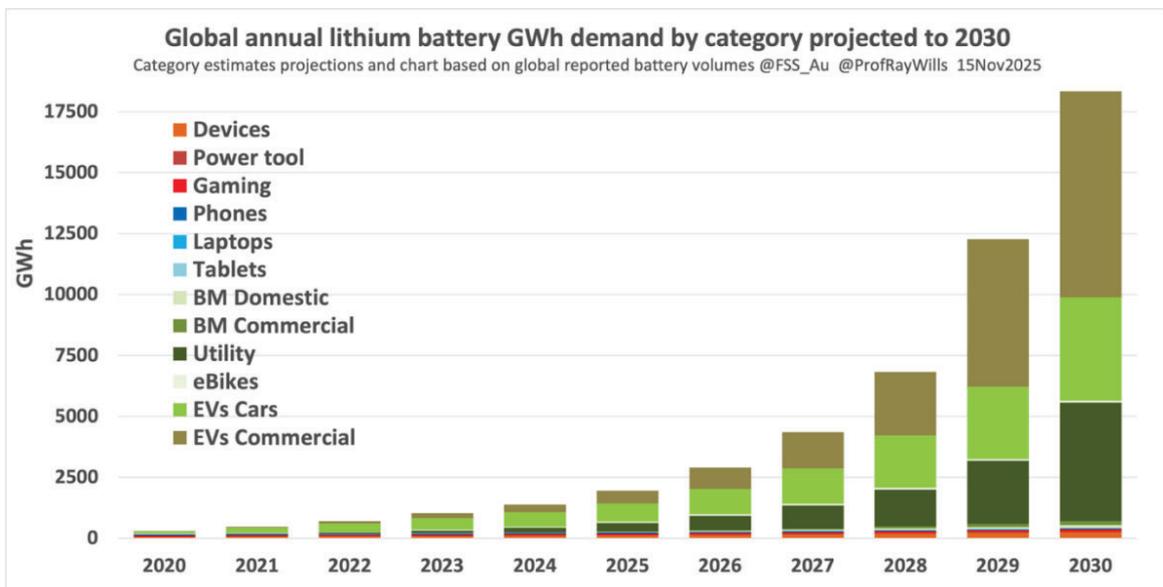


Figure 6. The global growth of battery utilisation by category projected to 2030 by Future Smart Strategies).

**Smart and synchronised charging, especially during peak renewable generation periods, offers a simple and efficient way to store energy, leveraging assets already owned by consumers.**

## Harmonising Mobility, Infrastructure, and Market Reform

The convergence of EV technology, smart grids, and renewable energy generation calls for coherent policy action, and Victorian EV adoption share is second only to the ACT (Figure 7). While the highest density of EV uptake is in Melbourne, regions too are taking advantage of EVs (Figure 8).

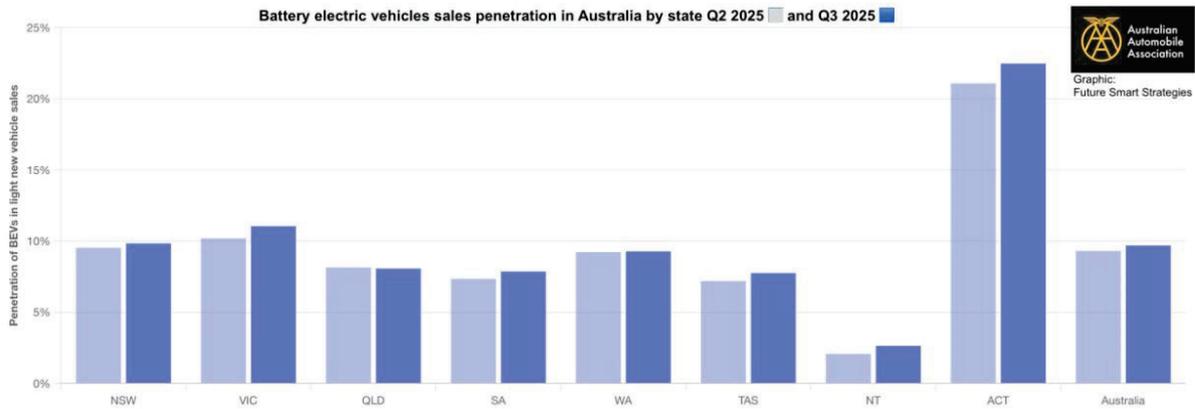


Figure 7. Battery electric vehicles sales penetration in Australia by state Q2 2025 and Q3 2025 (Data [Australian Automobile Association](#), graphic Future Smart Strategies).

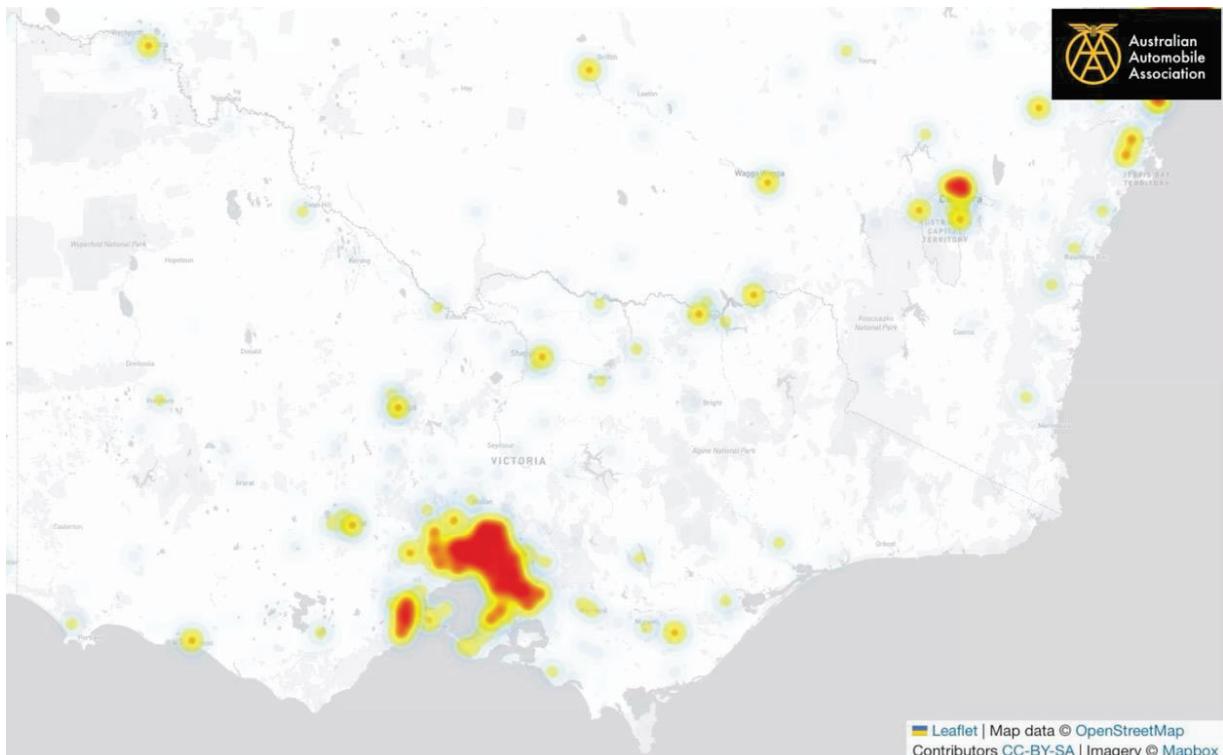


Figure 8. Heatmap showing geographic distribution of vehicle registrations in Victoria ([Australian Automobile Association](#)).

Victoria is well placed to lead in this area, with three critical priorities:

1. Smart, price-mediated charging: Aligning EV charging with renewable supply using automated, cost-effective load control systems.
2. Equitable infrastructure rollout: Ensuring that EV charging infrastructure is accessible in older suburbs and shared-living settings where off-street parking is limited, and ensuring EV owners relying on home charging in old areas renew wiring to avoid fire risk that may potentially arise from very old electrical circuitry.
3. Circular electrical economy creation: Building local capabilities for second-life batteries, recycling, and component reconditioning.

**Harmonising mobility, power systems and markets can now happen as we move beyond a narrow focus on EV adoption and seek to create a resilient and decarbonised mobility system that benefits both the grid and consumers and enables a more complete transition to the net zero economy.**

#### Combined Environmental and Economic Gains

Victoria's grid transition demonstrates the synergy between electrification and renewables in reducing system costs. Every kilowatt-hour consumed by an EV enhances grid utilisation and supports the economics of renewable energy. Each home or business with an EV increases the value of local rooftop solar installations and community energy projects. All forms of battery storage, whether from vehicles or stationary sources, contribute to improved system reliability and reduced dependence on gas-peaker plants that would otherwise bring higher wholesale electricity pricing.

Evidence from both national and global energy markets shows that [regions exceeding 50% renewable penetration experience see downward pressure in electricity prices](#) and increased grid reliability.

**The integration of EVs with smart grid net zero technology amplifies both environmental and economic benefits.**

#### A Transformative Decade Ahead

EVs are not merely an endpoint in the energy transition; they are the driving force behind its acceleration. Over the next decade, Australia's expanding EV fleet will help stabilise the power system. Advances in smart charging, recycling, and bidirectional energy use will transform vehicles, combined with home storage, will yield revenue-positive assets. The collective residential battery capacity will underpin the reliability of renewable energy around the clock.

It is possible to see from the trends outlined above that building significant new transmission lines, may not be required to the level as is now being planned, when the V2G systems and rooftop PV systems are added to the grid systems. The savings in cost and loss of power due to

the thermodynamics of long-distance transmission, suggest that energy planning should consider the possibility of a far greater role for this DER opportunity.

The central challenge and opportunity for Victoria is to shape policy that prioritises integration and community participation, ensuring that new technologies advance both public benefit and climate stability.

**If managed effectively, the EV transition will result in lower prices, reduced emissions, and decreased reliance on imported fossil fuels—delivering a modern, resilient, and clean mobility system, together with a modern, resilient and clean power system.**

## 2. Strategies to Align EV Charging with Grid Supply and Demand

The electrification of transport delivers faster and more cost-effective emissions reductions than any other pathway in the sector. **Each EV on Victoria’s current grid displaces roughly 2 tonnes of CO<sub>2</sub>e annually, with even greater savings as renewables surpass 70 % grid penetration.**

The following strategies and recommendations are outlined to demonstrate how to make the most of the extraordinary opportunities created by these two core benefits being integrated rapidly.

### 2.1 Flexible and Smart Charging

- Evidence from AEMO and international markets indicates that most EV charging takes place overnight, or at workplaces, coinciding with periods of lower grid demand. By leveraging smart systems such as time-of-use and dynamic tariffs, charging can be further aligned with times of peak renewable generation (e.g., midday solar, off-peak wind).
- **Policy recommendation:** *Mandate and, as appropriate, provide incentives for the universal adoption of network-connected smart chargers that default to off-peak operation unless users choose to override.*

### 2.2 Incentive-based Load Shifting

- Implement dynamic pricing that rewards charging during periods of renewable energy surplus and imposes penalties during peak demand times.
- Promote community and commercial fleet aggregation to form virtual battery networks, allowing EVs to operate as coordinated, controllable loads that respond to market signals.

### 2.3 Bidirectional Charging and Grid Services

- Vehicle-to-Grid (V2G) and Vehicle-to-Home (V2H) technologies transform EVs into valuable grid assets. A typical EV battery (50–100 kWh) has the capacity to power the average Australian home for one to two days or provide frequency support to stabilise

the grid. For some this may prove a source of energy export earnings, for others simply greatly increased energy security at home.

**Policy Recommendation:**

- *Accelerate the development and implementation of interoperability standards for bidirectional chargers, specifically aligning with ISO15118.*
- *Provide funding to aid real transition to operational projects (not just ‘pilots’) in commercial fleets, public transport depots, and community hubs.*

### 3. Public Charging Infrastructure

#### 3.1 Deployment Equity

- A significant number of Victorians, particularly those living in urban areas without off-street parking, rely on accessible public charging infrastructure.

**Policy Recommendation:**

- *Ensure the equitable distribution of public charging stations, with a focus on older suburbs, regional towns, and areas with multi-dwelling buildings.*
- *Update building codes for owners, including rental laws for landlords to require EV-ready wiring for all new residential and commercial developments; existing properties must be included to renew old electrical wiring and ensure electrical safety and avoid fire risk.*

#### 3.2 Integration with Renewables

- Solar and battery co-located charging sites can alleviate strain on the grid and reduce overall costs, delivered by both private and public investment – including incentives to retrofit daytime charging stations to solar farms or microgrids serving precincts.

**Policy Recommendation:**

- *Offer incentives for the development of renewable-powered charging precincts and require a minimum level of renewable energy participation for publicly funded chargers.*

### 4. Electricity Network Role and Tariff Design

#### 4.1 Role of Distribution Businesses

- Distribution Network Service Providers (DNSPs) should serve as platform providers, enabling data exchange and maintaining grid reliability, without owning or operating charging infrastructure except in cases of market failure.

#### 4.2 Tariff Reform

- Network tariffs should incentivise grid-friendly behaviours by:
  - Offering low or negative prices during periods of solar and wind energy oversupply.
  - Implementing demand-responsive caps during peak times.

- Using volume-weighted pricing that reflects true system costs, as demonstrated in National Electricity Market (NEM) price-share analyses.

***Policy Recommendation:***

- As modelling consistently shows that renewables reduce wholesale prices, while V2G and flexible EV loads help manage fluctuations, policy strategists need to adjust their future planning to consider dramatically more DER-based power systems using V2G (and including consideration of the growth of stationary storage in home and utility-scale batteries).

## 5. Second-Life Batteries

### 5.1 Integration with Grid

- The deployment of distributed second-life storage, especially in combination with rooftop solar, establishes a decentralised energy backbone that can reduce the need for further network investment and buffer price volatility.

### 5.2 Circular Economy Potential

- Retired EV batteries, which retain approximately 70–80 % of their capacity, remain valuable as stationary energy storage solutions, supporting local energy resilience.

***Policy Recommendation:***

- *Develop industry-wide standards for EV battery grading, reuse certification, and safety protocols.*
- *Provide incentives for repurposing these batteries as community-scale storage, prioritising fringe-of-grid and low-income communities.*

## 6. Battery Manufacturing, Recycling, and Supply Chain Opportunities

### 6.1 Local Capability

- Victoria has the potential to foster a comprehensive circular battery economy, encompassing cell manufacturing, pack assembly, recycling, and reconditioning.
- This could be achieved by aligning with the national Critical Minerals Strategy in cooperation with Western Australia, New South Wales, and federal initiatives.

***Policy recommendation:***

- *Support research and development as well as investment incentives for local processing and recycling facilities that employ emerging green extraction technologies.*

### 6.2 Regulation and Standards

Throughout this submission there are recommendations on regulations and standards. These need to include batteries which of course are used in many other parts of the energy transition but will be a major additional factor with EVs as well as other elements such as urban design and equity, data and cybersecurity, and workforce skills.

***Policy recommendations:***

*Establish statutory requirements for battery lifecycle traceability to ensure safety and transparency in recycling and disposal, while maximising resource recovery.*

*Urban Design and Equity*

- Ensure that access to EV mobility is integrated with public transport, active travel options, and car-share schemes to prevent increased congestion or exacerbation of inequality.

*Data and Cybersecurity*

- Require open APIs and cybersecurity standards for both charging infrastructure and V2G systems to safeguard consumer data and maintain grid security.

*Workforce Skills*

- Invest in training for electric power systems, EV servicing, and smart energy integration to build a skilled workforce that supports emerging industries and secure employment opportunities.

## List of Recommendations

- *Mandate and, as appropriate, provide incentives for the universal adoption of network-connected smart chargers that default to off-peak operation unless users choose to override.*
- *Accelerate the development and implementation of interoperability standards for bidirectional chargers, specifically aligning with ISO15118.*
- *Provide funding to aid real transition to operational projects (not just 'pilots') in commercial fleets, public transport depots, and community hubs.*
- *Ensure the equitable distribution of public charging stations, with a focus on older suburbs, regional towns, and areas with multi-dwelling buildings.*
- *Update building codes for owners, including rental laws for landlords to require EV-ready wiring for all new residential and commercial developments; existing properties must be included to renew old electrical wiring and ensure electrical safety and avoid fire risk.*
- *Offer incentives for the development of renewable-powered charging precincts and require a minimum level of renewable energy participation for publicly funded chargers.*
- *As modelling consistently shows that renewables reduce wholesale prices, while V2G and flexible EV loads help manage fluctuations, policy strategists need to adjust their future planning to consider dramatically more DER-based power systems using V2G (and including consideration of the growth of stationary storage in home and utility-scale batteries).*
- *Develop industry-wide standards for EV battery grading, reuse certification, and safety protocols.*
- *Provide incentives for repurposing these batteries as community-scale storage, prioritising fringe-of-grid and low-income communities.*
- *Support research and development as well as investment incentives for local processing and recycling facilities that employ emerging green extraction technologies.*
- *Establish statutory requirements for battery lifecycle traceability to ensure safety and transparency in recycling and disposal, while maximising resource recovery.*
- *Examine how much overall reduction in transmission planning can be reduced as the DER growth due to V2G sets into the overall system at scale.*

## 9. Recommendations Summarised

Term of Reference	Recommendations
(1) Charging Alignment	Mandate smart charging; implement dynamic tariffs; make off-peak charging the default setting.
(2) Public Access	Accelerate the rollout of equitable charging infrastructure with appropriate funding, prioritising solar-powered or co-located systems.
(3) Network Role & Tariffs	Position DNSPs as neutral enablers; introduce tariffs aligned with renewable generation; pilot local network markets.
(4) EV Uptake & V2G	Establish holistic national standards relevant to EVs, including building codes; offer financial incentives for bidirectional integration.
(5) Battery Second Life	Implement certification and incentive schemes for community projects utilising second-life batteries.
(6) Manufacturing & Recycling	Support local mineral processing, pack assembly, reuse initiatives, and recycling through targeted policy, workforce development, and R&D funding.
(7) Other Matters	Integrate equity, cybersecurity, workforce transition, and planning reform into all policy development processes.
Overall DER Planning	Examine how much overall reduction in transmission planning can be reduced as the DER growth due to V2G sets into the overall system at scale.

## 10. Conclusion

Widespread EV uptake will increase grid efficiency by improving asset utilisation and supporting the economics of large-scale solar and wind deployment and perhaps reducing the need for such large-scale systems.

EVs represent the most powerful lever for decarbonisation across both the transport and energy sectors, driving renewables growth, reducing average electricity costs, and delivering system-wide flexibility.

This inquiry arrives at a critical juncture where the transformations in electric vehicles and the energy sector are converging. Victoria can lead the way in synchronising EV adoption with grid decarbonisation, thereby enhancing reliability, reducing system costs, and ensuring that the electric future benefits to Victorians.

The primary challenge lies not in grid capacity but in governance and system design.

**The most effective solution is smart, distributed, renewable electrification, placing people, not petrol, at the heart of the energy system.**