Submission No 30

INQUIRY INTO DEVELOPMENT OF A HYDROGEN INDUSTRY IN NEW SOUTH WALES

Organisation: BlueScope

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BlueScope submission to the Standing Committee on State Development's Inquiry into the development of a hydrogen industry in NSW

ATT: Standing Committee on State Development of a hydrogen industry in New South Wales

Executive Summary

The purpose of BlueScope's submission is to support the development of a hydrogen industry in Port Kembla, New South Wales. If hydrogen is to play its expected role in decarbonising the Australian economy and to fuel domestic manufacturing, energy and transport, there is a need to accelerate commercialisation, reduce technical uncertainties, build domestic supply chains and production capabilities. The proposed Port Kembla Hydrogen Hub can play a key role in Australia's decarbonisation journey, but the NSW Government must act now to start building this industry and equipping relevant stakeholders to contribute to achieving this vision. BlueScope notes that this competition is not just with other parts of Australia but with global competitors, all of whom are keen to become global hydrogen hubs and are well advanced.

From BlueScope's perspective Port Kembla is the logical and ideal location for a variety of reasons, none more than its proximity to the Port Kembla steelworks. Whilst 'Green Steel' using Hydrogen is still in its infancy and possibly decades away from commercialisation, if hydrogen is to play its expected role in decarbonising the Australian economy and the steel industry, it is necessary to accelerate commercialisation, reduce technical uncertainties, build up domestic supply chains and production capabilities, to ensure the future supply of hydrogen is available at scale, green and affordable.

As part of the transition to lower carbon intensity in iron and steelmaking, BlueScope is working towards building flexibility into its processes and operations to include competitively priced green hydrogen in the fuel mix well before the implementation of major new breakthrough blast furnace technology.

BlueScope recognises that the establishment of a large-scale hydrogen industry in Port Kembla presents $2.5bn in investment opportunities for the region and state. BlueScope is keen to contribute to helping deliver this favourable outcome for the local, state, and national economies.

BlueScope also supports the submission of Wollongong City Council.

BlueScope

BlueScope's economic impact in the Illawarra Region, NSW and Australia

BlueScope is Australia's largest steel manufacturer and has a significant presence in the Illawarra Region. The Port Kembla Steelworks and Springhill Works together employ over 3,000 people directly, supporting almost 10,000 highly skilled and well paid jobs (around 10% of jobs in the region). In terms of economic impact, BlueScope provides 11% of Gross Regional Product (at $1.6 billion) and 24% of the region's total output (at $6.5 billion).

More broadly in NSW, BlueScope accounts for almost 1% of Gross State Product (at $4 billion) and supports 19,200 jobs (which is 0.6% of FTE jobs in NSW). There is no question that based on these numbers, provided by IRIS (the Illawarra Regional Information Service) in 2017, BlueScope and the steelworks is very important and a significant economic contributor to our region and the state of NSW.

At the Port Kembla Steelworks, BlueScope's operations make over 3 million tonnes of steel products per year. More than 2.2 million tonnes of this production are sold in the domestic market, while the balance is exported. BlueScope's Australian-made steel products are vital inputs for the building and construction, manufacturing, transport, energy, and infrastructure sectors.

BlueScope's commitment to sustainability

BlueScope believes that sustainability is integral to the long-term growth of the company, and that steel plays a critical role in supporting local communities and a sustainable society. The company takes a lifecycle approach, seeking to improve the performance of its products over their entire lifecycles, with a focus on the four principles of a circular economy: reduce, reuse, remanufacture and recycle.

Steel is a fundamental building block of any modern society and a domestic steel manufacturing capability is a critical and a strategic asset for Australia's future economic security and prosperity. BlueScope collaborates with researchers across the country, including with CSIRO and the CO2 CRC in relation to developing low-emissions steelmaking technologies.

BlueScope recognises that the global steel industry, producing in excess of 1.8 billion tonnes of steel per annum, is responsible for around 8 per cent of global direct emissions, because it is based around the use of fossil fuels to produce virgin iron and steel. Steel's strength, durability, adaptability, and cost-effectiveness make it a material of choice for infrastructure and other sectors, but it is also a critical input for the transition to a clean energy future. Steel is a key material for wind towers, hydropower, solar farms, electricity transmission infrastructure, and transport systems.

The company has played a foundational role in the establishment of Responsible Steel, the sector's first global multi-stakeholder standard and certification programme for steel. BlueScope plans for its Port Kembla Steelworks to be one of the first steel plants in the world to be accredited by Responsible Steel by the end of calendar year 2021.

Many of BlueScope's products are registered under the Australian environmental product declaration program, which provides detailed information about their environmental performance, can assist in determining the environmental impact of buildings and infrastructure that use these products, and can help earn points for Green Star building projects.

In June last year, BlueScope became a founding member of the Net Zero Steel Pathway Methodology Project, along with Tata Steel and ArcelorMittal. The initiative seeks "to establish recognised methodological guidance on the net zero transition pathway for all (ironmaking and) steelmaking, for the use by policymakers, organisations, investors,

customers and civil society, taking into account the views and needs of relevant stakeholders."[1]

With steel being an infinitely recyclable material, currently 23% of the feed for the Port Kembla Steelworks uses recycled scrap steel. And for cooling we use 97% recycled water (from effluent) and sea water, along with 20% of our electricity supply coming from renewables via the Finley Solar Farm Power Purchase Agreement (PPA).

BlueScope's commitment to climate change action

BlueScope supports the Paris Agreement on climate change, recognising that the global economy must transition to net zero by the middle of this century to limit global increases in temperature to well below 2 degrees. That includes supporting the Nationally Determined Contributions (NDCs) of the countries in which it operates, such as the Australian Government's 2030 target.

Since 2011 BlueScope has reduced its total carbon emissions by around 30% as a result of the closure of one Blast Furnace at the Port Kembla Steelworks and increasing the use of scrap in the mix to make steel.

Over recent years BlueScope has embedded climate change into its corporate strategy. The Company firmly believes that taking action on Climate Change is essential to its long-term success.

The Company has increased its public reporting of climate change risks and opportunities (reporting in line with the recommendations of the Taskforce on Climate-related Financial Disclosures), enhanced governance (including establishing a Risk & Sustainability Committee of the Board, and a Climate Change Council), introduced shadow carbon pricing for the evaluation of capital expenditure, and is participating in and leading several collaborations with industry associations and research organisations.

In 2018, BlueScope set a target of a 12 per cent reduction in greenhouse gas (GHG) intensity for its three steelmaking sites globally (including Port Kembla Steelworks) by 2030. In FY2019, it achieved a 1.2% reduction (FY2020 performance was affected by government-mandated COVID closures).

[1] BlueScope *Sustainability Report 2019-20* pg.45.

The Company has invested in a solar Power Purchasing Agreement (PPA) equivalent to 20 per cent of its purchased electricity consumption in Australia and is considering further investment in renewable energy. Several technologies to reduce emissions are being considered in concert with a potential blast furnace reline at Port Kembla.

Taking this a step further, this week BlueScope announced it is formalising its approach by announcing the establishment of a new Executive Leadership Team position, appointing Gretta Stephens as Chief Executive Climate Change. Gretta provides a technical background in engineering and materials science, and a track record of working with government and wider industry to solve macro problems and is ideally placed to lead this new global function. Gretta will now drive the work already underway, including building out the decarbonisation pathway and the long-term carbon reduction aspirations for the business which will be informed by the extensive work already in progress. This is a large body of work and BlueScope will report the outcomes and direction later this year.

Hydrogen

Introduction to Hydrogen

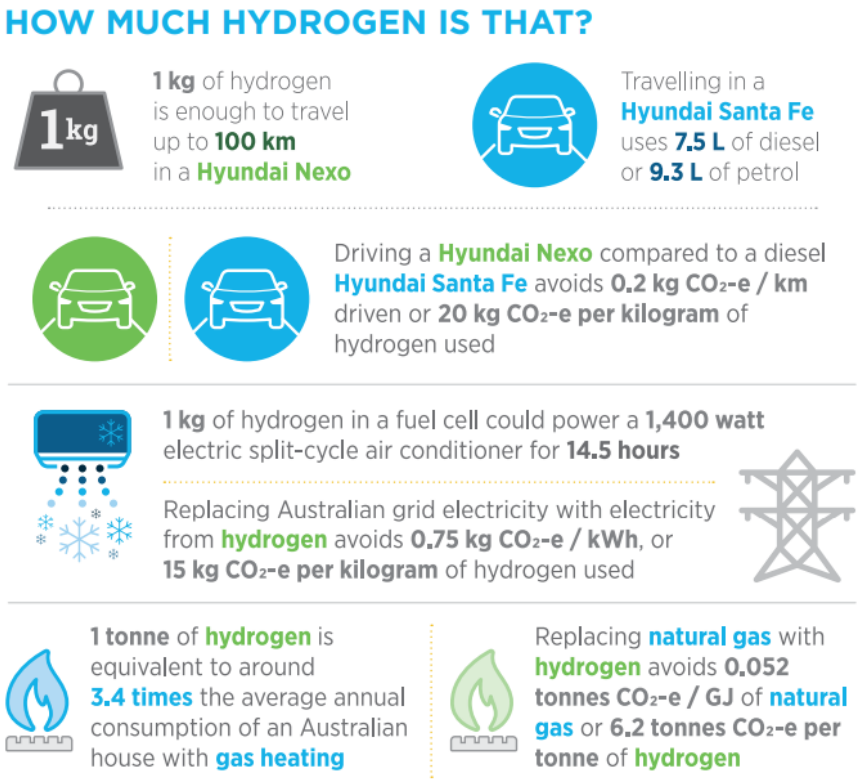
There are four broad categories of hydrogen, according to the nature of the greenhouse gas emissions associated with its productions:

- *'Green' hydrogen* refers to hydrogen produced using electrolysis of water powered by renewable sources of energy.
- *'Grey' hydrogen* is produced using fossil fuels with no carbon and capture technology deployed to secure the resulting CO_2 emissions.
- *'Blue' hydrogen* is produced the same way as grey hydrogen; however, Carbon Capture and Storage (CCS) prevents the release of CO_2 by storing it underground or reusing it in industrial processes.
- *'Pink' hydrogen* is produced via electrolysis, using nuclear energy as its source of power.

Green hydrogen production relies on the availability of very large quantities of low-cost renewable energy, as well as large batteries of electrolysers.

The environmental and efficiency benefits of hydrogen are well known, and numerous government agencies and universities in Australia are working to take the critical steps to

developing the domestic hydrogen industry. The CSIRO, for example, has mapped the critical research steps Australia must take to capitalise on the potential 7,600 jobs and $11 billion a year in revenue by 2050 from the hydrogen industry.[2] Some of these benefits are depicted in the image below.



Hydrogen Insights

McKinsey & Company collaborated with 109 members of the Hydrogen Council to present a quantitative perspective on the use of hydrogen as a decarbonisation option. The group's report, "Hydrogen Insights" (February 2021), acknowledges that there is already an enormous momentum and investment in hydrogen, with over 200 projects announced worldwide. The report notes, "with hydrogen production costs falling, costs for hydrogen distribution are becoming increasingly more important". This group calls for reduced shipping costs from major hydrogen supply centres to unlock demand for hydrogen. As BlueScope has told its investors, McKinsey and the Hydrogen Council reinforce that the commitment to deep decarbonisation, and to capitalise on the new wave of momentum in the hydrogen industry, requires the necessary regulatory framework, to support long-term targets and short-term

[2] https://www.csiro.au/en/News/News-releases/2019/Five-key-opportunities-identified-for-hydrogen-industry-growth.

milestones. As the report suggests, “All this will require new partnerships and ecosystem building, with both businesses and governments playing important roles.”

‘Green Steel’ Production

Hydrogen as an emerging breakthrough technology in steelmaking

BlueScope recognises that the future of hard to abate industries like ironmaking will need to be centred around breakthrough technologies – once proven and scalable. Encouraging work is being undertaken around the globe to explore breakthrough ‘green steel’ ironmaking technologies – including hydrogen and electrolysis. There has been a lot of recent media commentary about this topic.

A diverse group of hydrogen-based iron making technologies are currently being explored. These range from the injection of hydrogen into existing blast furnace operations to the more radical replacement of front-end ironmaking with Direct Reduced Iron (DRI) solely using hydrogen.

People may ask why BlueScope is not adopting alternative technologies such as hydrogen-based iron making in the nearer term instead of assessing the next blast furnace reline? To be clear, whilst these prospective hydrogen iron making technologies are promising, those which have the potential to deliver a meaningful reduction in GHG emissions, they are in the early stage of technology development. Most range from concept studies to prototypes and small-scale demonstration plants with further significant advances in technology required. We expect these emerging technologies will continue to develop over this decade and the next with larger-scale take-up across the steel industry in the 2040s, consistent with recent views expressed by BHP.

These emerging technologies will also require supportive public policy and capital to reach commercial scale. The IEA’s Iron and Steel Technology roadmap which was released in October last year provides a comprehensive and highly credible assessment of prospective ironmaking technology options.

For hydrogen-based iron making to be successful in the longer run, BlueScope require competitively priced hydrogen from renewable sources. That is Green Hydrogen. The current cost of hydrogen in Australia is $5-6 per kilogram, or $40-48 per gigajoule – which is five times the cost of natural gas. The Federal Government’s stretch target for hydrogen is $2 per

kilogram which would reduce the cost to $16 per gigajoule. From these numbers, there is clearly a lot more to do to make hydrogen competitive in Australia. In addition, DRI production based on Hydrogen replacing natural gas is yet to be commercially proven. Again, BlueScope is excited by the potential of hydrogen-based technologies, but we are also aware of the technology readiness level of these concepts and the lead time for their commercialisation, relative to the campaign life of the No.5 Blast Furnace.

This clearly puts the spotlight on the scale of the challenge confronting the steel industry to deliver large scale GHG emissions abatement in Australia.

Specifically, the industry needs:

- Access to affordable, firmed and reliable energy with a focus by governments, both federal and state, on addressing the barriers to high natural gas and energy costs. Without this, manufacturing and other sectors simply cannot be competitive over the longer term.
- Energy grids to be decarbonised as swiftly as possible without loss of grid reliability which is critical to manufacturing industries.
- Widespread availability of competitively priced hydrogen from renewable sources.
- Policies to be in place for Australian steelmakers to invest in decarbonisation which avoids putting the industry at a competitive disadvantage to competitors whose costs are lower because they continue to use existing, higher emissions technologies
- So, in the short to medium term, the steel sector will need to rely on incremental technology performance improvements within conventional routes, increasing use of firmed renewable energy and other abatement measures.
- BlueScope continues to assess a diverse portfolio of projects including: optimising raw material mixes, waste heat and gas recovery, increased scrap usage, and greater use of renewable energy as part of the Blast Furnace reline pre-feasibility study.
- An update on BlueScope's short-term and long-term plans will be provided later this calendar year – together with an updated climate scenario analysis and carbon emission targets.

Port Kembla Steelworks blast furnace reline

BlueScope has commenced work on the blast furnace reline prefeasibility work being done to Assess options for the future configuration of the Steelworks, once the No.5 Blast Furnace comes to the end of its current operating campaign, which is now expected to occur late in this decade, with an indicative range of 2026 to 2030. The furnace is operating well, and the

business is planning to continue to operate it for as long as it is efficient, reliable and safe to do so. However, given the critical nature of iron making to the Port Kembla operations (especially given it is a one blast furnace operation), and to ensure we maintain supply and the role of steelmaking in Australia's sovereign capability, we have commenced a pre-feasibility study on relining #6 Blast Furnace (which was shut in 2011) and having it available from around 2026.

At this point, a reline is likely to be the most technically feasible and economically viable option for Australian steelmaking given that longer-term breakthrough low-emission technologies are still under development. As part of the project assessment the team will be evaluating the latest technologies available to reduce carbon emissions intensity which is considered integral to the project.

Whilst EAF steelmaking has been considered, it is not economically viable given Australia's high energy costs and insufficient availability of cost effective, quality scrap steel to support three million tonnes of flat steel production at Port Kembla.

The initial focus is on the option to reline the currently mothballed No.6 Blast Furnace (6BF). A reline of No 6 would allow the project to be executed in a measured way with minimal operational disruptions. This contrasts to a traditional blast furnace reline where activity is typically highly concentrated within a relatively short window and with a higher risk profile.

To be clear, the reline of 6BF does not lock BlueScope into blast furnace steelmaking for another 20 years. As emerging technologies are developed over time to full commercial scale, the strong cash flows and earnings capability of the Australian business provide significant capacity to transition to these breakthrough technologies as and when they are technically and commercially viable in Australia.

Federal Government's Technology Investment Roadmap

In September 2020, Energy Minister Angus Taylor announced the Federal Government Technology Investment Roadmap, which supports green steel, green aluminium, and the first hydrogen export hub. In a vote of confidence for Port Kembla, the Prime Minister and the Energy Minister announced the exciting news at BlueScope's Port Kembla steelworks.

Coregas Pty Ltd already producing hydrogen at Port Kembla

Coregas manufactures hydrogen at their plant located within the Port Kembla steelworks, in relatively small amounts, for a very limited range of uses, including for BlueScope.

The plant is the largest merchant hydrogen plant in Australia and has operated since 1986.

The company already works with car companies, including Hyundai and Toyota, who have recently brought hydrogen-powered cars to Australia to trial. Coregas is responsible for building the only current hydrogen refuelling station operating in New South Wales, at Macquarie Park in Sydney and have just been approved to build its second hydrogen refuelling station at its Port Kembla operation.

Coregas is a critical partner for BlueScope's Port Kembla Steelworks.

Barriers to the use of hydrogen at Port Kembla Steelworks

Although BlueScope endorses the development of a hydrogen industry in NSW, it must be noted that there are barriers to NSW becoming a major production, storage, and export hub – especially because there are barriers within the Port Kembla Steelworks.

At a company level, there are several economic and technical barriers that make it challenging for Port Kembla Steelworks to convert from BF-BOF (Blast Furnace – Basic Oxygen Furnace) to DRI-EAF (Direct Reduced Iron – Electric Arc furnace) using hydrogen as the reductant in the foreseeable future.

Firstly, the capital cost of such a conversion would be prohibitive (indicatively more than $2.8 billion for conversion to currently available technology based on Natural Gas and excluding pellet production facilities) and would require four to five times more capital expenditure than relining a blast furnace. The image below compares the high CAPEX/OPEX implications of hydrogen technology, compared to other current or emerging technologies.

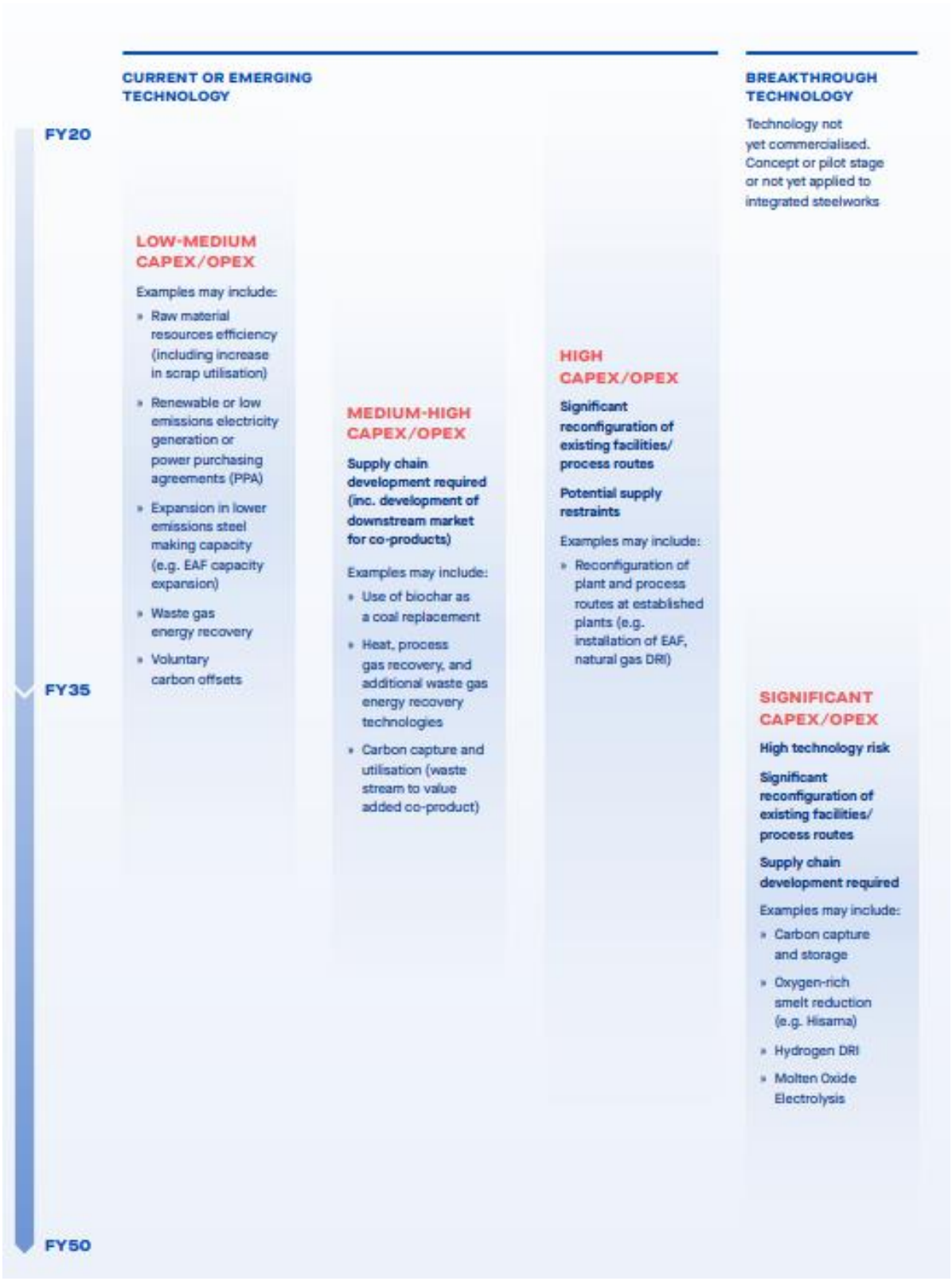


Image: Current or Emerging Technology, BlueScope Sustainability Report 2019-20.

Secondly, the high cost of natural gas and electricity on the East Coast of Australia compared to other jurisdictions means such a plant would manufacture hot rolled coil (at more than $100/tonne higher cost and would therefore struggle to be globally competitive. BlueScope's

analysis indicates that even halving of a current gas prices would not allow such a plant to be competitive when compared to the existing BF-BOF plant.

Third, if such a plant were to use green hydrogen rather than natural gas (assuming such technology becomes commerciality viable), it would require an electrolyser of around 1.4GW, requiring 3GW of installed renewable electricity generation capability coupled with storage to ensure continuous supply. For comparison, the total increase in Australia's installed capacity of large-scale renewable energy (mostly solar) in 2019 was 2.2GW across 34 projects.[3] The total installed generation capacity from all renewable sources (hydro, wind and solar) in Australia, including both large-scale commercial and residential, was 26.4GW in 2019.

BlueScope has also calculated that producing the required amount of green hydrogen to reduce emissions from iron and steelmaking will require very significant capital investment and land. To replace just 20 per cent of the pulverised coal injection (PCI which is <30% of the fuel/reductant in our Blast Furnace) at Port Kembla Steelworks, for example, with 'green hydrogen' would require 29 x 10MW electrolysers, with each electrolyser having a footprint of 1000m2. They would consume 290MW of electricity (the Steelworks currently consumes an average of about 100MW). Oxygen is a by-product of the electrolysis process, providing a potential synergy for the co-location of hydrogen production and BF-BOF steel plants. Using hydrogen to replace some PCI as above would reduce GHG emissions from the Port Kembla Steelworks by just 3.7 per cent.

Another barrier that exists is that, as some companies and researchers have suggested over time, direct reduced iron (DRI) technology plants using natural gas might have the potential for either carbon capture and storage (CCS) or phased conversion to hydrogen, as a transition pathway to low emissions ironmaking. As the electricity grid is decarbonised, EAF steelmaking GHG emissions intensity will also be reduced. However, it is important to note that this is yet to be proven and has significant technical and financial risks.

The barriers outlined above demonstrate that the BF-BOF method is likely to remain the predominant iron and steelmaking technologically global for several decades, due to its cost effectiveness, relative efficiency and abundance availability of raw materials, and the large sunk investment in his technology. However, BlueScope is still positive about the development of a hydrogen industry in NSW and believes if this is to eventuate, the foundations must be laid now. In the short to medium term, the company's, and sector's,

[3] Clean Energy Council, Clean Energy Australia Report, April 2020.

focus will be on improving the efficiency of the BF-BOF process. To pursue the aim of decarbonising the Australian economy, we need to accelerate commercialisation, reduce technical uncertainties, and build up our domestic supply chains and production capabilities.

BlueScope supports Wollongong City Council's position on Hydrogen

BlueScope endorses the submission made by Wollongong City Council, as it agrees that Port Kembla is an ideal location for a Hydrogen Hub. There are many reasons including that: the region is strategically aligned, has well established partnerships, networks and research capabilities and already has the infrastructure to support the development of hydrogen industries and build a hydrogen supply chain. As the Council's submission notes, the Draft Illawarra Shoalhaven Regional Plan 2041 also recognises the development of Port Kembla as an international trade hub, NSW's second container port and an emerging hydrogen hub to grow the local economy and new jobs in the clean energy sector'.

Conclusion

In summary, BlueScope endorses the NSW Government's plans to develop a Hydrogen Hub in Port Kembla. From BlueScope's perspective Port Kembla is the logical and ideal location for a variety of reasons, none more than its proximity to the Port Kembla steelworks. Whilst 'Green Steel' using Hydrogen is still in its infancy and possibly decades away from commercialisation, if hydrogen is to play its expected role in decarbonising the Australian economy and the steel industry, it is necessary to accelerate commercialisation, reduce technical uncertainties, build up domestic supply chains and production capabilities, to ensure the future supply of hydrogen is available at scale, green and affordable.

As part of the transition to lower carbon intensity in iron and steelmaking, BlueScope is working towards building flexibility into its processes and operations to include competitively priced green hydrogen in the fuel mix well before the implementation of major new breakthrough blast furnace technology.

BlueScope acknowledges that government policy plays a key role in accelerating work on the enablers of decarbonisation in the Australian steel industry. These enablers include:

1. Affordable and reliable low emissions energy supply, which governments should focus on for the long-term.
2. Affordable renewable hydrogen, which is widely available, competitively priced, and produced from renewable resources.

3. Industry competitive policies which make it viable for Australian steelmakers to invest in GHG emissions reduction, while ensuring domestic markets are not disadvantaged by high-emitting competitors (imports).
4. Co-investment in a range of potential carbon abatement projects that BlueScope could undertake, which require significant capital investment and may not be economically viable standalone.
5. Efficient and effective environmental and planning approvals processes.

BlueScope respectfully urges the NSW Government to proceed with its plans for the Hydrogen Hub in Port Kembla.

We would be happy to provide further information in support of this submission, including meeting with you in person.

For further information, or if you have any questions, please contact BlueScope's Manager Corporate Affairs, Michael Reay on or

Yours sincerely

John Nowlan

CHIEF EXECUTIVE – AUSTRALIAN STEEL PRODUCTS