Submission to the Department of Industry, Science and Resources - *Green Metals Consultation Paper*

Australian Steel Institute submission

11th July, 2024

Submission to the Green Metals Consultation Paper

The Australian Steel Institute (**ASI)** is pleased to make a submission to the *Green Metals Consultation Paper.*

Introduction

The ASI is the nations peak body representing the entire steel supply chain, from the primary producers through to end users in building and construction, resources, heavy engineering and manufacturing.

The membership base includes approximately 6,000 individuals that are associated with more than 600 corporate memberships and over 350 individual memberships.

A not-for-profit member based organisation, the ASIs activities extend to, and promote, advocacy and support, steel excellence, standards and compliance, training, events and publications. The ASI provides marketing and technical leadership to promote Australian-made steel as the preferred material to the resources, construction, and manufacturing industries, as well as policy advocacy.

The Australian steel industry

The Australian steel industry consists of three primary steel producers, supported by over 300 steel distribution and processing sites throughout the country and hundreds of manufacturing, fabrication and engineering companies.

Australia's primary steel producers and steel product manufacturers together form a strategically important value chain that has the capability to supply in excess of 90 per cent of the steel grades and qualities required in this country. If special categories such as very large diameter pipe, stainless steel, electrical steel, and tinplate are excluded, then the capability is significantly closer to 100 per cent.

Australia produces around 5.6 million tonnes of steel per annum across five major manufacturing locations. It is important to note the economic and social contribution of the Australian steel industry. It employs over 120,000 Australians and generates $29 billion in annual revenue[1].

The economic contribution of the Australian steel industry is very significant. Based on recently completed analysis conducted by BIS Oxford Economics, it is estimated that for every $1 million invested,

- 5 workers are employed in the steel and closely related industries,
- $2.8 million output is contributed to the economy, and
- $1.1 million of value is added to Australian GDP.

Steel fabrication is essential for manufacturing of bespoke construction products such as foundations, piling, columns, beams, girders, gantries, platforms, and towers. Areas of specialisation include wind turbine towers, transmission towers, storage tanks, chemical processing plant, boilers and pressure vessels, mining infrastructure refurbishment, mobile

[1] ABS 81550DO003_202223 Australian Industry, 2022-23 (Manufacturing Industry Data Cube)

equipment for underground and surface mining, mobile cranes, bridges, armoured vehicles for Defence, naval and domestic ship building, rolling stock, truck bodies and trailer chassis.

The steel industry is noteworthy in having a high proportion of jobs and businesses located in regional areas or non-capital cities, where unemployment is typically higher than the national average. The industry is technically complex and requires a highly skilled workforce to support it, encouraging the ongoing presence of high-quality tertiary education institutions in regional areas.

The steel industry is a key enabler for the nation's renewable energy transition and associated legislated climate targets. Between now and 2030 it is estimated that at least 400,000 tonnes of extra fabricated steelwork will be required per annum to service over 23 GW of existing renewable energy generation projects across wind, solar, water and transmission infrastructure.

Response to Consultation Paper Questions

1. What insights do you have on green metals markets?

Whilst it's early days in this market area, the ASI has observed that there is demand and potentially also a premium for green steel in end use applications where there is a high degree of consumer choice and preference able to be leveraged. Examples include the automotive market and to a lesser extent the white goods / consumer durables markets. The take-up of a green steel option in these markets is likely to follow a similar pattern as has been observed for electric vehicles, whereby early adopters are willing to pay a premium but the mass market only transitions when there are lower cost options and/or incentives available to help bridge any price differential.

In commodity markets, where there is limited consumer influence, and a very high emphasis on cost management, the demand for green steel is negligible. Examples of these markets include civil construction, engineering, and building markets. To date, the only exceptions have been a small number of iconic projects where the developer is seeking a particular sustainability / circular economy outcome e.g. green star rating.

The very limited volume of green steel products currently available means that there isn't a true market where these products are traded and prices are transparent. It is unlikely that this will change until significantly more production capacity is converted to green steel product capability.

Another market uncertainly is cost of production of lower carbon steel, until such time as commercial scale technology breakthroughs are achieved - particularly in Primary steel making. Cost premiums for alternative lower emissions steel products will vary according to the technology used, and specific local market conditions. Cost factors will warrant further market analysis as new plants providing lower carbon products come on line. Further, during the early to medium term stage of new technology rollout, and depending when this occurs, operational costs will likely be considerably higher due to the cost of supply for new energy sources such as green hydrogen. Early 'first mover' production costs are also likely to be higher due to the higher cost of funds associated with risk and new technology startup.

2. How does metal recycling contribute to Australia's green metals industry in Australia?

a. What is the impact of metal recycling on reducing emissions from Australia's industrial sectors?

Metal recycling is a critical input to Australian steel manufacturing and will play a vital role in Australia's green or low carbon steel making industry.

Using recycled ferrous scrap in the steelmaking process is an enabling pathway to reduce the Green House Gas equivalent emissions (GHGe) associated with primary steelmaking (the traditional Blast Furnace / BOF route), and is the key feedstock for secondary steelmaking (the Electric Arc Furnace (EAF) route).

By 2027 ASI estimates that Australian steelmakers will require an extra 500,000 tonnes per annum of scrap steel supply to meet local market demand. During the next decade this additional demand is estimated to increase by 2,500,000 tonnes of scrap steel.

The Blast Furnace / BOF process is between four and eight times more carbon emission intensive than the Electric Arc Furnace (EAF) process. The secondary steelmaking route typically utilises approximately 90% recycled ferrous scrap in the mix of charge materials.

Therefore, the availability and supply of recycled ferrous scrap is an essential pathway for Australian steelmakers to:

1. Reduce GHGe over time, especially whilst conducting R&D into new low carbon steelmaking technologies;
2. Meet Federal Government legislated Safeguard Mechanism targets;
3. Meet market demand.

We anticipate a very strong increase to domestic and global ferrous scrap demand in coming years as international jurisdictions carbon abatement policies continue to require lowering GHGe intensity levels for global steelmakers.

b. What are the opportunities to increase metal recycling in Australia? How could this be achieved?

The steel industry generates one of the highest levels of materials recycling both in Australia and globally, reportedly over ninety percent.[2] However we maintain our industry is missing significant opportunities to achieve circular economy goals and decarbonise due to a lack of traction of existing Federal Government policy on the circular economy and waste management in the following areas:

1. The Regulations and instruments in the *Recycling and Waste Reduction Act 2020* need to apply to the prohibition of unprocessed ferrous steel scrap metal exports. Unlike other banned Australian waste exports such as glass, plastic, tyres, and paper and cardboard, the regulations do not currently prevent exports of unprocessed scrap metal, which contains significant quantities of prohibited waste export materials such as plastics, glass, foam and rubber within the key components of scrapped motor vehicles and white goods;
2. Prohibiting the export of unprocessed ferrous steel scrap through using the existing legislation and readily available instruments would enable a significant increase to the availability of supply of Australia's recycled steel scrap to our steel manufacturers, which is critical in both reducing steel making GHG emissions and closing the recycling loop ensuring adequate supply of steel to the Australian construction industry;
3. Our countries steel scrap processors have ample capacity to process all of the available unprocessed ferrous steel scrap domestically if the legislation is enacted on unprocessed ferrous scrap steel exports; furthermore, Australia's scrap processing industry can demonstrate that that it has world class capability to process all available unprocessed ferrous scrap steel, the floc and ASR waste to meet all necessary environmental requirements that arise out of the additional volume processed onshore, and, has further plans to build on this capacity.

[2] Its widely reported the steel industry recycles in excess of 90 percent of ferrous scrap steel into the steel making process which is close to worlds best practice; according to Australia's National Waste Report [2022], it is estimated Australia generates 5.7million tonnes of unprocessed ferrous and non-ferrous scrap metal per annum and recovers 87% of both these forms of scrap for recycling.

It is critical for the Federal Government to be aware our ferrous steel scrap supply will increasingly be constrained globally and locally as international steel mills steadily increase their demand for scrap; and as such many countries are now placing bans on the export of ferrous scrap steel. This material is now globally viewed by steelmaking countries as a sovereign resource, which is critical to both meet steel making demand and GHGe reduction programs.

The following key facts further support the highly beneficial outcomes of prohibiting the export of unprocessed ferrous steel scrap, and greatly increasing the circular economy for our industry:

- In excess of 1.05 million tonnes of unprocessed steel scrap [ASB data], in the form of end-of-life vehicles and white goods is exported to developing countries annually, which includes over 250,000 tonnes of [currently export banned] plastics, glass, tyres, rubber, foam, floc and other wastes.[3] Under current conditions we expect these unprocessed scrap export volumes to increase. By processing this scrap material onshore this would make available approximately 800,000 tonnes of additional processed ferrous steel for the Australian industry.
- Higher proportionate recycled scrap use in steel manufacturing processes decreases GHG emissions and reduces the reliance on iron ore and coking coal volumes. The domestic steel industry has prioritised the increased use of recycled scrap as one of the key enablers in its decarbonisation pathway and the drive towards low carbon steel. Based on Australian Economic Advocacy Solutions modelling, banning the export of unprocessed steel scrap could deliver a saving of 1.2 million tonnes in GHG emissions per annum from Australian steel mills, and 80,000 tonnes CO_{2e} from unprocessed scrap shipping emissions savings per annum. [4]
- In achieving both GHG emission reduction targets and meeting their domestic steel demand, 71 countries have now either banned or are in the process of applying severe limits to exports of steel scrap, which includes Waste Shipment Regulation changes in the EU.[5]

Further, our country is passing its wastes onto other nations, which are often not managed appropriately to meet best practice environmental processing requirements. The prohibition of the export of unprocessed steel scrap brings us in line with our international trade obligations on the regulation of waste exports such as plastics, paper, cardboard and glass.

[3] As above (2)

[4] Australian Economic Advisory Solutions [AEAS], *Economic and Environmental Benefits from an Australian Unprocessed Ferrous Scrap Metal Export Ban*, August 2022; the report found for every 10,000 tonnes of steel scrap metal processing which is undertaken in Australia, 37.2 FTE local jobs are created and $4.8m in economic Value Add; also refer *NSW EPA Consultation Paper*, 'Proposal for minimum environmental standards in the scrap metal industry, 2017; which outlines serious concerns on the environmental controls of waste substances within unprocessed steel scrap sector, especially end of life cars and white goods; concerns are raised around poor environmental management and controls for other wastes contained within unprocessed scrap, such as: plastics / oils / coolants / grease / batteries / waste tyres / ozone depleting substances / glass and management and controls for scrap shredder floc.

[5] https://gmk.center/en/infographic/43-countries-of-the-world-limit-the-export-of-scrap-metal-and-every-third-of-themprohibits-it/; Andrii Tarasenko, GMK Center <accessed 5 May 2024>

Processing ferrous scrap produces shredder floc waste which is required to be managed appropriately in Australia, and the supply chain in some international export jurisdictions are avoiding processing costs associated with this due to different environmental management standards.

It needs to be highlighted that by placing such restrictions on the export of unprocessed ferrous scrap that market prices for ferrous scrap will not be impacted because Australia's steel industry and metal recyclers compete internationally and ferrous scrap prices are driven by global market forces. Further, the export of processed ferrous scrap would not be impacted by this regulation.

In summary, the total volume of Australia's available unprocessed ferrous scrap steel, which emanates from end-of-life products used by Australians, is not being made available for recycling inputs for our industry because it is being exported to Asian countries together with other banned waste export materials, which often circumvents appropriate best practice environmental processing and treatment controls and enables the avoidance of our State based waste levies. In our view this appears contradictory to the intent of the Commonwealths Recycling and Waste Reduction Act, which is:

- To stop the export of unprocessed waste which is likely to have negative consequences to the environment and human health;
- Building Australian industries capacity to increase its recycling capabilities and grow more sustainably;
- Maximise the ability of Australia's waste management and recycling sectors to recover, recycle, reuse and convert wastes into new products.

c. What impact does the export of scrap metal have on Australia's ability to develop a green metals industry and reduce emissions from existing industry?

Steel scrap is a critical input for the manufacture of low carbon steel via the secondary EAF steel making route using renewable energy supply in Australia for secondary steelmakers such as Infrabuild; and, is a critical pathway for primary steelmakers [BlueScope and Liberty GFG] to reduce GHGe whilst working on new low carbon steel making technology breakthroughs, such as H-DRI, which is anticipated to take some time.

Therefore, our countries steelmaking volumes using scrap to reduce carbon are at risk if available steel scrap volumes are constrained. The current volumes of steel supply (by steel making route) at risk are illustrated in the Appendix (Table A) showing manufacturing volumes.[6]

[For more detailed information, please refer to the answers provided to questions 2(a) and 2(b)]

To develop a 'green' metals industry and reduce emissions from our existing industry we must optimise the circular economy for steel and its manufacturing input needs, and the availability of steel scrap. The Australian Government is developing a *National Circular Economy Framework* for release in 2024, with the objectives of managing our own waste and optimally recycling all industrial materials to further develop modern manufacturing, local

[6] Australian Primary steel makers currently produce 4.5m tonnes of steel per annum; our Secondary steel makers produce approximately 1.45m tonnes of steel per annum.

supply chain resilience and to close the material loops to strengthen product stewardship. This is a critical policy for the Australian steel industry, and if fully adopted will optimise the increase of available recycled steel scrap volumes for our local manufacturers to produce lower carbon products.

3. What practices are used to verify and measure green metals? What are the limitations of these approaches?

There is no single agreed global definition for '*Green' Steel.* This is because many international steel making jurisdictions have developed their own approaches to measuring GHGe intensity by focussing on their specific steel making routes and processes, and the fact that new technology breakthroughs for primary steel production routes (which provides approximately 70% of global steel supply) at a commercial scale, have not yet occurred and are expected to take some time.

Currently there are a number of different standards and methodologies which have widely varying approaches to measuring GHG emissions from steel making; these include:

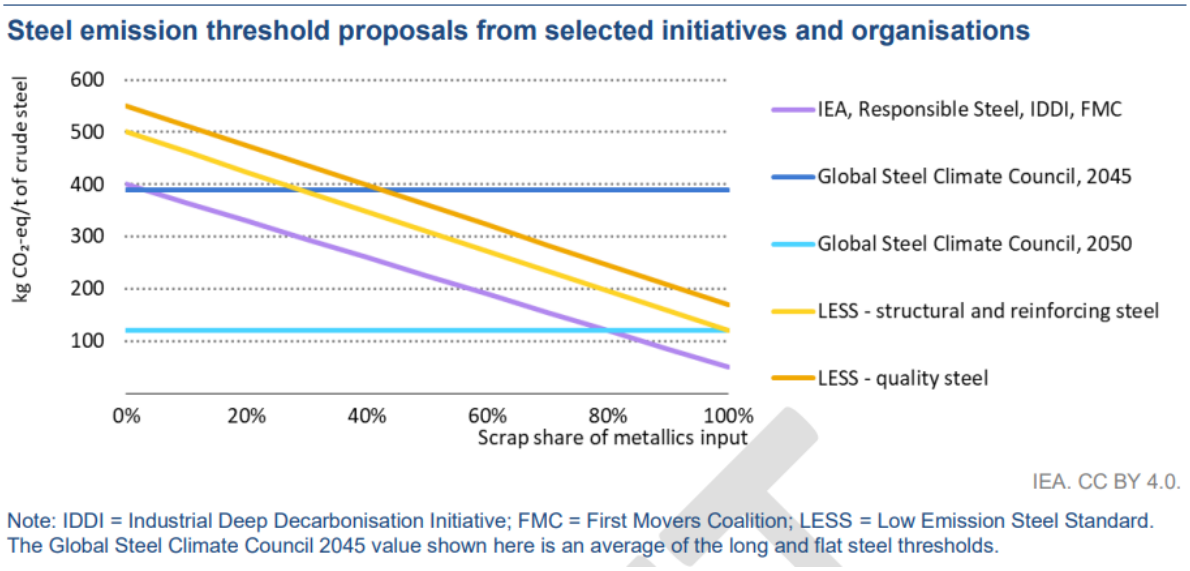
- The Responsible Steel Standard v2.0: a voluntary accreditation which awards certification based on achieving specific level emissions intensity measured in tonnes of CO_{2e} per saleable tonne of crude steel; Responsible Steel covers all emissions from extraction, preparation, processing, and transportation of input materials to final crude products leaving the facility[7];
- Global Steel Climate Council [GSCC] Standard: establishes a glidepath based on global average emissions intensity of steel production;
- Worldsteel CO_2 emissions and energy intensity, Climate Active program: measures global average emissions intensities based on a combination of standards from ISO, the GHG Protocol and the IPCC Guidelines[8]; this measurement program excludes emissions associated with raw materials extraction and transport;
- Environmental Product Declarations [EPDs]: Globally there has been accelerating change to EPDs and their Product Category Rules, which includes Life Cycle Assessments; current ISO Standards for EPDs include ISO 14040 and 14044, and ISO 14067 and 14064.

Worldsteel is currently conducting a detailed review of Chain of Custody principles to produce a global steel producers guidelines document. Currently some global steel producers are trading their products bundled with Emissions Reduction Certificates [EMRs] brought about via carbon reduction project initiatives, enabling their customers to utilise for their own purposes such as offsetting Scope 3 emissions. However, the supply chain boundaries, external and internal input assessments and overall methodologies for computing emissions reductions values vary across regions which exposes the possibility of 'green washing' enabling different calculations of embodied carbon for a particular product.

One of the key areas of disagreement between regional measurements of GHGe intensity per tonne of crude steel is the metrics used to calculate the sliding scale benefits of steel scrap inputs in production. The chart below developed by IEA illustrates those variances

[7] Responsible Steel Standard v2.1; <https://www.responsiblesteel.org/standards>
[8] Worldsteel Association 2023; <https://worldsteel.org/>

between several existing methodology approaches. [9] (Note, this document was distributed at a Climate Club meeting, and is identified as a draft.)



Our steel producing industry members, BlueScope, Liberty GFG and Infrabuild believe a lack of standardisation in carbon intensity metrics across our global industry at both a site and product level is a major challenge, which is leading to low levels of understanding from stakeholders such as customers and project investors on the differences between various standards methodologies and how GHGe is calculated, including different global approaches to accounting standards used.

The current global situation of a mixture of GHGe intensity methodologies for steel making has a high potential of leading to increased reporting compliance costs, increased risk of green washing, and lack of interoperability across trade channels.

Another challenge is increasing rates of change to EPD Product Category Rules from different programs, and a lack of industry wide EPDs, which also limits comparability and hinders the measurement of emissions reductions over time at the product level. Increasingly there is a lack of comparable data for the industry value chain.

In summary, the major challenges in achieving a common understanding on methodologies are:

- Setting common boundaries ensuring a level playing field, incorporating all material sources of emissions and methodology for reporting, regardless of the level of vertical integration of individual steel making sites.
- Agreeing and establishing common accounting rules.
- The existence of many EPD programs globally which have differing program rules – potential for harmonisation

4. If you are a downstream user of metals, what factors do you consider in your decisions to purchase traditionally produced, emissions-intensive metals or green metals?

The ASI is not in a position to comment on this question.

[9] Definitions for near zero and low emission steel and cement, and underlying emissions measurement methodologies: summary of emerging common understanding; IEA, May 2024

5. Are you already committed to incorporating green metals into your business plans? How do you plan to achieve those goals? If you are not planning to include green metals, what further measures could accelerate or incentivise you to do this?

The ASI is not in a position to comment on this question.

6. What is the scale of investment needed to convert existing facilities or establish new ones (including enabling infrastructure)?

The scale of total investment is very dependent on the preferred technology option chosen by individual steelmakers but is likely to be in the multiple tens of billions of dollars to convert all Australian steelmaking capacity to net zero production. The ultimate cost will be determinant on the specific technology path adopted by each of the producers, particularly the options chosen for production of virgin iron from iron ore. For example, if the technology chosen doesn't rely on hydrogen for reduction of iron ore e.g. the use of an electrolytic process, then the requirement for investment in the enabling infrastructure of hydrogen production will be significantly lower.

7. Is your organisation currently undertaking or planning to undertake any major green metal investments or facility refurbishments?

The ASI is not in a position to comment on this question.

8. What are the benefits to the local region or community when developing a green metals project?

The community benefits arising from developing a green steel project are essentially the same as would be derived from an investment in a traditional steel project. These being:

- opportunities for skilled employment in high paying roles;
- generation of diversity programs, stimulating participation, employment for all community members;
- financial stimulation and underpinning of regional economies;
- maintenance and development of a supporting and allied industries e.g. service providers, suppliers, refurbishes etc.
- creation of a baseload of demand for skilled workers that helps to support regional tertiary education facilities;
- generation of export income;
- creation of domestic supply chains to support sovereign capability.

These are all in addition to the overarching economic benefits generated by the steel industry, as estimated by BIS Oxford Economics, whereby it is estimated that for every $1 million invested,

- 5 workers are employed in the steel and closely related industries,
- $2.8 million output is contributed to the economy, and
- $1.1 million of value is added to Australian GDP.

The unique additional benefit associated with a green steel project is that it is likely to be future proofed and therefore has better long-term viability.

9. How are you considering these benefits in evaluating projects? Are there ways to increase opportunities for the local community or broader industry?

The ASI is not in a position to comment on this question.

10. How can the government support industry to enable communities and workers to share in the benefits of transitioning to green metals?

The NSW government has established the role of Electricity Infrastructure Jobs Advocate, which provides a good model for how government can support industry to enable communities and workers to share in the benefits of transitioning to green steel.

The role of the Electricity Infrastructure Jobs Advocate is to advise the Minister for Energy on strategies and incentives to encourage investment, development, workforce development, employment, diversity and inclusion, education and training in the energy sector as New South Wales transitions to renewable energy. The role also provides advice on road, rail and port infrastructure required in the regions specified above to promote export opportunities for generation, storage and network technology.

11. Are you aware of case studies where private companies have established community benefit sharing with communities, and whether this has worked particularly well or poorly?

The NSW Renewable Energy Plan calls for community benefit sharing and includes specific targets and metrics for this. The Secretariat, which is part of the NSW Office of Energy and Climate Change, may be able to provide case studies as part of their monitoring of Plan outcomes.[10]

12. What are the key barriers to investing in new green metals facilities or decarbonising existing facilities?

The global production of lower carbon steel at commercial quantities is in its infancy, and for primary steel manufacturing the new breakthrough technologies required have not yet been fully developed. There are a large number of pilots and R&D programs being undertaken across the globe, which most experts agree will take considerable time to come to fruition. The technologies seen to have high potential include:

- Direct Reduced Iron (DRI) using natural gas or green hydrogen
- DRI combined with EAF
- EAF using renewable energy
- DRI based ironmaking combined with Electric Smelter Furnace (ESF)

The major barriers and enablers to investing in new green metals facilities include:

- The very significant capital requirements for new technology facilities, such as commercial scale gas DRI - EAF, or DRI - ESF technologies;
- Availability of scrap steel inputs for new low carbon EAF facilities;
- Key enablers are the availability of:

[10] https://www.energy.nsw.gov.au/sites/default/files/2022-09/nsw-renewable-energy-sector-board-plan.pdf

- Firm volumes of cost competitive natural gas supply for DRI pathway is absolutely critical;
- Very high and firm volumes, at competitive cost of hydrogen supply for H-DRI, which will be required in multiple volumes compared to conventional energy sources;
- Very high and firm volumes of competitively priced renewable energy and related facility upgrades; as discussed in other parts of this submission the future energy requirements for new technology facilities are expected to be much larger than traditional manufacturing routes.

The major barriers for decarbonising existing facilities include:

- Availability of high volumes of processed steel scrap inputs (as outlined in previous question responses);
- Availability of capital for necessary existing facilities network infrastructure / energy upgrades;
- And again and importantly, all inhibitors impacting the rollout of new renewable energy supply and storage facilities to increasingly decarbonise the energy grid; providing full access to firmed renewable energy supply to cater for all industry needs now and in the future.

  The ASI wishes to stress the critical importance of the decarbonisation of the grid enabling the provision of firm, high volume renewable energy supply to our industries steel making locations across the country, not only for all current industry needs, which is very significant, but also for future energy needs of the steel industry [and other transitioning hard to abate industries] as we transition to new technologies steel making routes which will require multiple volumes of electrons than it currently uses.

13. To what extent are barriers comprised of upfront capital costs or ongoing operational costs?

The ASI is not in a position to comment on this question in detail, however we refer the government to the following published journal article which provides some Australian based case studies on the opportunities and challenges, including indicative production cost considerations, for decarbonisation and low carbon steel making in Australia.[11] Anticipated production costs for low carbon primary steel making using new technologies are widely anticipated to be considerably higher, especially in the early phase of adoption, than production costs using the traditional primary steel making routes.

14. What options are there at each intermediary step to reduce emissions for metal products?

Both of the domestic steel producers that currently use the Integrated (Blast Furnace) process for making liquid iron from iron ore, are actively considering switching, or have committed to the Direct Reduction (DRI) process. The commercial production of DRI typically utilises natural gas to reduce iron ore to iron in a solid-state process. It is estimated that switching from coal-based reduction of iron ore in a blast furnace, to natural gas-based production of DRI, will result in an approximate 60% reduction in greenhouse gas emissions intensity. If this switch to direct reduction ironmaking is adopted as the preferred process for

[11] Australian iron ore to green steel: the opportunity for technology driven decarbonisation; C.Wang et. al., Geoscience Australia, 2022.

making steel from iron ore in Australia, it will result in a very significant increase in demand for natural gas. Longer term, the DRI process may be operated partially or entirely using hydrogen as the reductant, however this is currently not commercially viable (due to the cost of hydrogen) and remains technically unproven at scale.

A significant proportion of the steel product manufacturing applications for natural gas are for industrial process heating. Process heating is used in the steel industry for three main applications – hot rolling, heat treatment, and drying / curing.
In the various rolling operations that are used to transform large cross section crude steel into finished products, it is typically necessary to heat the steel to a high temperature such that it can be readily deformed and shaped without damage to rolling equipment. (Hot rolling temperature is typically in the range of 1,000°C to 1,200°C). Because of the large cross section in combination with the speed of operation, this heating is normally done in a gas fired furnace (mostly natural gas) as opposed to electrical induction heating. It may be possible to substitute a significant proportion of hydrogen (potentially 5% to 10%) for existing fossil fuel heating sources, with limited changes to equipment and need for investment. It is probable that these processes could be converted to run on 100% hydrogen fuel but that is likely to require significant upgrades and capital investment.

Heat treatment is a process used to transform the physical structure of steel products in order to achieve improved mechanical properties such as hardness, strength, and wear resistance. Whilst there are many variants, most typically involve heating the steel to a critical temperature and then subjecting it controlled cooling. (Heat treatment is typically conducted at temperatures in the range of 500°C to 800°C). The method of heating employed is again mostly determined by the cross-sectional thickness involved, with natural gas fired heating predominating and some use of electrical induction heating. As noted for hot rolling, it may be possible to substitute a significant proportion of hydrogen for existing fossil fuel heating sources, with limited changes to equipment and need for investment.

Pre-heating, drying and curing is normally associated with the application of surface coatings that are used for corrosion protection and decoration. Some examples of surface coatings include a thin layer of zinc (galvanizing) or zinc/aluminium, paint, or passivation chemical. The surface coating processes typically use a natural gas fired oven or furnace to remove volatiles as part of paint curing, or to drive out moisture to dry water born chemicals. (Operating temperature is typically in the range of 100°C to 200°C.) Again, it may be possible to substitute some of the natural gas with hydrogen in these surface coating processes.

The potential future use of renewably generated hydrogen as a partial or complete replacement for natural gas is predicated on the large-scale availability of hydrogen at a competitive price. The commercially proven hydrogen production processes with potential for large scale operation, such as electrolysis, are very energy intensive. In order to be truly renewable, the electrical energy for electrolysis is sourced from renewable generation such as wind and solar power processes. This in turn requires further very significant increases in the supply infrastructure for renewable electricity generation and transmission. The pace at which this can occur is determined by a range of factors including: permitting and regulatory approvals; availability of appropriately skilled workers across all facets of design, construction and operations; procurement and construction of facilities and infrastructure.

Please also refer to our response in question 12, in relation to not only the opportunity that firm high volume renewable electricity can provide as an intermediary step for all our metropolitan and regional steel making facilities, but also the need for highly reliable renewable energy supply in much higher quantities as new technology steel making facilities are rolled out.

15. What are the technologies associated with meeting green thresholds?

There are many different technologies being investigated for decarbonisation of the ironmaking and steelmaking processes, all at various stages of maturity, and offering widely varying potential for reduction of emissions intensity. The most technically and commercially mature option for replacement of blast furnace iron making is the direct reduction of iron ore in a shaft furnace using natural gas. This results in a solid iron product that is suitable for subsequent melting in an electric arc furnace. Assuming commercial and technical viability is proven, the natural gas could be substituted with renewably generated hydrogen.

A limitation of this technology approach is that it is only suited to certain higher purity iron ore types (magnetite). It is not well suited to the reduction of the predominant lower purity ore types (hematite, geothite). This has led to the investigation of an electric melting or smelting stage after the DRI step, in order to produce liquid iron which allows for the removal of impurities.

Many other intermediate options for reduction of emissions are being implemented, such as substitution of coke with biochar, increased use of scrap steel in the charge mix used for steelmaking, and increased energy efficiency through measures such as co-generation.

At an earlier stage of development are completely new ironmaking technologies, such as the direct electrolysis of iron, in either a solid state or liquid state process. Based on the current level of maturity, these technologies are at least one to two decades away from being proven commercially.

16. Are these technologies being developed or commercialised?

Please refer to the answer provided as part of question 15.

17. What factors would enable the acceleration of metals decarbonisation? For producers, what levels of production would be feasible over time?

Factors which would enable the acceleration of metals decarbonisation include:

- Significant funding support towards new technology projects from Federal and State Governments;
- The hastening of the decarbonisation of Australia's energy grid, especially for secondary EAF steel producers;
- The firm and significant volume availability of natural gas supply for primary steel makers as they transition away from traditional production approaches towards H-DRI;
- The firm and very high volume availability of hydrogen supply (much higher volumes of hydrogen are required compared to other energy sources) for primary steel makers as they transition from traditional production approaches towards H-DRI;
- New technology R&D commercial scale production breakthroughs for DRI;
- Commercial scale production and firm ongoing supply of Green Hydrogen, at highly competitive rates:
    - Initially Federal Government subsidies and policy incentives for hydrogen supply are highly anticipated until such time as commercial scale production dramatically reduces supply costs.

18. What are the best examples of a 'green premium' being established for low emissions products? What actions could improve demand for these products?

Please refer to the answer provided to question 1. It's very early days in this market space for the broader construction industry. The very limited volume of low carbon green steel products currently available from primary steel makers means, and current early adoption in other forms of steel making means that there isn't at this time a true high volume market where these products are traded and prices are transparent. It is unlikely that this will change until significantly more production capacity is converted to green, low carbon steel product capability.

19. What are the key production volumes, cost profiles and price assumptions that would support minimum commercial viability for green metals production?

The ASI is not in a position to comment on this question.

20. How would adopting renewable energy and green hydrogen impact on your current costs and the commercial viability of your operations, if you were able to implement them right now?

The ASI is not in a position to comment on this question.

21. What are your estimates of the cost-gap differences between producing green metals and traditional metals, across your planned decarbonisation pathway (per tonne)?

The ASI is not in a position to comment on this question.

22. To what extent has government support influenced investment thinking in Australia in respect to projects targeting decarbonisation?

Amongst the major challenges facing the Australian steel industry in respect to projects targeting decarbonisation are:

- The anticipated very high capital of low carbon steel production technologies and facilities in primary steel making compared to conventional production processes; whilst Federal Government policies are currently being worked on, such as the Future Made in Australia Fund, and National Reconstruction Fund, the full details as to how these funding arrangements will support local steel manufacturing have not yet become available;
- Policy support needed for research and development and the successful commencement of a green hydrogen industry in Australia will be critical for investment in this new start up industry, and will be important for manufacturers to continue to invest in gas DRI technology pathways;
- Steel materials produced are highly traded, price sensitive products, and the significant investments in new technology required must provide commercial returns.

Our industry must compete in a highly competitive global market, and imported steel continues to arrive in Australia from countries which measure the embodied carbon content in steel differently to others, and from jurisdictions which are still yet to introduce strong

policy incentives for industry to decarbonise. The market for steel in Australia is such that there are essentially very low or no barriers to international trade, meaning that to a large degree the pricing is set by import parity benchmarks. Since many steel products are pure commodities in the sense that the market treats them as generic provided basic mandated property requirements (e.g., mechanical strength) are satisfied, the domestic steel producers are obliged to compete directly with pricing determined by steel importers.

Therefore, the introduction of an effective Carbon Border Adjustment Mechanism [CBAM] by the Federal Government will help reduce an important barrier for steel manufacturers to invest heavily in new technologies for low carbon steel. The final design of this policy and anticipated new legislation will play an important role in influencing investment thinking in Australia targeting major decarbonisation projects.

There are significant local industry participant costs associated with meeting Safeguard Mechanism emission reduction requirements, which mean that if only the domestic steel producers are subject to this requirement, they are at a production cost disadvantage relative to international competitors that aren't subject to comparable CO2 emissions reduction regimes. In the short term this situation will likely result in margin compression for domestic producers, causing reduced profitability. Over the medium to long term, the relative competitive disadvantage and reduced profitability outlook will likely result in a lack of capital investment and/or closure of higher cost facilities. The ultimate consequence of carbon leakage is therefore likely to be loss of domestic production capacity and a shift to sourcing of steel supply from international producers that aren't subject to comparable emission reduction requirements.

a. What impact will the government's industry investment measures, such as the National Reconstruction Fund and Future Made in Australia Innovation Fund, have on your transition?

National Reconstruction Fund
This fund is intended to provide finance in the form of debt, equity, and guarantees to support Australian projects which deliver high value transformation of our industries, and we consider the objectives of the fund could fit the types of new low carbon steel making technologies our steel producing members are working on, considering the following enabling capability categories of the fund: decarbonisation, growing domestic industry capacity, national security of critical products supply and expanding economic diversity.

Secondly, we see a potential fit of this fund supporting new technology developments across the supply chain, such as green hydrogen and hydrogen electrolyser projects, however we are not in a position to comment on the extent of this potential synergy.

Future Made in Australia Fund
The ASI strongly supports the initiation of this fund to maximise Australian manufacturing growth and development opportunities as we transition to lower carbon, and to catalyse growth opportunities for the Australian steel industry in global markets.

We see the following elements of this fund as supportive of decarbonisation investment decisions for Australian steel production, and we agree with the key underpinning of this policy prioritising the net zero transformation of difficult to abate sectors such as Steel, in order to help industry transformation and ensure economic security of Australia:

- We expect the $3.2B being provided to ARENA will be made available for application by our manufacturing members for innovative new low emissions steel making projects during the next decade, and $168M for Renewable Energy projects will help support the decarbonisation of the energy grid, which in turn will help our manufacturers in meeting the significant lower emissions initiatives and targets, and will strongly support decarbonisation plans of our secondary steel producers.
- We see the hydrogen production tax incentive of $2 per kilogram for Renewable Hydrogen development, the development of a national hydrogen strategy, and the $6.7B budget funding for new hydrogen supply chains as being positive policy drivers to help initiate firm, more competitive cost hydrogen supply to industry.
- The ASI supports the funds investment in careers diversity and women's careers, and the funds $209M set aside for the Net Zero Authority to target employment transition and skills and community development.
- Whilst we are naturally supportive of the $32.3M and $15.4M being set aside to support the expansion of "green metals", we are not aware of any details as to how this element of the program will be undertaken and assessed at this time.

As it is early days in the rollout of these Federal Government funds, as the peak steel industry body we welcome any future discussions and input where we can add value to these policies.

As the firm and cost-effective ongoing supply of high volumes of natural gas to our sector is a critical transition pathway to low emissions steel making, the ASI supports Federal Government policies which will underpin this very important need as we transition to low carbon steel making.

Public investment should be used to encourage and accelerate the transition of domestic steel producers to lower carbon emission intensity production technologies. In addition to the types of support schemes outlined in the consultation paper, the scope should include funding for fundamental and applied research, preferably via industry-led collaborative initiatives such as the Australian Research Council funded Steel Research Hub and the Heavy Industry Low-carbon Transition (HILT) Cooperative Research Centre.

b. What impact will the government's recently announced renewable hydrogen measures have on your transition?

As identified above, the ASI is supportive of these measures which are likely to play a role in the industries decarbonisation transition, subject to H-DRI technology breakthroughs at a commercial scale, as firm and globally competitive Hydrogen storage and supply on an ongoing basis will be critical for the success of this specific new technology pathway. Also as previously outlined, the continuing important role of natural gas supply for this technology rollout will be critical.

c. What impact do the government's policies to incentivise renewable electricity generation, storage and transmission have on your transition?

Such policies incentivising the decarbonisation of the energy grid will continue to have an important impact on the transition of our steel producers to lower carbon manufacturing, in particular for our secondary steel producers using existing and next stage EAF technologies.

A key pre-cursor for the supply of Green Hydrogen will be the availability of firm and reliable renewable energy.

23. What approach and features do you consider to be most effective?

The ASI is not in a position to comment on this question.

24. Are there parts of the value-chain that require particular support (for example, energy inputs, green alumina or iron inputs, or green aluminium or steel production)?

The ASI sees a very significant opportunity for the Australian steel and iron ore sectors and our economy being uncovered via partnerships developed between Australian steel manufacturers and iron ore miners, to produce and supply green low carbon iron for both domestic value-add and overseas export supply. Such local partnerships from a research and development perspective are already underway. With strong government policy support Australian companies could be positioned globally as a high volume world class producer of green iron, utilising the reductant of iron ore via new DRI technologies and renewable energy, and thus eliciting a tremendous number of new jobs and delivering new market export-value add growth opportunities for our steel manufacturers and the economy.

25. Where support is provided across a value chain, such as intermediate metal outputs, what design features are necessary to ensure support is effective for producers with different levels of vertical integration?

The ASI is not in a position to comment on this question.

26. What eligibility thresholds would be appropriate to access production incentives?

The ASI is not in a position to comment on this question.

27. Should incentive levels be varied for different thresholds?

The ASI is not in a position to comment on this question.

28. Should there be time limits for accessing production support? If so, what should the duration be and when should it commence, cease, or phase down?

The ASI is not in a position to comment on this question.

29. What would be an appropriate level of incentive to support the development of competitive production for green alumina, aluminium, steel and iron?

The ASI is not in a position to comment on this question.

30. How could eligibility criteria be most appropriately linked to the delivery of strong community benefits?

The ASI is not in a position to comment on this question.

31. What demand side options would best drive confidence for green metals producers? Should the government consider regulation, procurement rules for government purchasing, voluntary targets or other demand options?

The ASI is in favour of procurement rules for government purchasing to stimulate demand for green or low carbon steel, however such policy regulation should be introduced in a timed manner with the commercial scale availability of low carbon products and standardisation of embodied carbon measurement to ensure equitable transparency for purchasing decisions, avoid unnecessary carbon leakage offshore, and help protect the best interests of early adopter new technology investors in Australia. We offer the following analysis and recommendations.

The Government has developed a Buy Australian Plan designed to improve the way government contracts work and build domestic industry capability through the Australian Government's purchasing power. It has also reformed the Commonwealth procurement rules, which [will amongst other things] require:

- 20% of procurements by value are sourced from small to medium enterprises [SME], up from 10%[12]; and
- consideration of the broader impact of climate change when considering whether a procurement constitutes 'value for money'[13].

As outlined above [refer question 3], we strongly recommend government policy and procurement rules devised to generate demand for lower carbon products must cater for the current global steel industry situation whereby there are various methodologies for computing embodied carbon and GHGe intensity measurement. If policy is not aligned with this situation, it may drive perverse unintended consequences which could impact any significant levels of investment in new low carbon steel making technologies in our local industry.

Further, internationally and locally the steel industry is planning for and rolling out advanced steel products traceability programs using 'material passports' and modern digitised tracking systems in order to ensure full transparency and traceability of products, their identification and content details back to their manufacturing mill of origin. Government support on this process from a procurement perspective will help ensure greater stewardship and transparency for purchasing decisions, and also further help to stimulate the growth in steels circular economy for products re-use and recycling.

The Buy Australian Plan

The Buy Australian Plan is intended to improve the way government contracts work and build domestic industry capability through the Australian Government's purchasing power through, amongst other things, maximising opportunities for businesses to participate in

[12] Rule 5.6 of the Commonwealth Procurement Rules: https://www.finance.gov.au/government/procurement/commonwealth-procurement-rules/encouraging-competition

[13] Rule 4.5(e) of the Commonwealth Procurement Rules: https://www.finance.gov.au/government/procurement/commonwealth-procurement-rules/value-money

major infrastructure processes and supporting industry sectors through use of the Government's purchasing power.

A Future Made in Australia office within the Department of Finance to coordinate implementation of the Buy Australian Plan across the Australian Public Service as well as strengthening engagement with states and territories to deliver economic, social and environmental benefits to regions, industry sectors and communities has also been established. This is to be welcomed.

The Australian Industry Participation National Framework[14] commits the Australian Government and state and territory governments to adopting a consistent national approach to maximise Australian industry participation in major projects in Australia and overseas. Each jurisdiction also has its own industry participation policies aimed at increasing Australian industry participation. For instance, the Australian Government has an Australian Industry Participation scheme which may require those responsible for:

- major public and private projects with capital expenditure of $500 million or more;
- Australian Government procurements of $20 million or more; or
- projects receiving Australian Government grants (or payments from the Clean Energy Finance Corporation or the Northern Australia Infrastructure Facility of $20 million or more

to develop a plan that requires proponents to provide full, fair and reasonable opportunity for Australian industry to compete for work.[15]

However, some jurisdictions do more than merely ask proponents how they will go about providing Australian industry the ability to tender to provide products for projects. Queensland has a local benefits test under its Queensland Procurement Policy which requires agencies to conduct a local benefits test for all significant procurement activities, where a weighting of up to 30 per cent may be applied. The purpose of the test is to evaluate the benefits that any supplier would bring to the local area.[16]

Moreover, the South Australian Government has a policy designed to give the local steel industry a competitive advantage through requiring that procurement evaluation criteria must contain a minimum 20 percent industry participation weighting.[17]

Finally, Victoria has a requirement under the *Local Jobs First Act 2003* that a responsible minister set local content and other requirements for identified strategic projects. Unless an exemption is granted, the responsible minister must set these requirements at no less than 90 per cent for a construction project, or 80 per cent for a services or maintenance project related to a strategic project.[18]

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[14] https://www.industry.gov.au/sites/default/files/australian-industry-participation-national-framework.pdf

[15] https://www.industry.gov.au/major-projects-and-procurement/australian-industry-participation/australian-government-funded-projects . It is presumed this obligation will be imposed on those who receive funds from the National Reconstruction Fund Corporation.

[16] Office of the Chief Advisor (Procurement) (2019) *Local Effects Test* https://www.hpw.qld.gov.au/__data/assets/pdf_file/0024/3795/localbenefitstest.pdf

[17] South Australian Industry Participation Plan Policy (2021): https://www.industryadvocate.sa.gov.au/documents/20210921_Updated-South-Australian-Industry-Participation-Policy-A2036574.pdf

[18] https://localjobsfirst.vic.gov.au/__data/assets/pdf_file/0044/189998/Local_Jobs_First_Supplier_Guidelines_-_October_20221.pdf

These are principles that should be adopted in all jurisdictions. It is pleasing that Australian Government has agreed to increase the value of goods to be procured from SMEs. However, downstream or fabrication/manufacturing parts of the steel value chain needs clear investment signals in the form of minimum participation targets for major projects in order to encourage large scale capacity and capability investments that require a multi-year payback.

A specific recommendation is that Governments should apply a weighting in favour of procurements providing local benefits to the areas in which relevant infrastructure is being constructed. Legislation should permit the declaration of project of strategic importance, which may specify (amongst other things) a local content requirement.

Value for money and whole of life considerations

Gaining value for money for the taxpayer is one of main goals of the procurement rules followed by Australian Governments. When assessing value for money officials must consider the relevant financial and non-financial costs and benefits of each proposal. The ASI considers the definition of what constitutes 'value for money' used by many Australian governments in procurement documentation is construed in a relatively narrow way, overly focusing on achieving the cheapest cost option rather than the option that benefits the economy as a whole. In addition, 'whole of life' considerations are not given appropriate weight as they relate to large infrastructure projects.

Purchasing locally provides other significant savings for a projects whole-of-life costing, like lower inventory to manage, reduced lead times and improved after-sales support. Continuity of work within the local industry helps ensure that the existing high skills base is available for ongoing maintenance. Onsite inspection costs can be significantly reduced where the personnel involved are resident in the region.

Finally, a whole family of Australian Standards ensures safe and economic use of steel. Australian Standards are used as a matter of course by Australian-based members of the steel supply chain. They ensure mechanical properties, chemical composition, dimensional and mass tolerance. They cover welding, painting, galvanising and design to deliver quality and reliable solutions. Like links in a chain, if one Standard's requirements are not met, the whole system is likely to fail. These are clearly matters that should be dealt with exhaustively in any guidance given with regards to 'whole of life' and 'value for money' issues. Maintenance of this supply chain capacity (jobs, capabilities, skills and investment) also clearly offers social and environmental advantages to the nation, as well as providing procurers with a greater choice of vendor.

As indicated in the South Australian Industry Participation Policy, value for money is achieved by balancing the benefits of economic development on the one hand with other criteria such as price, quality and delivery. The setting of the minimum participation weightings takes this balance into account.[19] Value for money evaluation should incorporate triple bottom line, social, economic and environmental sustainability considerations as well as whole of life costing.

The Australian Government has changed its Procurement Rules so that as part of the value of money principle procuring officers are now required to consider a procurement's broader impact on climate change when undertaking the assessment. A wider view of what constitutes 'value for money' should continue to be adopted.

[19] South Australian Industry Participation Plan Policy (2021): 11 https://www.industryadvocate.sa.gov.au/documents/20210921_Updated-South-Australian-Industry-Participation-Policy-A2036574.pdf

The Australasian Procurement and Construction Council (APCC) published the *Australian and New Zealand Government Framework for Sustainable Procurement*[20], which contained the following principles that guide the implementation of sustainable procurement:

1. Adopt strategies to avoid unnecessary consumption and manage demand;
2. In the context of whole-of-life value for money, select products and services which have lower environmental impacts across their life cycle compared with competing products and services;
3. Foster a viable Australian and New Zealand market for sustainable products and services by supporting businesses and industry groups that demonstrate innovation in sustainability; and
4. Support suppliers to government who are socially responsible and adopt ethical practices.

Sustainability accreditation

Finally, as steel is recognised as a sustainable material, there was a need to establish mechanisms for companies to determine what a sustainable steelwork supplier is and how to identify one. The Steel Sustainability Australia[21] (**SSA**) Certification Program was established by the ASI to identify sustainable steel suppliers by assessing the environmental and social impact of their steelwork manufacturing and processing operations. The SSA Program engages the entire steel value chain by certifying downstream steel fabricators, roll formers, and reinforcing processors and verifying upstream steel producers against best practice environmental, social and governance (ESG) indicators.

The accreditation is designed to be used by regulators, building and construction proponents, specifiers and procurers including government agencies, and environmental rating agencies and bodies such as the Green Building Council of Australia to determine sustainable steel suppliers and products, and to support sustainability targets such as reductions in embodied carbon. SSA Certification assures steel suppliers, and their products are sustainably manufactured and processed and are sourced through responsible and ethical supply chains.

Accordingly, it is recommended that government procurement policies should make it a mandatory requirement for procurers to source steel products from businesses accredited under the SSA program. It is recommended that all structural steel and fabricated products should be sourced from businesses certified under the SSA Certification Program.

32. How could the introduction of new demand measures affect competition?

The ASI maintains that any demand measures being considered by government at all levels need to be cognisant of:

- The potential for carbon leakage and impact on Australian industry 'first adopter' investments on lower GHGe technology;
- The dual impacts of Federal and State government policies;
- The fact that there is currently no agreed single global standard for measuring GHGe intensity for steel producers, which creates a risk of 'green washing' and / or carbon leakage;
- The readiness of hard to abate and industries to service such demand with commercially available volumes of lower carbon products at market acceptable pricing levels.

[20] https://www.apcc.gov.au/_files/ugd/473156_54e042e91f914e81a2e55b6a9bbbc301.pdf
[21] https://www.steelsustainability.com.au/

33. Are there any other issues or opportunities that can be addressed to unlock an Australia green metals industry?

The Australian industry is working hard on all matters relating to decarbonisation to ensure we remain globally competititve, play a strong part in contributing to Australia's net zero targets, and continuing to provide world class industrial products whilst increasing best of class sustainability credentials.

We face tremendous opportunities to grow and develop a strong and vibrant low carbon industry over time, and both Commonwealth and State Governments have a critical role to play working closely with our industry to make this happen. Both tiers of government policy will need to work hand in glove, and provide direct positive developments to stimulate our industrys low carbon growth opportunities whilst working to overcome significant barriers, which in summary will incorporate:

- Long term funding approaches, including grants and tax incentives to support the very high capital costs of new facilities and early adopter new technology production;
- Supporting hard to abate industries such as steel which have the highest risk of carbon leakage;
- Full utilisation of existing legislation, such as *Recycling and Waste Reduction Act 2020* in order to fully capitalise on the steel sectors circular economy and shore up critical local supply of ferrous steel scrap inputs;
- Policies which overcome highly critical energy supply issues and firm access at competitive prices and growing volumes, including: renewable energy, natural gas and hydrogen;
- Increased access to high grade raw materials;
- Consideration of the need for regional development and local community facility, networks and education across steel supply chain locations;
- The critical sovereign role a sustainable, globally competitive, Australian steel industry has to manufacture essential product inputs for building and construction, infrastructure, energy and transmission, manufacturing and defence.

APPENDIX

(A) Table showing Australia's steelmaking capacity

Company	Manufacturing Locations	Typical Production	Production Process
BlueScope	Port Kembla, NSW	3.2 million tonnes	**Integrated (BF/BOF)**: iron ore / coal / scrap steel Coke Ovens, Sinter Plant, Blast Furnace, BOF steelmaking
InfraBuild	Laverton, VIC	0.7 million tonnes	**EAF route**: scrap steel EAF steelmaking
	Rooty Hill, NSW	0.6 million tonnes	
Liberty Primary	Whyalla, SA	1.2 million tonnes	**Integrated (BF/BOF)**: iron ore / coal / scrap steel Coke Ovens, Pellet Plant, Blast Furnace, BOF steelmaking