Net Zero Commission

Pathways Call for Evidence Submission

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Net Zero Institute Submission

NSW Net Zero Commission Decarbonisation Pathways Call for Evidence

Prepared by the Net Zero Institute, University of Sydney

10 August 2026

Executive Summary

The Net Zero Institute (NZI) welcomes the opportunity to contribute to the NSW Net Zero Commission's Decarbonisation Pathways Call for Evidence. The pathways process represents an important opportunity to translate legislated emissions targets into practical decisions about infrastructure, investment, technology deployment, workforce development, regional transition and community participation.

This submission is made by the Net Zero Institute, University of Sydney, and is based on accumulative research from NZI members, including multidisciplinary research, policy engagement, white papers, sector capability mapping and prior consultation input. It reflects the Institute's role as a whole-of-University platform connecting research expertise with government, industry and community needs.

NZI's core message is that credible decarbonisation pathways for NSW must be technically robust, economically investable, socially grounded and capable of being updated over time. Pathways should make visible the enabling conditions required for delivery, including planning coordination, finance, skills, supply chains, First Nations participation, community trust, transparent monitoring and adaptive governance.

This submission emphasises five overarching themes:

- Decarbonisation should be treated as a connected whole-of-system challenge rather than a set of isolated sector pathways.
- Early deployment of commercially available technologies should be prioritised while continuing to support emerging technologies for hard-to-abate sectors.
- Private capital, policy certainty and coordinated regulation will be critical to accelerating investment.
- Community trust, First Nations participation and regional benefit-sharing are essential enablers of delivery.
- Pathways should include transparent assumptions, leading indicators, monitoring and regular updating as technologies, costs, markets and community expectations evolve.

AI-enabled data centre growth should be considered within NSW decarbonisation pathways because it intersects with electricity and water systems, land-use planning, environmental performance and community outcomes. Its cumulative impacts should be assessed alongside other emerging sources of infrastructure demand.

Summary of Priority Inputs for the NSW Pathways

Pathway area	Priority input	Implication for modelling and policy
Electricity and energy	Generation, transmission, storage, consumer energy resources and demand response must be modelled together.	Test both large-scale infrastructure and distributed solutions, including community batteries, virtual power plants and vehicle-to-grid.
Transport	Electrification must be paired with mode shift, public transport, active transport and freight planning.	Model charging infrastructure, freight corridors, depot charging and land-use effects on travel demand.
Industry	Low and medium temperature heat electrification is a near-term opportunity but requires process redesign and investment certainty.	Include tariff risk, technical support needs, demonstration pathways and industrial precinct opportunities.
Resources and critical minerals	Critical minerals are a transition enabler but supply chains must be circular, secure and lower impact.	Include recycling, processing, substitution, methane abatement, disclosure and regional workforce transition.
Land and agriculture	Agricultural emissions reduction should be integrated with biodiversity, water, food production and carbon storage.	Model adoption barriers, measurement costs, permanence risk and trusted demonstration pathways.
Finance and governance	Investment depends on stable policy signals, bankable demand and de-risked project pipelines.	Test the effect of blended finance, long-term revenue certainty and public co-investment.
AI and data centres	Growth should be modelled as clustered, long-lived infrastructure with cumulative energy, water, land-use and community impacts.	Align approvals with infrastructure readiness, precinct-level capacity, transparent performance and measurable community benefit.

1. Opportunities and Barriers to Improving NSW's Transition to Net Zero

NSW has the opportunity to move beyond point-in-time emissions targets and develop sector pathways that clarify the pace, scale and sequencing of change required across the economy. The Commission's Balanced, Delayed and Fast-tracked scenarios provide a useful structure for testing how different assumptions about technology uptake, behaviour change, cost, infrastructure readiness and social acceptance affect the feasibility of achieving net zero by 2050.

The most significant barriers are not limited to technology availability. In many sectors, mature or near-mature solutions already exist. The more difficult barriers are often systemic: fragmented planning, lengthy approvals, uncertain investment signals, grid connection delays, uneven community engagement, workforce shortages, supply-chain constraints and limited coordination across government portfolios.

Pathway modelling should therefore avoid assuming that technology availability automatically leads to deployment. Deployment depends on finance, skills, infrastructure, regulation, community trust and confidence in market settings. These constraints should be treated as core pathway variables rather than background context.

The pathways should also make sector dependencies explicit. Electrification of transport, buildings and industrial heat depends on electricity system readiness. Renewable infrastructure depends on critical minerals and supply

chains. Land-use decisions affect agriculture, biodiversity, renewable infrastructure, water security and carbon sequestration. Waste and circular economy policy can reduce upstream industrial emissions and embodied carbon. These interdependencies should be visible in the modelling architecture.

AI-enabled data centres illustrate the need for systems-level pathway planning. Their combined requirements for computing, cooling, electricity, water, backup systems and supporting infrastructure should be considered within broader assessments of network capacity, land use and regional infrastructure readiness.

2. Policies and Market Mechanisms

Clear, stable and coordinated policy settings are essential to accelerating emissions reduction. Policy uncertainty increases project risk, delays investment and raises the cost of capital. The NSW pathways should identify where policy settings are likely to be decisive in enabling deployment, particularly for electricity infrastructure, industrial electrification, zero-emission transport, circular economy infrastructure and land-sector participation.

A central policy priority is to improve coordination between planning, energy, transport, industry, environment, regional development and skills portfolios. Whole-of-government coordination is particularly important in regions hosting multiple transition assets, including Renewable Energy Zones, transmission corridors, renewable generation, storage, industrial precincts and land-sector projects.

Planning and permitting reform should focus on reducing unnecessary procedural delay while maintaining transparent environmental assessment, First Nations participation and meaningful community engagement. Fast-tracking cannot be achieved by weakening engagement. It is more likely to be achieved by beginning engagement earlier, improving coordination between agencies, using clear milestones and maintaining transparent commitments registers that show how community input has shaped project design.

Market mechanisms should reward emissions reduction, system flexibility, resource efficiency and credible carbon outcomes. Electricity market reform should support both large-scale infrastructure and distributed energy resources. Industrial policy should encourage low-emissions production, circular materials and demand-side efficiency. Land and carbon market settings should prioritise integrity, permanence, biodiversity co-benefits and accessible participation for landholders.

For data centres, coordinated energy, water, planning, environment and regional development settings will be important. In areas of concentration, precinct-level assessment can complement project-level approvals by considering cumulative infrastructure capacity, climate risks, land-use competition and community needs.

3. Stimulating Private Finance

The transition to net zero is an investment challenge as much as a technical challenge. Australia has significant pools of private capital, including institutional capital, but the presence of available capital does not by itself create investable projects. The central challenge is to create bankable pipelines with credible risk allocation, clear revenue streams and measurable outcomes.

Government can help mobilise private finance by reducing uncertainty and de-risking projects that are strategically important but not yet commercially straightforward. This may include blended finance, sovereign or public co-investment, concessional capital, guarantees, offtake support, revenue certainty and transition-focused investment vehicles.

The pathways should test how different finance conditions affect deployment rates. A Delayed pathway should model the risks of compressed delivery timelines, higher reliance on future technologies and greater exposure to cost escalation. A Fast-tracked pathway should not simply assume optimistic uptake; it should identify the enabling financial, regulatory, workforce and infrastructure settings required to make faster deployment credible.

Financing frameworks should also recognise the importance of early-stage research, demonstration and commercial translation. Many technologies needed for hard-to-abate sectors require support to move from laboratory or pilot scale to commercial deployment. Finance mechanisms should therefore cover both near-term

abatement from mature technologies and development pathways for options that may be needed later in the transition.

4. Technology Development and Deployment

Technology readiness varies substantially across sectors. The pathways should distinguish between technologies that are mature and ready for immediate deployment, technologies that require demonstration and scale-up, and technologies that remain uncertain in cost, infrastructure requirements or public acceptance.

Mature or near-mature technologies include rooftop solar, batteries, electric buses, many passenger electric vehicles, energy efficiency upgrades, consumer energy resources, low and medium temperature heat electrification, precision agriculture tools, landfill gas capture and methane reduction practices. These should form the foundation of near-term emissions reduction.

Emerging technologies, including renewable fuels, advanced industrial process electrification, long-duration storage, direct air capture, engineered carbon removals, advanced critical mineral processing and some heavy freight or aviation options, should be supported through targeted demonstration, careful monitoring and realistic assumptions about scale-up.

Pathways should avoid over-reliance on uncertain future technologies to compensate for delayed action in areas where mature solutions are already available. Conversely, pathways should maintain room for emerging technologies where they are likely to be necessary for hard-to-abate sectors, provided their assumptions about cost, readiness, infrastructure and social acceptance are transparent.

University of Sydney research capabilities identify opportunities to improve the efficiency of AI infrastructure through advanced cooling, integrated optimisation, demand response and coordinated computing, cooling and power systems. These approaches should be considered within technology and demonstration pathways for emerging digital infrastructure.

5. Demand Reduction and Behaviour Change

Demand reduction should be treated as a core pathway assumption, not a secondary co-benefit. Reducing demand can lower emissions directly, reduce infrastructure pressure, defer capital expenditure and improve the feasibility of meeting near-term targets.

In transport, the most effective approach is to make the most popular modes greener while making the greenest modes more attractive. This means accelerating vehicle and bus electrification while improving public transport frequency, walking, cycling, micromobility and land-use planning that reduces dependence on private car travel.

In electricity, demand response, load shifting, consumer energy resources and virtual power plants should be treated as active system resources. Households, businesses and large energy users can contribute to system flexibility where market design, digital tools and consumer protections are aligned.

In agriculture and land management, behaviour change includes adoption of precision agriculture, improved fertiliser management, clean on-farm energy, livestock emissions reduction, participation in carbon and biodiversity markets, and restoration of degraded land. Uptake depends on practical advice, demonstration sites, measurement costs, trust, value streams and administrative simplicity.

6. Economic Impacts and Workforce Pressures

Different decarbonisation pathways will have different implications for households, businesses, regions, public finances and the workforce. The Commission should explicitly model the economic consequences of delay, including higher future infrastructure costs, compressed investment timelines, greater reliance on immature technologies and increased exposure to transition risk.

Accelerated decarbonisation can support regional development, export opportunities and new industries if implemented with credible planning and benefit-sharing. NSW has opportunities in renewable energy, critical

minerals, circular economy infrastructure, clean manufacturing, renewable fuels, electrified industry and land-sector innovation.

Workforce constraints may become a binding limitation on delivery. Simultaneous demand for labour across transmission, renewable generation, housing, transport, construction, industrial projects and land management could create bottlenecks unless training, mobility and regional workforce planning are integrated into the pathways.

Transition planning should address both new workforce demand and the needs of workers and communities affected by declining high-emissions industries. This includes credible regional development strategies, skills pathways, local procurement, industry diversification and transparent engagement with affected communities.

Data centre investment may support broader economic capability where it is linked to research, workforce development and adjacent industries, including AI systems, cybersecurity, energy management, advanced cooling, water technologies and digital infrastructure. Pathway assessment should consider durable local capability and employment beyond construction.

7. Just Transition, First Nations Peoples and Regional Communities

A just transition requires more than consultation. It requires early, resourced and sustained participation by communities in decisions that affect land, infrastructure, employment, cultural heritage and regional development.

First Nations engagement should be grounded in self-determination, cultural authority and genuine partnership. Communities should be supported to define their own priorities and preferred benefits rather than being asked to respond to pre-determined project proposals. Benefits may include employment, education, health, cultural stewardship, biodiversity outcomes, governance capacity, land management and economic self-determination.

Regional communities hosting renewable infrastructure, transmission projects, industrial precincts or land-sector projects should have access to transparent information, meaningful benefit-sharing and visible local opportunities. Standing regional reference panels, local commitments registers and participatory mapping could help reduce consultation fatigue and build trust across multiple projects.

The pathways should recognise that community acceptance is not a fixed external variable. It is shaped by process quality, timing, transparency, local benefit, perceived fairness and the extent to which communities can influence decisions before they are locked in.

Data centre development is one example of why social licence should be treated as an enabling condition for infrastructure delivery. Early engagement, transparent reporting and measurable local benefits are important where communities may experience cumulative impacts on energy, water, land use, amenity and local infrastructure.

8. Sector-Specific Considerations

8.1. Electricity and Energy

NSW should pursue a balanced energy transition that combines utility-scale renewable generation, transmission and storage with distributed energy solutions. Renewable Energy Zones and transmission upgrades remain critical, but they should be complemented by rooftop solar, batteries, community batteries, virtual power plants, vehicle-to-grid capability and demand response.

Pathways should account for grid connection delays, transmission timing, supply-chain constraints, workforce availability, storage duration, system flexibility and community acceptance. The modelling should test scenarios in which distributed energy resources reduce peak demand and improve resilience alongside large-scale infrastructure.

Data centres supporting AI workloads should be included in electricity-demand scenarios, particularly where multiple facilities may create concentrated or cumulative loads. Modelling should consider their implications

for generation, networks, storage, firming and demand response alongside other sources of future electricity demand.

8.2. Transport

Transport decarbonisation requires both electrification and demand-side change. Passenger vehicles, buses, freight, public transport, active transport, micromobility and land-use planning need to be considered as a connected system.

Near-term priorities include zero-emission buses, charging infrastructure for apartments and regional locations, public fleet conversion, depot charging for commercial vehicles, freight consolidation, low-emission last-mile delivery and planning reforms that support compact, connected communities.

8.3. Industry

Industrial electrification is a major near-term opportunity, especially for low and medium temperature heat. However, deployment often requires process redesign, operational planning, tariff management and confidence in electricity availability and reliability.

Government support should include technical advisory services, demonstration projects, industrial precinct planning, financing support and guidance for businesses operating in more complex electricity markets.

8.4. Resources and Critical Minerals

Critical minerals are central to the energy transition, but the opportunity for NSW and Australia is broader than extraction alone. Pathways should support responsible resource development, circular value chains, recycling, substitution, traceability, lower-impact processing and supply-chain resilience.

Resource-sector transition should also prioritise methane measurement and abatement, transparent facility-level emissions data, clear distinction between direct abatement and offset use, and workforce transition planning in coal-reliant regions.

8.5. Land and Agriculture

Land and agriculture pathways should integrate emissions reduction with biodiversity, water, food production, soil health and regional livelihoods. Opportunities include precision agriculture, optimised fertiliser use, feed additives, clean on-farm energy, improved grazing management, anaerobic digestion, soil carbon management and restoration of degraded lands.

Adoption will depend on trusted advice, demonstration farms, simple measurement tools, practical incentives and market settings that reward landholders for credible emissions, carbon and biodiversity outcomes.

8.6. Waste and Circular Economy

Waste pathways should prioritise organics diversion, landfill gas capture, resource recovery and circular economy design. Circularity should be treated as an emissions reduction strategy because it can reduce upstream production emissions, embodied carbon and demand for primary materials.

Pathways should account for the transition period in which legacy landfill emissions continue even as organics diversion and recycling improve.

8.7. Built Environment

The built environment pathway should address operational emissions, embodied carbon, thermal performance, electrification and climate resilience. Household electrification requires attention to renters, low-income households, apartments and communities that may otherwise be left on declining gas networks.

Planning and building standards should align housing delivery with emissions reduction, energy efficiency, resilience, transport access and affordability.

Data centre siting should be considered within metropolitan, regional and precinct planning because facilities may interact with housing, employment land, agriculture, biodiversity corridors, transport infrastructure and other strategic land uses.

8.8. Carbon Management

Carbon management should prioritise direct emissions reduction wherever feasible. Carbon removals may be required for residual emissions, but pathways should avoid relying on removals to compensate for delayed mitigation.

Carbon storage should be assessed for integrity, permanence, measurement quality, biodiversity, water impacts, land-use implications and community acceptance.

9. Evidence to Inform Pathway Inputs and Assumptions

The following evidence categories should be prioritised in the Commission's pathway modelling:

- Technology readiness and deployment timelines by sector, distinguishing mature, emerging and uncertain technologies.
- Capital, operating and system-integration costs, including electricity tariff implications for industrial users and transport electrification infrastructure costs.
- Infrastructure constraints, including transmission, grid connection, ports, logistics, charging networks, storage and industrial precinct readiness.
- Supply-chain and workforce capacity constraints, including cumulative demand across energy, construction, transport and industrial projects.
- Facility-level and mine-level emissions data where available, including clearer distinction between on-site abatement and offset use.
- Land-use, land-cover and land-sector emissions data, supported by remote sensing, AI-enabled monitoring and independent verification.
- Adoption and behaviour-change data, including consumer energy resources, EV uptake, public transport and active transport shifts, landholder participation and industry investment decisions.
- Community engagement and social licence indicators, including participation breadth, trust, benefit-sharing effectiveness and capacity-building outcomes.
- Sensitivity testing should include deployment delays, slower behavioural uptake, higher capital costs, workforce shortages, grid constraints, lower carbon prices, weaker community acceptance and climate impacts on land carbon permanence.
- Data centre assumptions should be supported by reliable, independently verifiable evidence, including forecast-versus-actual energy and water demand, cooling performance, carbon intensity, backup generation and grid flexibility. This can improve future modelling without allowing the sector to outweigh other pathway priorities.

10. Outcomes Beyond Emissions Reduction

Emissions reduction is the primary objective, but pathway choices will also shape economic, social and environmental outcomes. The Commission should monitor broader indicators to ensure pathways are credible, fair and resilient.

- Household energy affordability and equitable access to electrification.
- Regional employment, skills development and economic diversification.
- First Nations self-determination, cultural heritage protection and benefit-sharing.
- Business competitiveness, investment certainty and export opportunities.
- Land-use change, food production, water availability, biodiversity and nature-positive outcomes.
- Health, air quality, heat resilience and reduced exposure to climate hazards.
- Infrastructure resilience, including energy, transport, water and communications dependencies.
- Circular economy outcomes, embodied carbon and resource recovery.

- Local employment, skills development and participation in adjacent technology and infrastructure industries.
- Quality and distribution of local employment, community benefit and public value from major transition and digital infrastructure.
- Infrastructure demand and cumulative impacts from emerging loads, including AI-enabled data centres, across energy, water, land use and local services.

11. Monitoring, Governance and Adaptive Pathways

The pathways should be designed as a living evidence base that can be updated as technology costs, policy settings, climate risks and community expectations change. Transparent assumptions and independent review will be important for credibility.

For each sector, the Commission should identify leading indicators that show whether NSW is moving quickly enough, not only lagging emissions outcomes. Examples include renewable generation and storage commissioning, grid connection timelines, EV and bus fleet adoption, industrial electrification projects, methane abatement, landfill gas capture, land-use change monitoring, community engagement quality and workforce readiness.

Public reporting should be clear enough for researchers, industry, communities and investors to understand pathway assumptions, uncertainty ranges and the evidence base behind key decisions.

Conclusion

The Net Zero Institute supports the development of practical, evidence-based NSW decarbonisation pathways that recognise the complexity and interconnected nature of the transition. The most successful pathway will not simply be the one that reaches net zero at lowest modelled cost. It will be the pathway that successfully aligns technology, infrastructure, finance, policy, industry, communities and environmental outcomes to deliver a durable and socially supported transition.

NSW has an opportunity to build pathways that guide investment, improve coordination, strengthen regional economies and support fairer transition outcomes. To achieve this, the pathways should make enabling conditions explicit, treat community participation as central to delivery, and remain adaptable as evidence changes. NZI would welcome opportunities to provide further technical input, research expertise or targeted evidence as the Commission continues its pathway development process.

Supporting Publications and Source Material

The following publications and prior submissions informed this response. References are provided here only, consistent with the requested submission style.

- Net Zero Institute, University of Sydney. Financing the Net Zero Transition: Ideas for Australia.
- Net Zero Institute, University of Sydney. Critical Minerals and Materials: The Sustainable Supply of Materials for the Clean Energy Transition.
- Net Zero Institute, University of Sydney. Critical Minerals and Materials: Capability Update.
- Net Zero Initiative, University of Sydney. Path to Net Zero: Accelerating Australia's path to Net Zero through innovative partnerships backed by world-class research.
- Net Zero Institute, University of Sydney. Net Zero Institute Annual Report 2025.
- Net Zero Institute, University of Sydney. Response to the NSW Data Centre Consultation Paper, May 2026.
- Net Zero Institute and Centre for AI, Trust and Governance, University of Sydney. Response to the NSW Parliamentary Inquiry on Data Centres, March 2026.