

Pathways Call for Evidence Submission

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NSW Net Zero Commission Decarbonisation Pathways 2026 Call for Evidence

BlueScope Submission

31 July 2026

Executive Summary

BlueScope welcomes the opportunity to contribute to the NSW Net Zero Commission's 2026 Call for Evidence. We understand that this work will support the development of pathways to inform NSW's transition towards its legislated emissions reduction targets and net zero by 2050. Achieving these objectives will require sustained and coordinated action across the economy, including hard-to-abate industries such as steelmaking. BlueScope is actively progressing the decarbonisation of its operations, with the goal of achieving net zero Scope 1 and Scope 2 emissions across global operations by 2050, supported by interim emissions intensity targets for 2030.

As an emissions-intensive, trade-exposed manufacturer, BlueScope has a deep understanding of what is required to reduce emissions while operating in a globally competitive market. This submission draws on that understanding to inform the Commission's pathway development, outlining the enabling conditions and constraints that will shape the pace and feasibility of industrial decarbonisation.

Maintaining competitiveness is essential. For emissions-intensive, trade-exposed industries such as steelmaking, successful decarbonisation will require pathways that support emissions reduction while maintaining international competitiveness, attracting investment and preserving sovereign manufacturing capability. Poorly aligned policies risk increasing costs without reducing global emissions if production and investment shift offshore to jurisdictions with lower costs, weaker climate policy settings or higher emissions intensity. Maintaining industrial competitiveness is therefore a necessary condition for decarbonisation, preserving the capacity to invest in lower-emissions production, retain sovereign manufacturing capability and avoid carbon leakage.

The pace of industrial decarbonisation will depend on the timely delivery of critical enabling conditions. Assessing the readiness of abatement options requires consideration not only of technology maturity, but also whether the conditions necessary for deployment can be delivered at the required scale and pace. These conditions include access to affordable and reliable energy, development of supporting infrastructure, access to raw material supply chains, development of workforce capability and capital availability. Sectoral pathways should assess enabling-condition readiness with the same discipline as technology readiness, considering the timing, cost and availability of the enablers required for commercial deployment of lower-emissions technology. Pathway assumptions should also reflect realistic development and delivery timeframes for major industrial, energy and infrastructure projects, drawing on observed delivery experience in an Australian context.

A stable and coordinated policy environment is critical for decarbonisation investment. Major industrial projects are long-lived investments that require stable and predictable policy settings. NSW-specific policy can accelerate the development and delivery of the enabling conditions required for industrial decarbonisation through coordinated infrastructure and funding and efficient planning and approvals processes. To improve investment confidence, State policy and regulatory frameworks should align with Commonwealth settings, avoiding duplication, inconsistency and potential unintended consequences. The Commission's pathway work provides an important opportunity to identify where state policy action can address barriers, harmonise regulation and accelerate the delivery of the enabling conditions required for emissions reduction.

Collectively, these themes highlight that successful industrial decarbonisation depends not only on the availability of lower-emissions technologies, but also on the conditions required to deploy them at commercial scale. Robust pathways should therefore assess technology readiness, enabling-condition readiness, industrial competitiveness and policy settings in an integrated manner, recognising that each influences the timing, cost and feasibility of emissions reductions. Pathways that do not adequately account for these interdependencies risk overstating the pace of

decarbonisation and understating the investment, infrastructure and policy requirements needed to achieve emissions reduction objectives.

This submission outlines potential decarbonisation pathways for the Port Kembla Steelworks, provides BlueScope's perspective on the conditions required to support industrial decarbonisation, and responds to the specific questions raised in the consultation paper. BlueScope welcomes ongoing engagement with the Commission to support an effective, economically sustainable and orderly transition to net zero.

1 Context for BlueScope's submission

1.1 Australia's largest steel producer

BlueScope is an Australian-headquartered, ASX-listed steel manufacturer that produces steel materials, products, systems and technologies for domestic and international markets. The company operates across 14 countries, with approximately 100 sites in Australia, including large manufacturing plants spanning iron and steel production, coating and painting, roll-forming facilities and distribution centres.

BlueScope manufactures approximately 3.2 million tonnes of steel annually at the Port Kembla Steelworks (**PKSW**) in Australia, using the Blast Furnace - Basic Oxygen Furnace (**BF-BOF**) method of primary iron and steelmaking. The BF-BOF production route is often referred to as 'primary' steelmaking as it creates iron and steel with virgin iron ore as the primary input. Under this production route, iron ores are smelted with coke, limestone and other inputs in a BF to produce molten iron. The molten iron is then converted into steel in a basic oxygen furnace together with a proportion of cold ferrous feed, typically scrap steel.

The company employs approximately 7,000 people in Australia, including around 3,500 people at the PKSW and adjacent Illawarra facilities. Its contribution to NSW includes an estimated 20,000 direct and indirect jobs, \$12 billion in output per year and \$2.3 billion in household income per year.¹ BlueScope is currently progressing several major investments in NSW, including the No. 6 Blast Furnace reline (\$1.15 billion) and Plate Mill Modernisation (\$300 million) at the PKSW, commissioning of a new metal coating line (\$415 million) at its Erskine Park facility, and recently commenced operations at a new pipe and tube mill at Unanderra (\$70 million). Collectively, these investments contribute to economic activity, employment and industrial capability in NSW.

BlueScope is Australia's only domestic manufacturer of flat steel products, providing sovereign capability to supply key sectors including building and construction, manufacturing, agriculture, infrastructure, transport and defence. This domestic iron and steelmaking capability is core to Australia's manufacturing base and strategic interests, supporting supply-chain resilience, critical industries and defence capability while preserving the platform needed for Australia to participate in future low-emissions iron and steelmaking opportunities. In addition to supplying key domestic sectors, BlueScope exports around a quarter of its Australian steel production, with volumes varying according to domestic and international market conditions.

Steel is a foundational input to many of the technologies and infrastructure required to decarbonise the Australian economy. Much of the infrastructure that Australia needs to drive the energy transition will be made from steel, including wind towers, solar farms, hydro and electric transmission infrastructure. It is estimated that approximately 400,000 tonnes per annum of

¹ IRIS Study 'BlueScope's Economic Contribution to Australia, NSW and the Illawarra', January 2023

additional steel will be required for renewable energy and related infrastructure, between now and 2050, to meet Australia's targets based on AEMO NEM forecasting.² Additional steel will also be required to meet Australia's green hydrogen ambitions. As Australia's only flat steel producer, BlueScope has a critical role to play in enabling Australia's renewable energy transition.

1.2 BlueScope operates in a highly competitive market against producers that do not bear material carbon costs

BlueScope operates in a highly competitive global market, exporting to the world and competing against imports at home. In 2022, the global steel industry produced just under 1.8 billion tonnes of finished steel, and one in every five tonnes produced was exported.³ The Australian steel sector is highly trade exposed. Australia's crude steel production was 5.8 Mt in 2021-2022 with steel imports of 2.5 Mt and exports of 1.0 Mt.⁴ The steel sector is even more trade exposed when considering the steel contained in imported goods. The World Steel Association (**worldsteel**) estimates Australia's true steel use is 10.5 Mtpa⁵, meaning imports account for approximately half of Australia's true steel consumption.

Australian steelmakers operate in globally traded markets and are therefore largely price-takers. BlueScope competes domestically against imports from producers in low-cost jurisdictions, often with higher greenhouse gas emission (**GHG**) intensity and less stringent environmental standards. GHG emissions from the PKSW are lower than the average of blast furnace emissions from Australia's major source countries of steel imports (China, Japan, Korea and India).⁶ Furthermore, steelmakers in jurisdictions with relatively strong climate policy settings, such as the EU and Korea, are shielded from carbon pricing through the allocation of free credits or permits. As a result, most imported steel supplied into Australia is not currently subject to material carbon costs.

1.3 BlueScope strongly supports decarbonisation and is committed to reducing its greenhouse emissions

BlueScope supports Australia's 2030 and 2050 GHG targets, consistent with Australia's Nationally Determined Contribution under the Paris Agreement. BlueScope has developed a decarbonisation pathway to support delivery of its climate strategy. It has a 2050 net zero goal for Scope 1 and Scope 2 emissions across all operations globally, supported by two interim emissions intensity targets for 2030:

- A 12 per cent reduction in GHG emissions intensity for its steelmaking operations globally; and
- A 30 per cent reduction in GHG emissions intensity for its non-steelmaking activities globally (such as cold rolling, metal coating and painting lines).

Both targets are measured against a FY2018 baseline.

Existing primary steelmaking processes are GHG intensive. Achieving the 2050 net zero goal is ambitious and highly dependent on several key enablers, including the development of emerging low-emissions ironmaking technologies, access to affordable and firm renewable electricity generation and transmission infrastructure, availability of competitively priced green hydrogen (with natural gas as a first step in enabling the transition), access to appropriate quality and sufficient quantities of economic raw materials, and supportive and consistent policy settings.

² Australian Energy Market Operator, 2022 Integrated System Plan for the National Electricity Market (June 2022)

³ World Steel Association, World Steel in Figures 2023

⁴ Department of Industry, Science and Resources, Commonwealth of Australia, Resources and Energy Quarterly December 2022, steel imports

⁵ World Steel Association, Steel Statistical Yearbook 2022, table 58

⁶ CRU Emissions Analysis Tool, average blast furnace emissions from China, Japan, Korea and India

BlueScope has delivered NSW and Australia's largest emission reduction from facilities covered by the Safeguard Mechanism (**SGM**). The PKSW's Scope 1 emissions have decreased by 40 per cent (4 MtCO₂-e) since 2005, reflecting a combination of structural changes, operational improvements and productivity initiatives, including closure of one blast furnace in 2011.

BlueScope has a strong track record of realising energy efficiency and emissions reduction opportunities. Between FY2012 and FY2025, the PKSW reduced its Scope 1 and Scope 2 emissions per tonne of output from 2.53 tCO₂-e/t to 2.07 tCO₂-e/t raw steel – an 18 per cent decline.⁷ According to data from worldsteel, PKSW ranks in the best fifteenth percentile for emissions efficiency of the 52 BF-BOF facilities surveyed globally.⁸ From this position, further emissions reductions available within the existing BF-BOF production route are likely to become progressively more difficult and costly.

2 Decarbonisation Pathways for Primary Steelmaking at Port Kembla Steelworks

At the Port Kembla Steelworks, iron and steelmaking is currently undertaken using the blast furnace-basic oxygen furnace (BF-BOF) process route, with Pilbara iron ores and metallurgical coal forming the principal raw material inputs. BlueScope's indicative decarbonisation pathway combines a near-term focus on optimising existing assets with a longer-term transition to lower-emissions ironmaking technologies. The pathway to decarbonising primary steelmaking is complex and uncertain and contingent on technology optimisation and evolution, access to sufficient quantities of competitively priced raw materials and energy sources, and supportive and consistent public policy.

2.1 Optimising current operating assets

In the near term, incremental emissions reductions may be delivered through ongoing optimisation of existing assets. BlueScope continues to evaluate, trial and implement a range of asset optimisation and lower-carbon fuel initiatives to reduce the emissions intensity of existing primary steelmaking operations at the Port Kembla Steelworks.

Projects to improve energy and process efficiencies include blast furnace humidity injection control to reduce coal use and installing new equipment, such as turbo-alternators, a waste gas heat recovery system and top gas recovery turbine as part of the No. 6 Blast Furnace reline project, and a more efficient plate mill furnace, to enable more onsite electricity generation and reduce external electricity consumption. BlueScope continues to evaluate current and emerging equipment upgrade opportunities that may further improve the efficiency and productivity of existing operations.

Increasing the proportion of ferrous scrap used in the BOF helps reduce the emission intensity of primary steelmaking. Through optimising the inherent chemical and heat energy within the BOF process, capital upgrades and operating practices have enabled a significant increase in scrap

⁷ National Greenhouse and Energy Reporting Scheme

⁸ World Steel Association, CO₂ Data Report 2025 (2024 data year). Note that this data is limited to those iron and steelmakers who voluntarily report emissions data to worldsteel (52 BF-BOF sites in 2024 representing 21.9 per cent of global BOF steel production and 47 per cent of global BOF steel production excluding China. No Chinese steel plants report CO₂ data to worldsteel).

additions since 2018. However, it is important to note that the proportion of scrap used in the BOF is constrained by scrap availability, economic factors, operational considerations and further technical upgrades. BlueScope continues to investigate opportunities to further increase scrap use at the Port Kembla Steelworks.

Low-carbon energy sources, such as biochar and biomethane, present opportunities to reduce emissions across both the near and longer term. Biochar could partially displace pulverised coal injection (PCI) in blast furnace operations. Trials have demonstrated technical potential; however, challenges remain in securing cost-effective supplies of sustainably produced biochar at the scale required for commercial adoption, and large-scale domestic supply chains remain in an early stage of development. Biochar could also be utilised across the longer term as a potential carbon source used in emerging primary steelmaking technologies. BlueScope is working with several prospective biochar suppliers to explore the potential for a large-scale supply chain in Australia. Similarly, biomethane offers a lower-carbon substitute for natural gas that can utilise existing and future gas infrastructure and assets. BlueScope is progressing supplier sourcing activities and assessing site-based production opportunities, but broader industry development and supply availability are still required.

Many of these near-term opportunities remain subject to technical and economic feasibility assessments and require supportive government policy settings to facilitate commercial deployment. BlueScope will continue to work to optimise the Port Kembla operations until it is commercially and technically viable to transition to lower emissions iron and steelmaking technologies.

2.2 Long term to 2050: technology evolution pathway and key enablers

Beyond incremental improvements, large-scale decarbonisation of primary steelmaking at Port Kembla will require a transition to new ironmaking technologies. BlueScope continues to assess pathways capable of delivering a substantial reduction in emissions from ironmaking and steelmaking in Australia.

Direct Reduced Iron (DRI) is currently considered one of the most prospective lower-emissions ironmaking pathways for large-scale primary steel production. Depending on the iron ore feedstock and process route, DRI can be coupled with either an Electric Arc Furnace (EAF) or an Electric Smelting Furnace (ESF) followed by a Basic Oxygen Furnace (BOF) or EAF. While DRI-EAF technology is already deployed commercially, it generally requires access to affordable sources of high-grade iron ore feedstocks, such as magnetite, which have limited global availability. By contrast, the nascent DRI-ESF pathway has the potential to utilise the more prevalent Pilbara iron ores, creating a significant opportunity for both Australian and global steel sector decarbonisation.

However, the pace of decarbonisation will not be determined by technology development alone. For hard-to-abate sectors such as primary steelmaking, the critical path is increasingly the timely delivery of the enabling conditions required to deploy any viable technology at commercial scale. These enablers, which are detailed throughout BlueScope's submission, include access to competitively priced natural gas, affordable and firm renewable electricity, transmission and network capacity, suitable raw materials, skilled labour, planning and approvals pathways, capital support and policy settings that are stable, support investment and coordinated delivery, and maintain international competitiveness.

Even where a technology pathway is proven technically and economically feasible, commercial deployment would still require design, feasibility studies, engineering, approvals, procurement, construction and commissioning. These activities must occur alongside the delivery of the critical

energy, infrastructure, supply-chain and policy enablers needed to support operation at scale and are likely to take several years beyond successful technology validation.

The NeoSmelt Joint Venture provides an example of these challenges. Through the partnership between BlueScope, BHP, Mitsui Iron Ore Development, Rio Tinto and Woodside Energy, the project is investigating a DRI-ESF pathway capable of using Pilbara ores while maintaining the ability to produce high-quality steel products. Following completion of the current feasibility phase, a Final Investment Decision is expected in mid-FY2027, with pilot operations planned to commence in 2029. The pilot plant is intended to generate the technical and operational data required to support future commercial-scale investment and is pursuing a direct scale-up pathway from pilot to commercial deployment, bypassing the demonstration-scale stage to accelerate commercialisation relative to traditional technology development pathways.

Importantly, even a successful pilot would represent only one step in a much broader commercialisation process. The pace at which lower-emissions steelmaking technologies can contribute to emissions reduction objectives will depend not only on technology readiness, but also on the timely delivery of the enabling systems required to support commercial-scale deployment. The scale and complexity of the critical enabling requirements needed for deployment have become increasingly apparent, placing ambitious decarbonisation timelines at increasing risk.

Pathway planning should therefore not treat technology readiness as the sole determinant of emissions reduction timing. For hard-to-abate sectors such as primary steelmaking, the more practical question is whether the supporting conditions required for deployment can be established at the pace, scale and cost required. In BlueScope's view, robust sectoral pathways should explicitly test the timing and availability of these critical enablers, as without these, proven technology may still be unable to deliver material emissions reductions at commercial scale.

For prospective DRI technology pathways, the most significant enabling requirements relate to the availability of competitively priced natural gas during the transition period, access to affordable and reliable electricity and raw materials, and policy settings that support investment, competitiveness and coordinated delivery. BlueScope is actively working to progress these enablers through technology development (for example the NeoSmelt JV), assessment of future raw material pathways, and ongoing engagement on the energy, infrastructure and policy settings required to support commercial-scale deployment. These enabling requirements are discussed in the following sections.

Natural gas as a transition enabler

A key feature of the Port Kembla decarbonisation pathway is the use of natural gas as a transitional input while green hydrogen production, transport infrastructure and supply chains mature. DRI technology can operate using natural gas and transition to green hydrogen, or blends of hydrogen and natural gas, as hydrogen becomes commercially available at scale.

BlueScope's analysis indicates that natural gas-based DRI has the potential to reduce emissions by up to 60 per cent relative to existing blast furnace operations. Over the longer term, replacing natural gas with lower-carbon hydrogen could achieve emissions reductions of more than 80 per cent compared with the current Port Kembla BF-based process.

Infrastructure, energy and raw material requirements

The scale of the transition required for lower-emissions primary steelmaking is significant. For example, a natural gas based DRI-ESF facility of comparable output to the existing Port Kembla Steelworks would require 30 to 40 petajoules (PJ) of natural gas per year, equivalent to seven per cent of natural gas demand on the Australian east coast in 2024 and 40 times Port Kembla's

current gas use⁹. Securing this volume of gas at internationally competitive prices would be challenging given the current supply constraints and competing demand across the east coast market.

Electricity requirements would also increase materially. The Port Kembla Steelworks currently uses approximately 1TWh of electricity per year. A transition to natural gas-based DRI would approximately double electricity consumption, while a subsequent transition to hydrogen-based ironmaking could increase electricity demand by up to fifteen-fold. The Illawarra region currently lacks the transmission and electricity capacity needed to support large-scale lower-emissions steelmaking at Port Kembla. Timely investment in transmission infrastructure, including a direct connection to the PKSW, together with renewable generation, storage and supporting energy infrastructure, will be essential. These requirements should be treated as core pathway assumptions, not secondary implementation issues.

Access to suitable raw materials is also a critical enabling condition for lower-emissions steelmaking pathways. Existing commercial DRI technologies require high-grade beneficiated iron ore, such as magnetite concentrates or pellets. These materials have limited global availability and are expected to face increased demand as steelmakers pursue decarbonisation. Their cost and availability are a material constraint on deployment, highlighting the importance of developing alternative ironmaking pathways capable of utilising more abundant Pilbara iron ores.

Public policy and enabling conditions

Effective policy support is essential to enable primary steelmaking decarbonisation – across both the near term as existing assets are optimised and the longer term as lower-emissions technologies are deployed. This includes policies that support access to competitively priced firm renewable electricity, sufficient quantities of competitively priced gas during the transition period, development of hydrogen supply chains, and investment in enabling infrastructure.

Grants, incentives and other risk-sharing mechanisms will also be important to help overcome early technology risks, higher production costs and early-mover disadvantages.

Policies that minimise carbon leakage risks and maintain the international competitiveness of Australian steelmakers should remain a key consideration in the design of these policy settings. Commonwealth measures, including the Trade-Exposed Baseline Adjustment (TEBA) within the Safeguard Mechanism and the potential development of a Carbon Border Adjustment Mechanism (CBAM), are intended to support emissions reductions while maintaining the competitiveness of Australian industry. State-based measures that impose additional or more stringent obligations on trade-exposed facilities risk undermining these national mechanisms by increasing costs without addressing carbon leakage, potentially shifting production offshore rather than reducing global emissions. Consistency between Commonwealth and State policy frameworks is therefore essential to avoid deindustrialisation and support investment in lower-emissions production.

Collectively, these requirements demonstrate that decarbonisation of primary steelmaking depends on the coordinated development of technology, energy systems, infrastructure, raw material supply chains and policy settings. Progress in any one area alone is unlikely to deliver the required emissions reductions.

⁹ Based on BlueScope's analysis in its Australian DRI Options Study that takes into account transitioning existing Port Kembla based assets from indigenous fuels to natural gas fuel and information on natural gas consumption in a DRI plant from publicly available sources

2.3 Maintaining capability during the transition

The No.6 Blast Furnace reline is an essential bridge to future lower-emissions steelmaking. It is intended to maintain Australia's sovereign flat steelmaking capability while alternative ironmaking technologies are developed and commercialised, and while the broader enabling conditions required for deployment are established. The reline does not determine BlueScope's ultimate technology pathway. Rather it preserves the capability, optionality and time needed for technology development, infrastructure delivery, energy system readiness, raw material supply chains, skilled workforce capability and policy settings to mature in parallel.

3 BlueScope's responses to specific questions included in the NSW Net Zero Commission 2026 Call for Evidence paper

Policies and Market Mechanisms

Q1: What opportunities or barriers could improve the effectiveness of NSW's transition to net zero?

a. What policies or market mechanisms could accelerate emissions reductions in specific sectors or communities? What barriers or opportunities exist for their adoption, including any evidence from businesses, industry and/or comparable jurisdictions?

For emissions-intensive, trade-exposed industries such as steelmaking, the most effective policy framework is one in which emissions reduction obligations for large industrial facilities are administered through nationally consistent Commonwealth mechanisms, while State governments focus on enabling decarbonisation through energy, infrastructure, planning and industry development policies. Decarbonisation pathways for primary steelmaking involve large-scale capital investment, significant infrastructure development and long asset lifecycles. Investment confidence is strengthened where emissions reduction requirements are governed through a single national framework, rather than multiple overlapping jurisdictional regimes that may duplicate obligations, increase compliance costs or create conflicting investment signals.

For facilities covered by the Safeguard Mechanism, emissions reduction outcomes are already being driven through a nationally coordinated policy framework. Additional State-based facility-level emissions requirements that duplicate, overlap with or exceed Commonwealth obligations risk increasing regulatory complexity without improving emissions outcomes. NSW policy settings can make their most significant contribution by supporting development of the technologies, infrastructure and energy systems required to enable decarbonisation while maintaining the competitiveness of Australian industry through the transition.

Consistent and coordinated policy settings across Commonwealth and State jurisdictions remain important. Alignment between climate, energy, infrastructure, planning and industrial policy frameworks can reduce investment uncertainty, improve confidence to progress complex decarbonisation projects, and help ensure that critical enabling investments occur in a coordinated and timely manner.

Policy alignment is especially important where governments are seeking to address carbon leakage and competitiveness concerns. Commonwealth initiatives, including the Trade-Exposed Baseline Adjustment under the SGM and consideration of carbon border adjustment type mechanisms, are intended to support emissions reductions while maintaining the competitiveness of Australian industry. State-based measures that impose additional costs or

more stringent obligations on trade-exposed facilities may reduce the effectiveness of these national mechanisms and create conflicting investment signals.

Accordingly, for emissions-intensive, trade-exposed industries such as steelmaking, policy and market mechanisms are likely to be most effective when they:

- (i) maintain international competitiveness and minimise carbon leakage risks;
- (ii) accelerate deployment of the energy, infrastructure and raw materials inputs required for decarbonisation;
- (iii) support development and commercialisation of emerging technologies and supply chains;
- (iv) reduce barriers that delay or increase the cost of investment in lower-emissions industrial facilities; and
- (v) align procurement and embodied carbon policies with global steel sector decarbonisation objectives.

The following sections outline opportunities to advance each of these objectives.

Theme 1 – Maintain international competitiveness

Maintaining international competitiveness should be a central objective of industrial decarbonisation policy. Emissions-intensive, trade-exposed sectors operate in globally competitive markets and face a heightened risk of carbon leakage if policy settings are not carefully designed. It is also important to recognise that more stringent or overlapping State-based emissions obligations may detract from the effectiveness of Commonwealth carbon leakage measures by eroding the competitiveness outcomes those mechanisms are intended to preserve. Decarbonisation policies that increase costs without corresponding measures to preserve international competitiveness may shift production, investment and associated emissions offshore rather than reduce global emissions.

Policy frameworks should therefore support investment in lower-emissions production while maintaining a level international playing field. This is particularly important for sectors such as steelmaking, where decarbonisation depends on the deployment of new technologies, major infrastructure investment and development of supporting supply chains. Well-designed policy can help preserve sovereign manufacturing capability and regional employment while achieving emissions reduction objectives.

Theme 2 – Accelerate delivery of critical energy and infrastructure enablers

A second policy priority is accelerating the delivery of the critical energy and infrastructure enablers required for industrial decarbonisation. As technology capable of delivering substantial emissions reductions from primary steelmaking continues to develop, the principal challenge becomes ensuring that the energy, infrastructure and raw material inputs required for deployment are available at the necessary scale and cost. Policy and market mechanisms should therefore focus on accelerating development of these enabling conditions. Accelerating renewable energy deployment, storage and network investment therefore represents one of the most effective policy levers available to support industrial decarbonisation in NSW. Access to affordable, reliable and firmed low-emissions energy is an essential enabler of industrial decarbonisation, supporting not only the transition of primary steelmaking at the Port Kembla Steelworks to lower-emissions, more electricity-intensive production pathways such as natural gas-based DRI and, ultimately, hydrogen-based ironmaking, but also the competitiveness and decarbonisation of downstream steel processing and other energy-intensive manufacturing sectors across NSW.

To support these outcomes, NSW policy should prioritise market and regulatory reforms that enable timely investment in the electricity system and reduce the cost of decarbonisation for

emissions-intensive, trade-exposed industries. This includes supporting outcomes from ongoing electricity market and network reform processes led by AEMO, the AER and other market bodies that improve investment certainty for generation, storage and transmission infrastructure, as well as targeted planning, coordination and funding support to accelerate strategic transmission developments. For the Illawarra, timely delivery of transmission and network augmentation will be critical to unlocking lower-emissions industrial pathways and ensuring that infrastructure development keeps pace with the growing electricity requirements of industrial decarbonisation.

In addition to electricity infrastructure, access to competitively priced gas remains an important enabling condition for hard-to-abate industries transitioning towards lower-emissions production pathways. BlueScope's decarbonisation pathway identifies natural gas-based DRI as a transitional step before green hydrogen becomes commercially available and cost competitive at scale. Renewable gases such as biomethane may also play a supporting role in industrial decarbonisation by providing lower-emissions alternatives that can utilise existing gas infrastructure while enhancing domestic gas supply diversity and energy security. Policy settings that support the availability of affordable domestic gas supply for hard-to-abate manufacturing industries would assist emissions reductions by addressing a key barrier to transitioning to lower-emissions technologies. NSW policy should support gas market settings and infrastructure development that prioritise access to competitively priced gas for strategic domestic industries that have limited short-term alternatives.

Theme 3 – Support technology development and supply-chain formation

A third policy priority is supporting the development and commercialisation of emerging technologies and supply chains. The NSW Government can play an important role in accelerating deployment of lower-emissions inputs and industrial decarbonisation technologies that remain at an early stage of development.

Low-carbon inputs such as biomethane, biochar and other alternative fuels have the potential to reduce emissions from hard-to-electrify industrial processes, but remain at an early stage of development and face significant scale, cost, feedstock and offtake challenges. In many cases, suppliers require confidence in future demand before investing in production capacity, while industrial customers are unable to commit to long-term offtake until technical risk is reduced and supply becomes available at commercially competitive prices. Targeted funding support can help bridge this gap, accelerate movement down the cost curve and establish commercially viable supply chains that support industrial decarbonisation. Policy should also address practical barriers such as feedstock access, approvals, certification and digestate reuse.

Theme 4 – Reduce barriers to investment

A fourth policy priority is reducing barriers that delay or increase the cost of investment in lower-emissions industrial facilities. One such barrier is that existing funding mechanisms can be difficult to apply in complex industrial settings.

Many industrial decarbonisation projects are bespoke, site-specific and involve multiple interconnected systems rather than standardised technology deployments. As a result, businesses can face significant compliance requirements, administrative burden and uncertainty regarding eligibility when seeking access to government support programs. Simplifying and streamlining access to energy efficiency and industrial decarbonisation funding, particularly for medium-to-large projects, would improve participation and help accelerate emissions reduction opportunities that are technically proven but challenging to progress through existing funding frameworks.

Planning and approvals processes represent a related investment barrier and can materially influence the pace at which emissions reduction projects proceed. Delays in development approvals can create uncertainty, increase project costs and slow deployment of both industrial decarbonisation projects and the enabling infrastructure on which they depend. Streamlined and coordinated planning pathways for renewable energy, transmission infrastructure, industrial decarbonisation projects and emerging low-carbon fuel industries could accelerate implementation while maintaining appropriate regulatory oversight.

Theme 5 – Align procurement and embodied carbon policies with global steel decarbonisation

Government procurement and embodied carbon policies have the potential to influence steel demand and support decarbonisation outcomes. They also have the potential to result in unintended consequences if relevant context is not considered.

Embodied carbon procurement targets can stimulate demand for lower-emissions steel products, including those produced in Electric Arc Furnaces (EAFs) using high levels of ferrous scrap. However, ferrous scrap is a globally constrained resource that is already utilised across both primary and secondary steelmaking pathways to reduce emissions intensity. Current scrap availability is sufficient to meet only around one third of global steel demand, increasing to around 50 per cent by mid-century. As a result, increased demand for scrap-intensive steel products cannot necessarily drive additional scrap-based steel production. Instead, increased procurement of lower-embodied carbon steel for one project may simply divert a limited supply of scrap-based steel away from other projects. In these circumstances, procurement policies primarily reallocate emissions between projects rather than delivering an absolute reduction in steel sector emissions.

To support meaningful emissions reductions, government procurement and embodied carbon policies should prioritise the efficient use and reuse of steel and align steel specifications with globally recognised frameworks that distinguish between primary and secondary steelmaking pathways, ensuring that both scrap utilisation and primary steelmaking decarbonisation are supported as complementary components of a global net zero transition.

Taken together, these policy priorities highlight that industrial decarbonisation requires more than the existence of emissions reduction obligations alone. Rather, the principal challenge is ensuring that the technologies, infrastructure, energy systems and supply chains required to deliver those emissions reductions are developed and deployed at the pace and scale required, while maintaining the international competitiveness of Australian industry. A coordinated policy framework focused on these enabling conditions would provide the greatest opportunity to accelerate emissions reductions in emissions-intensive, trade-exposed sectors.

b. How could the NSW Government better stimulate private finance at the scale and pace needed for the net zero transition?

Mobilising private capital at the scale and pace required for the net zero transition requires a stable, predictable and investment-supportive policy environment. For capital-intensive sectors such as steel, long investment horizons, exposure to global competition and significant capital requirements necessitate a high degree of policy certainty and alignment across jurisdictions.

Government can support private investment by accelerating development of the enabling infrastructure required for industrial decarbonisation. Investment in renewable generation, transmission, storage and firming capacity reduces project risk, improves confidence in future energy availability and helps strengthen the commercial case for lower-emissions industrial

investments. For many large industrial projects, timely delivery of enabling infrastructure is a prerequisite for private capital deployment.

Government also has a role in reducing the risks associated with the development and deployment of emerging low-emissions technologies, industries and supply chains. While some decarbonisation opportunities, such as biomethane and biochar, are technically proven, they continue to face barriers to commercialisation and the establishment of robust local supply chains. Other technologies remain at an earlier stage of commercial maturity and require significant upfront investment before economies of scale can be realised. Supportive policy settings, co-investment, targeted grants and other risk-sharing mechanisms can help overcome first-mover disadvantages, attract private capital and support the development of commercially viable low-emissions industries in NSW.

Private capital is unlikely to invest in decarbonisation technologies unless projects can deliver an acceptable commercial return and remain internationally competitive, including against imported products. Policy frameworks should therefore avoid imposing additional costs on trade-exposed industries without effective measures to mitigate carbon leakage and preserve sovereign manufacturing capability. In the absence of such safeguards, investment and production may shift to jurisdictions with less stringent emissions requirements, undermining both global emissions reduction objectives and Australia's sovereign industrial capability.

In BlueScope's view, the most effective way to stimulate private finance is not through additional facility-level emissions obligations, but through policy measures that reduce investment risk, accelerate delivery of enabling infrastructure and technologies, and maintain the competitiveness of Australian industry throughout the transition.

c. *What are the drivers and risks to reaching NSW's interim targets in 2030 and 2035, and net zero by 2050?*

NSW's interim targets for 2030 and 2035, and net zero by 2050, are highly ambitious and will require coordinated progress across energy, infrastructure, industry, supply chains and government. Achieving these targets while maintaining economic competitiveness, supporting energy-intensive industries and preserving industrial capability will require recognition of the scale, complexity and interconnected nature of the transition ahead.

The primary drivers of NSW's emissions reduction pathway are the timely deployment of affordable and firmed renewable electricity (including transmission and storage infrastructure), development and deployment of lower-emissions industrial technologies, establishment of supporting supply chains, and consistent, supportive policy frameworks. Access to affordable, reliable and firmed low-emissions energy is a foundational enabler across all time horizons, supporting not only industrial decarbonisation pathways such as lower-emissions steelmaking, but also downstream manufacturing and broader electrification across the economy.

The relative importance of these drivers will vary over time. Achievement of the 2030 and 2035 targets is likely to depend primarily on deployment of current available technologies, energy efficiency improvements, increased renewable energy capacity and the development of near-term abatement pathways. By contrast, achievement of net zero by 2050 will require large-scale industrial transformation supported by commercial deployment of emerging technologies and development of new energy, fuel and raw materials supply chains.

Consequently, one of the most significant risks to achieving the 2030 and particularly the 2035 targets is delay in the delivery of renewable electricity generation, storage and network augmentation. Delays in establishing enabling supply chains for near-term abatement opportunities such as biomethane, biochar and increased scrap utilisation also present risks to achievement of NSW's interim targets. These pathways are important as they can provide

practical emissions reductions before transformational technologies are available at scale, but as outlined previously, their deployment is dependent on successful supply chain development and commercialisation.

For the longer-term trajectory to 2050, access to competitively priced natural gas remains critical as a transition fuel for hard-to-abate sectors such as primary steelmaking. Failure to secure affordable gas supply risks delaying deployment of lower-emissions technology pathways. Similarly, achievement of net zero is highly dependent on the availability of commercially viable and affordable green hydrogen at scale, together with the supporting infrastructure required for its production, transport and use.

A further risk across all time horizons relates to international competitiveness. Emissions-intensive, trade-exposed industries operate in globally competitive markets and face the risk of carbon leakage if policy settings impose costs that are not faced by international competitors. Decarbonisation pathways are more likely to succeed where policy settings support emissions reduction while maintaining the competitiveness of domestic industry and preserving incentives for continued investment in Australia.

Across all targets, policymakers should recognise that major infrastructure and industrial developments are complex and frequently experience schedule and cost pressures. Delays to major enabling projects, including generation, storage, transmission and industrial decarbonisation investments, can materially affect emissions reduction trajectories. This highlights the importance of realistic planning assumptions, coordinated policy settings and timely delivery of enabling infrastructure.

Ultimately, achievement of NSW's emissions reduction targets will depend not on any single technology or policy intervention, but on the coordinated and timely development of multiple interconnected enabling conditions across the energy, industrial and infrastructure systems that support economic activity.

d. What are the opportunities or barriers for collaboration across sectors to support the transition?

Cross-sector collaboration can create significant opportunities to accelerate decarbonisation and may be essential in areas where multiple sectors depend on common infrastructure, energy systems, feedstocks or supply chains. Many of the enabling conditions required for industrial decarbonisation are outside the control of any single participant and require coordinated action across multiple industries and parts of the value chain. Coordination across waste, gas and industrial sectors, for example, can support the development of biomethane supply chains and associated infrastructure at lower overall system cost.

Similarly, greater focus on regional industrial hubs can help unlock efficiencies through shared access to renewable energy, low-emissions fuels, transmission infrastructure, logistics networks and skilled workforces. By reducing duplication, enabling economies of scale and supporting shared infrastructure investment, these hubs can improve both the economics and pace of decarbonisation across multiple sectors.

The importance of collaboration is illustrated by the NeoSmelt Joint Venture. By bringing together BlueScope, BHP, Mitsui Iron Ore Development, Rio Tinto and Woodside Energy, the project combines expertise across mining, energy and steelmaking to investigate lower-emissions ironmaking pathways capable of utilising abundant Australian iron ore resources while continuing to produce high-quality steel products. Such collaboration helps accelerate technology development, share risk, leverage complementary capabilities and coordinate investment across the value chain. It also demonstrates how cross-sector partnerships can

mobilise expertise, capital and infrastructure investments that would be more difficult for an individual organisation to pursue independently.

While cross-sector collaboration can accelerate decarbonisation, such opportunities require several participants to invest simultaneously in complementary infrastructure, technologies or supply chains, creating coordination risks that can delay project development. These risks can be exacerbated by misaligned policy settings, differing investment horizons and commercial objectives, uncertainty regarding future demand and supply conditions, and difficulties coordinating investment timing across multiple sectors.

Government support can play an important role in addressing these barriers by reducing commercial risk, facilitating deployment at scale and creating the enabling conditions required for collaborative investment across multiple sectors. Clear, stable and coordinated policy frameworks, supported by targeted government investment and enabling infrastructure, can provide the certainty needed to align investment decisions across several participants. Where these conditions are established, cross-sector collaboration can accelerate technology deployment, reduce costs and improve coordination across value chains and increase the likelihood of achieving NSW's emissions reduction targets.

Technology and behaviour change

Q2: What are the opportunities and barriers to technology development, deployment for each sector?

a. What technologies are available or emerging in your sector, and what is their current state of readiness?

Steel sector decarbonisation will require both optimisation of existing steelmaking assets and deployment of new lower-emissions ironmaking technologies. The sector therefore faces a combination of near-term opportunities involving commercially available technologies and longer-term opportunities dependent on the development and commercialisation of emerging technologies. Examples of these technologies are outlined below.

Near term technology

BlueScope is progressively evaluating and trialling a range of asset optimisation and lower-carbon fuel initiatives to reduce the emissions intensity of existing primary steelmaking operations:

Low carbon energy sources: Biochar presents a promising short to medium-term decarbonisation option in the steel sector and BlueScope has successfully completed trials demonstrating its potential as a partial replacement for pulverised coal injection (**PCI**) in blast furnace operations. Similarly, Biomethane offers a lower-emission substitute for natural gas that can be directly utilised with existing gas infrastructure and assets.

While both biochar and biomethane production technologies are becoming increasingly mature globally, their development in Australia remains at an earlier stage. Both industries continue to face challenges associated with scaling supply chains, establishing reliable and sustainable feedstock and distribution networks, and securing the investment needed to support commercial deployment. The principal challenge is therefore not technology availability, but the development of commercially viable Australian supply chains capable of supporting industrial-scale deployment.

BlueScope is progressing supplier sourcing activities and assessing site-based production opportunities, however, domestic supply chains capable of supporting large-scale deployment

remain underdeveloped. As a result, challenges persist in securing cost-competitive, sustainably produced biochar and biomethane in the volumes required to support industrial-scale decarbonisation.

Increased scrap utilisation: Scrap utilisation is a mature and commercially proven decarbonisation pathway. BlueScope has significantly increased scrap utilisation rates across the past decade and continues to investigate opportunities to further increase scrap use within its existing steelmaking assets. However, further deployment is constrained by scrap availability and affordability, quality requirements, operational considerations and the need for additional technical upgrades.

Beyond these opportunities, emissions reductions are also being identified and pursued through ongoing process optimisation initiatives, including ferrous feed optimisation, energy efficiency improvements and operational performance enhancements that improve resource efficiency and reduce emissions intensity from existing assets. These technologies and practices are generally commercially proven and improve resource efficiency and reduce emissions intensity, delivering incremental emissions reductions while longer-term transition pathways continue to develop.

Longer term technology

BlueScope continues to assess technology pathways capable of delivering a substantial reduction in emissions from ironmaking and steelmaking in Australia:

DRI-ESF: As previously discussed, the NeoSmelt JV is developing a lower-emissions primary steelmaking pathway that combines Direct Reduced Iron (DRI) with an Electric Smelting Furnace (ESF) to enable the use of lower-grade Pilbara hematite ores without a conventional blast furnace. While DRI and ESF technologies are individually proven, their combined application for ironmaking using Pilbara ores remains unproven. This technology pathway is currently progressing through the pilot and demonstration phase and remains several years from potential commercial deployment.

If the NeoSmelt pilot is successful, the commercial viability of a large-scale investment would then need to be assessed, then the capital development and approval process, from conceptual design through to commissioning, is likely to take several more years to complete.

Future commercial deployment would further rely on the readiness of several critical enablers, including firm, affordable renewable electricity; competitively priced natural gas and ultimately green hydrogen; sufficient quantities of economically viable raw materials; and supportive government policy.

DRI-EAF: DRI-EAF technology represents the most technologically mature lower-emissions primary steelmaking pathway currently available and is already deployed commercially in several jurisdictions internationally. However, its application is constrained by the limited availability of affordable high-grade iron ore feedstocks such as magnetite. Commercial deployment in Australia would further rely on the readiness of several critical enablers, including competitively priced natural gas and ultimately green hydrogen; firm, affordable renewable electricity; and supportive government policy.

Scrap EAF: Secondary steelmaking, utilising an electric arc furnace to produce steel from recycled ferrous scrap, is a mature technology deployed extensively around the world.

While scrap will play a critical role in industry decarbonisation, scrap availability is inherently constrained and there is not enough to meet demand. Current data indicates scrap can meet only around 30% of global steel demand today, increasing to approximately 50% by 2050 as

more material returns to the recycling stream¹⁰. Accordingly, long-term steel sector decarbonisation will require a combination of secondary steelmaking using scrap and lower-emissions primary steelmaking pathways capable of meeting future steel demand.

In addition to supply constraints, BlueScope does not consider scrap-based EAF steelmaking alone to be able to reliably and competitively support flat steel production in Port Kembla while maintaining product quality and production scale.

Other emerging technologies: A range of alternative primary steelmaking technologies are under development globally, including hydrogen plasma smelting reduction, molten oxide electrolysis, and other novel reduction processes. These nascent technologies remain at pilot or demonstration scale and are generally less mature than DRI-based pathways. Most remain a decade or more away from potential commercial deployment, with substantial technical, commercial and infrastructure challenges requiring resolution before large-scale deployment can occur.

Across all longer term technology pathways, a common challenge is that successful deployment depends not only on technology readiness, but also on access to affordable energy, supporting infrastructure, appropriate raw materials, development of supply chains and supportive policy settings. As a result, technology readiness and enabling-condition readiness must progress together if emissions reduction opportunities are to be deployed at scale.

b. What constraints exist around technology uptake and deployment?

For lower-emissions steelmaking, the primary constraints to technology deployment extend beyond the challenge of developing, funding and commercialising new ironmaking technologies. They also include access to affordable and reliable firm renewable electricity, competitively priced natural gas and ultimately commercially viable hydrogen, availability of suitable raw materials, and development of supporting infrastructure. A supportive policy environment that provides the certainty needed to underpin investment in large-scale industrial assets with long operating lives is essential. In many cases, technology pathways are more advanced than the enabling conditions required to deploy them at scale.

Delays in the transmission, renewable generation, storage or gas infrastructure development required to transition to lower emissions technology could materially impact deployment timelines. Where sufficient electricity or gas supply is not available to meet the operational requirements of these technologies, deployment may not be feasible irrespective of technology readiness. Likewise, even where the necessary energy infrastructure is available, deployment may be constrained if input energy costs are not internationally competitive or otherwise undermine the commercial viability of the technology.

Many near-term opportunities also face funding and supply chain constraints. Biochar and biomethane supply chains remain immature and are characterised by a “chicken-and-egg” challenge. Suppliers require confidence in future demand before investing in production capacity, while industrial customers generally require commercially competitive supply and reduced technical risk before committing to long-term offtake arrangements.

Limited ferrous scrap availability also constrains reductions in primary steelmaking emissions intensity. This constraint is amplified by strong global competition for scrap and may be further exacerbated by export of unprocessed domestic scrap.

Policy and regulatory barriers can also affect technology uptake and deployment. Highly prescriptive regulatory frameworks, complex funding processes and lengthy planning and

¹⁰ iea.blob.core.windows.net/assets/eb0c8ec1-3665-4959-97d0-187ceca189a8/Iron_and_Steel_Technology_Roadmap.pdf

approvals pathways may reduce flexibility, increase project costs and delay deployment, particularly for large industrial projects with unique site-specific requirements. These challenges can be magnified where projects rely on coordinated development of supporting infrastructure, energy systems or supply chains.

Ultimately, successful technology deployment will depend on progress across multiple interconnected areas, including technology development, energy and infrastructure availability, supply chain maturation, access to raw materials and supportive policy settings. Constraints in any one of these areas have the potential to delay broader decarbonisation pathways.

c. *What does the evidence say about current and future costs?*

Available evidence indicates that current lower-emissions primary steelmaking pathways are materially more expensive than conventional blast furnace based steelmaking processes, (noting the cost of the PKSW No. 6 Blast Furnace project - involving the reline of an existing asset - is approximately \$1.15 billion) and require significant investment in new production assets, energy infrastructure and supporting supply chains. Technology costs remain uncertain, particularly for pathways that have not yet been commercialised at scale using Australian raw materials. This is especially true for emerging pathways such as DRI-ESF using Pilbara ores, where pilot-scale testing is still underway and future commercial-scale capital and operating costs remain subject to validation.

Future costs will be heavily influenced by the availability and pricing of key inputs, including energy (electricity, natural gas, hydrogen) and suitable iron ore feedstocks. For many lower-emissions steelmaking pathways, energy costs are expected to become a larger proportion of total production costs than is currently the case for conventional blast furnace operations. Consequently, access to affordable and reliable energy is likely to be a major determinant of future competitiveness and deployment.

Accelerated deployment of renewable generation, transmission and storage infrastructure, together with development of hydrogen and low-carbon fuel supply chains, will be critical to improving the economics of decarbonisation pathways over time.

Over the longer term, costs may decline as technologies mature, supply chains develop, supporting infrastructure is established and deployment occurs at larger scale. However, the pace and extent of future cost reductions remain uncertain and will depend on technology performance, energy input costs, policy settings and broader market developments.

d. *What role could the NSW Government play in strengthening technology development and deployment?*

The NSW Government has an important role in supporting both near-term emissions reduction opportunities and longer-term technology transformation.

This includes supporting development of a coherent national policy framework that provides long-term investment certainty and protects against carbon leakage, and helping to establish the enabling conditions required for deployment at commercial scale. From a technology perspective, State government support is likely to be most effective when focused on enabling deployment through infrastructure, energy, planning and investment settings, rather than direct involvement in technology development.

A first priority is accelerating investment in the enabling infrastructure required for industrial decarbonisation. This includes renewable generation, transmission and storage infrastructure, supporting the availability of affordable domestic gas supply during the transition period, and over the longer term facilitating the development of hydrogen production, transport and storage

infrastructure. Access to these enabling systems is critical for deployment of lower-emissions industrial technologies.

A second priority is supporting development and commercialisation of emerging technologies and supply chains. Targeted support for biochar, biomethane and lower-emissions ironmaking technologies can help bridge the commercialisation gaps, reduce risk and accelerate deployment. Co-investment, targeted grants and other risk-sharing mechanisms may be particularly valuable where technologies remain at pilot, demonstration or early commercial stages.

Simplifying access to funding programs and streamlining planning and approvals processes would further support industrial decarbonisation projects.

A third priority is supporting collaborative initiatives that enable investment coordination across sectors. The NSW Government can support projects such as the NeoSmelt Joint Venture and regional industrial hubs that bring together multiple sectors to share risk, infrastructure and expertise. These collaborations can accelerate technology development, improve infrastructure utilisation and help overcome barriers that would be difficult for individual organisations to address independently.

Strengthening technology development and deployment requires coordinated progress across technology readiness, energy systems, infrastructure, supply chains and policy settings. Government has an important role in ensuring these enabling conditions develop in parallel, allowing lower-emissions technologies to transition from demonstration to commercial deployment at scale.

Q3: What are the opportunities to foster demand reduction and behaviour change?

For the steel value chain, opportunities exist to improve material efficiency through better design, reuse, recycling and asset life-extension practices, reducing demand for virgin materials while maintaining the benefits delivered by steel products. Government procurement, built environment policies and product stewardship frameworks can support these outcomes by encouraging efficient material use, reuse of existing assets, whole of life emissions measurement (rather than only upfront emissions), building resilience and broader adoption of circular economy principles.

However, demand-side measures should recognise the distinction between primary and secondary steelmaking pathways. Embodied carbon policies may have the unintended consequence of increasing demand for scrap-based steel which does not necessarily reduce global emissions, given the constrained availability of ferrous scrap. Effective behaviour change should therefore support both increased recycling and the decarbonisation of primary steelmaking.

Behaviour change opportunities also exist throughout the steel value chain. Improved design practices can reduce material intensity without compromising performance, while greater emphasis on resilience, reuse, refurbishment and life extension can reduce demand for new material inputs. Policy frameworks that improve transparency regarding embodied carbon and material efficiency and promote whole of life considerations can help inform purchasing decisions and encourage adoption of lower-emissions practices.

More broadly, BlueScope supports measures that improve energy efficiency, optimise energy use and encourage demand-side participation across the economy. In many cases, reducing unnecessary energy consumption represents one of the lowest-cost and most immediate opportunities to reduce emissions and improve system reliability. Opportunities to reduce energy consumption across the economy should be pursued where technically and economically viable. However, policy should also recognise that industrial energy demand

cannot always be reduced without affecting production and that significant new energy demand will be required to support electrification and industrial decarbonisation pathways.

Economic impacts and just transition

Q4: What are the likely economic effects on NSW of different emissions pathways to net zero, relative to NSW's current level of ambition?

a. What are the most significant economic or workforce pressures the pathways should account for in your sector or community?

The economic effects of different emissions pathways will depend significantly on the extent to which they maintain competitiveness, support investment and preserve industrial capability while reducing emissions.

Well-designed pathways that successfully coordinate investment in energy, infrastructure and industrial decarbonisation have the potential to attract capital, create skilled jobs, support regional economies and strengthen NSW's long-term industrial competitiveness. Conversely, pathways that impose costs without delivering the enabling conditions required for decarbonisation may discourage investment and increase the risk of carbon leakage.

Pathways should therefore consider economic indicators that assess the interaction between emissions reduction policies, industrial competitiveness and broader economic performance, helping to identify policy settings that deliver both environmental and economic outcomes.

A significant challenge is ensuring that emissions reduction pathways support sustainable economic growth while maintaining the competitiveness of emissions-intensive, trade-exposed industries. Primary steelmaking is a globally traded commodity industry that competes directly with producers operating in jurisdictions with different energy costs, government support, policy settings and regulatory frameworks. Decarbonisation of primary steelmaking will require substantial capital investment, deployment of emerging technologies and major enabling infrastructure, all while maintaining competitiveness against imported steel products.

Maintaining sovereign primary steelmaking capability should also be recognised as both an important economic and strategic consideration. BlueScope is Australia's only manufacturer of flat steel products and supports critical sectors including construction, manufacturing, infrastructure, renewable energy and defence. The transition to net zero should seek to preserve domestic industrial capability and avoid carbon leakage, where production shifts offshore to regions with weaker climate policies and often higher emissions intensity.

To support this outcome, ambitious emissions reduction targets should be accompanied by targeted support for hard-to-abate emissions-intensive, trade-exposed industries to ensure they remain viable contributors to the NSW and Australian economy throughout the transition.

In addition to economic considerations, workforce capability and availability are likely to become increasingly significant constraints on delivery of decarbonisation pathways. Delivery of decarbonisation pathways will require large numbers of skilled workers across renewable energy, transmission, industrial infrastructure, manufacturing and emerging technology projects, often within the same regions and timeframes. Competition for engineering, construction, maintenance, electrical and technical skills is likely to intensify as investment accelerates.

Supporting workforce development, training, apprenticeships and reskilling pathways will therefore be essential to ensure NSW has the capability required to deliver major

decarbonisation projects while maintaining existing industrial operations and preserving critical manufacturing expertise.

Ultimately, the pathways that generate the strongest economic outcomes are likely to be those that successfully combine emissions reduction with investment attraction, workforce development, industrial competitiveness and retention of sovereign manufacturing capability.

Q5: What are the opportunities and barriers to addressing socio-economic priorities for a just transition, including equitable outcomes for First Nations peoples and rural, regional and remote communities

A successful transition presents opportunities to create new industries, supply chains and employment associated with renewable energy, low-carbon fuels, hydrogen, critical infrastructure and emerging steelmaking technologies. Development of regional industrial hubs and shared infrastructure can help maximise these benefits and support regional communities through the transition.

Where investment is successfully coordinated, decarbonisation pathways also have the potential to attract new capital, strengthen regional economies, support workforce development and create long-term employment opportunities across both existing and emerging industries.

Key barriers include the scale of investment required, uncertainty around future technology pathways, and the risk of reduced industrial competitiveness if policy settings are not appropriately designed. For trade-exposed industries, maintaining viable domestic manufacturing operations during the transition is essential to preserving jobs, skills and regional economic activity.

A significant risk is that regions with a high concentration of emissions-intensive industries may experience adverse economic and workforce impacts if investments in replacement industries, infrastructure and skills development does not occur at the pace required.

Accordingly, a just transition should focus not only on reducing emissions, but also on retaining and creating high-quality jobs, preserving industrial capability and ensuring that regional communities continue to benefit from economic activity associated with major industrial operations.

BlueScope also recognises the importance of ensuring equitable outcomes for First Nations communities through respectful engagement, employment opportunities, training pathways and support for First Nations businesses as part of its broader approach to regional development and environmental stewardship.

Opportunities also exist to strengthen participation of First Nations people in emerging energy, infrastructure and industrial supply chains. Achieving these outcomes will require early engagement, long-term partnership approaches and investment in skills, capability development and economic participation.

More broadly, successful delivery of a just transition will depend on aligning decarbonisation pathways with workforce development, training, apprenticeships and reskilling initiatives so that the benefits of the transition are shared across communities, regions and industries.

Evidence and other considerations

Q6: What evidence can you provide to inform pathway inputs and assumptions? For example, cost curves, deployment rates, or sector-specific data, include commercially sensitive data where relevant.

For hard-to-abate sectors such as primary steelmaking, pathway modelling should recognise that emissions reductions depend on the coordinated development of multiple enabling conditions, rather than the deployment of any single technology. Technology adoption is contingent on the availability of affordable and reliable energy, enabling infrastructure, suitable raw materials, capital investment and supportive policy settings. Assumptions relating to any one of these factors should therefore be considered in the context of the broader system, as delays or constraints in one area can materially limit progress in others.

This is particularly relevant for lower-emissions steelmaking pathways, where the energy and infrastructure requirements are substantial. A transition from the existing blast furnace route to a natural gas-based direct reduced iron (DRI) pathway would depend on access to significant quantities of competitively priced natural gas, making gas availability a critical near to medium-term assumption underpinning potential lower-emissions ironmaking pathways. A natural gas-based DRI pathway would also require a significant increase in electricity consumption, with further substantial increases if natural gas is ultimately replaced by hydrogen. Commercially viable green hydrogen therefore remains a key longer-term assumption underpinning further emissions reductions. Pathway modelling should therefore utilise realistic assumptions regarding energy affordability and availability, and the timing of transmission, generation, storage and gas infrastructure development.

Modelling assumptions should also reflect the complexity and uncertainty associated with industrial technology development and commercialisation. While progress is being made in the development of lower-emissions ironmaking technologies, commercial deployment remains subject to technical validation, economic assessment and the establishment of supporting supply chains and infrastructure. For example, the NeoSmelt JV is progressing a lower-emissions DRI-ESF ironmaking pathway capable of utilising Pilbara iron ores, with pilot operations currently anticipated to commence later this decade. However, successful pilot-scale operation would represent only one stage in the broader commercialisation process. Subsequent feasibility studies, engineering design, investment decisions, approvals, procurement, construction and commissioning would still be required before commercial-scale deployment could occur.

Accordingly, pathway assumptions should recognise that industrial decarbonisation is unlikely to follow a linear trajectory. Large-scale industrial projects typically involve long development timeframes, multiple investment decision gates, complex regulatory and approval processes, and dependencies on external infrastructure and supply chain development. The timing of material emissions reductions is therefore inherently uncertain and may be influenced as much by the pace of infrastructure delivery, policy development and enabling-condition readiness as by the maturity of the underlying technology itself.

In BlueScope's view, the most robust pathways will be those that explicitly test the availability and timing of the key enablers required for deployment, rather than assuming that technologies can be adopted independently of the broader systems needed to support them. This approach is likely to provide a more realistic assessment of the timing, cost and feasibility of emissions reductions in hard-to-abate sectors.

BlueScope welcomes the opportunity to engage directly with the Net Zero Commission on sector-specific data during pathway development.

Q7: Beyond emissions reduction, what outcomes should be considered? For example, impacts on business, jobs, land-use, water and biodiversity

In addition to emissions reduction, sectoral pathways should consider impacts on economic growth, industrial competitiveness and sovereign manufacturing capability. For emissions-intensive, trade-exposed sectors such as steelmaking, maintaining international

competitiveness while decarbonising is critical to avoiding carbon leakage and retaining domestic industrial production. Well-designed pathways should support both emissions reduction and sustainable economic growth, recognising the important role that sovereign steelmaking capability plays in underpinning Australia's construction, manufacturing, infrastructure, renewable energy and defence sectors.

The economic effects of different pathways will depend not only on their emissions outcomes, but also on their ability to attract investment, support industrial capability and maintain the competitiveness of domestic industries. Pathways that successfully coordinate investment in energy, infrastructure and industrial decarbonisation are more likely to support regional economies, attract capital and strengthen NSW's long-term industrial competitiveness.

Workforce capability should also be recognised as a critical enabling condition for the transition. Achieving NSW's emissions reduction targets will require significant investment across renewable energy, transmission, storage, industrial decarbonisation and emerging technology projects, creating increased demand for skilled labour. Maintaining a suitably trained workforce, supporting apprenticeships and reskilling programs, and ensuring sufficient capability across engineering, construction, electrical and technical trades will be important to both delivering decarbonisation projects and maintaining existing industrial operations.

Accordingly, pathway assessment should consider workforce availability, skills development and labour market capacity as important enabling factors, rather than assuming the required workforce can be mobilised without constraint.

Land-use, water and biodiversity impacts should similarly be assessed alongside emissions outcomes. Large-scale deployment of renewable energy, transmission infrastructure, hydrogen production and other enabling assets can create competing demands for land and water resources. Identifying opportunities to minimise environmental impacts, optimise the use of existing industrial precincts and infrastructure, and coordinate development across sectors will help support efficient and sustainable transition pathways.

More broadly, pathway assessment should recognise the interconnected nature of environmental, economic and social outcomes. Emissions reduction pathways are likely to be most durable where they deliver positive outcomes across these dimensions simultaneously, ensuring the transition provides enduring benefits for communities, industry and the broader NSW economy.

Q8: Do you have any other comments or information you would like to provide?

BlueScope welcomes the Commission's recognition that emissions reduction trajectories will differ significantly across sectors. While some industries can readily adopt commercially available low-emissions technologies, others face more complex transitions dependent on technology evolution, infrastructure development and supply chain maturity. For hard-to-abate sectors such as primary steelmaking, progress is unlikely to be linear and will depend on the timely development of multiple interconnected enabling conditions.

In developing sectoral pathways, it is important to recognise that the principal challenge is increasingly not the availability of emissions reduction opportunities, but the availability of the energy systems, infrastructure, raw materials, supply chains and the investment required to deploy them at scale. The pace of decarbonisation will ultimately depend on how quickly these enabling conditions can be established, together with policy settings that provide clear investment signals, regulatory stability and confidence for long-term capital investment.

Successful decarbonisation of hard-to-abate industries will therefore require coordinated progress across technology, infrastructure, energy supply chains and policy frameworks,

underpinned by realistic assumptions regarding technology readiness, project delivery timeframes and infrastructure availability.

Accordingly, pathways should be assessed not only on their technical abatement potential, but also on their implications for competitiveness, investment, workforce capability, sovereign industrial capacity and broader economic outcomes. Maintaining flexibility in policy design, supporting technology innovation and recognising sector-specific challenges will be critical to achieving successful long-term outcomes for NSW.

Industrial facilities such as the Port Kembla Steelworks support regional employment, economic activity and the supply of products that underpin the state's infrastructure, manufacturing and energy transition objectives. BlueScope is committed to reducing emissions from its operations and continues to actively pursue both near-term opportunities to optimise and decarbonise existing assets, as well as longer-term lower-emissions ironmaking pathways. While the transition to low-emissions primary steelmaking is complex and dependent on the availability of enabling technologies, infrastructure, energy and raw materials, BlueScope remains focused on progressing practical and achievable decarbonisation opportunities. Through continued collaboration between industry, government and the broader energy sector, NSW can support industrial decarbonisation while maintaining internationally competitive manufacturing, preserving sovereign steelmaking capability and retaining the economic benefits that domestic industry delivers to the state.