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Australian Energy Market Operator
Draft 2025 Inputs Assumptions and Scenarios Consultation
https://aemo.com.au/consultations/current-and-closed-consultations/2025-iasr
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Dear Mr Westerman

Re: Draft 2025 Inputs Assumptions and Scenarios Consultation

The Australian Aluminium Council (the Council) represents Australia's bauxite mining, alumina refining, aluminium smelting and downstream processing industries. The aluminium industry has been operating in Australia since 1955, and over the decades has been a significant contributor to the nation's economy. Department of Industry, Science and Resources has recently forecast[1] that earnings for Australian exports of aluminium, alumina and bauxite are expected to rise from $16 billion in 2023–24 to $18 billion in 2024–25. More than $14B of this comes from the alumina and aluminium industries, as value adding mineral processing sectors. The industry includes six large bauxite mines plus several smaller mines which collectively produce over 100 Mt per annum making Australia one of the world's largest producers of bauxite. Australia is the world's largest exporter of alumina with five alumina refineries producing around 20 Mt per annum of alumina. Australia is the seventh largest producer of aluminium, with four aluminium smelters and additional downstream processing industries including more than 20 extrusion presses. Aluminium[2] is one of the commodities most widely used in the global transition to a clean energy future. It is also recognised for its importance to both economic development and low emissions transition. Aluminium is Australia's top manufacturing export. The industry directly employs more than 21,000 people, including 6,600 full time equivalent contractors. It also indirectly supports a further 55,000 families predominantly in regional Australia. The integrated industry contributes around $18 B to Australia's GDP.

The Council welcomes the opportunity to make a submission to AEMO's review of the Draft 2025 Inputs Assumptions and Scenarios Consultation. The Council notes the outputs of AEMO's planning publications for the National Electricity Market (NEM), including the NEM Electricity Statement of Opportunities (ESOO), the Gas Statement of Opportunities (GSOO), and the Integrated System Plan (ISP) are used not only by AEMO and other Government agencies in planning for the NEM, but also can be used by a range of other public and private agencies. The assumptions and scenarios are therefore of key importance in defining the range of possible and probable outcomes.

Aluminium Industry Context

Aluminium is one of the commodities most widely used in the global transition to a clean energy future[3]. It is also recognised for its importance to both economic development and low emissions transition. Aluminium use is highly correlated with GDP, so as countries urbanise, per capita use of aluminium increases. It is expected that by 2050, global demand for aluminium will nearly double[4]. While an increasing proportion will be met through recycled aluminium, there will remain a need for increased production of primary aluminium requiring a comparable increase in global bauxite mining and alumina refining rates.

[1] https://www.industry.gov.au/publications/resources-and-energy-quarterly-december-2023
[2] https://www.worldbank.org/en/topic/extractiveindustries/brief/climate-smart-mining-minerals-for-climate-action
[3] https://www.worldbank.org/en/topic/extractiveindustries/brief/climate-smart-mining-minerals-for-climate-action
[4] International Aluminium Institute High Substitution Scenario

Australia is one of the very few countries which has bauxite mining, alumina refining, aluminium smelting and aluminium extrusion all within its borders, making aluminium one of only two commodities in which the raw materials are mined and processed all the way to a consumer product right here in Australia. The single biggest opportunity to decarbonise the energy intensive, vertically integrated Australian aluminium industry is through the combination of electrification or conversion to low emissions fuels for existing industrial processes and decarbonisation of the national electricity supply.

Australia has a large resource and industrial base and has great potential for conversion to zero- and low-emissions industrial production including for export, with economic benefits to match. While industrial production is a major contributor to Australia's overall emissions, both directly and via consumed electricity, Australia's green industry ambition is linked to opportunities created by the global transition to net zero.

As the Council has maintained throughout our dialogue with Government, the future of the industry in Australia cannot be taken for granted[5]. Key risks include high energy costs combined with a high cost to decarbonise industrial processes, proactive industry policy among competitor nations, as well as regulatory complexity and uncertainty.

To support this industrial decarbonisation, Australia must be sufficiently competitive to be able to attract global decarbonisation investment. Recent analysis by the Council compared industry policy measures in Australia with other key aluminium and alumina producing jurisdictions[6] and found more is required to ensure appropriate policy settings are in place to support a positive future for this strategically important industry.

Aluminium Industry Energy Use

Australia's aluminium smelters are already a large electricity consumer, with the four smelters using around 2,600 MW or ~10-12% of the electricity consumed in the NEM. Providing electricity is supplied consistently, with firm power, and at internationally competitive prices, aluminium smelting can be run on renewable electricity. As smelters are already electrified, no technological conversion is required. The carbon intensity of the Australian grid is declining rapidly, with this increased penetration of variable renewables. The owners of Australia's four smelters[7] have recently been in the process of recontracting for electricity at the end of their current terms (2025-2029), with the terms of these new arrangements extending to between 2035-2055.

As there is an increased penetration of variable renewable technologies, there will be an increased role that smelters will be able to offer to support reliability through power services, flexibility and interruptibility. Interruptibility is the short term loss of power to part of or whole potline or whole smelter. Flexibility is the ability to use more or less power than normal, for short term periods (seconds to minutes through to hours) without creating too much process instability. Aluminium smelters already offer a range of services and functions which support the network over varying weather, network demand and operating conditions, including Reliability and Emergency Reserve Trader (RERT) and Frequency Control Ancillary Services (FCAS). Smelters' large and fast-acting interruptibility helps secure and restore stability to the network before and after contingencies occur – which can potentially avoid impacts on, or load shedding to the broader customers and population. The industry has increasingly been called upon to support grid stability and reliability, as the challenges in managing the grid increase over the course of phaseout of aging thermal generators in parallel with growing volumes of variable renewable power supplies. For example, during May

[5] https://news.alcoa.com/press-releases/press-release-details/2024/Alcoa-announces-curtailment-of-Kwinana-Alumina-Refinery-in-Western-Australia/default.aspx

[6] https://aluminium.org.au/wp-content/uploads/2023/11/Aluminium-Critical-Mineral-Report-Nov23.pdf

[7] https://www.alcoa.com/australia/en/news/releases?id=2024/09/portland-aluminium-secures-new-energy-contract, https://www.tomago.com.au/tomago-aluminium-future-renewable-energy-needs/, https://www.riotinto.com/en/news/releases/2024/rio-tinto-signs-australias-biggest-renewable-power-deal-as-it-works-to-repower-its-gladstone-operations

and July 2022 Tomago Aluminium provided 62 hours of modulation across 36 events which were a mixture of RERT and responding to high market price. This response by Tomago supported the Australian Energy Market Operator (AEMO) to manage a complex and challenging system and maintain supply to domestic customers. Additionally, smelters are increasingly offering rights in in relation to the short-term reduction of volume at times of peak demand via contractual arrangements[8].

While the industry nominally uses ~10% of the NEM, the Minimum Operational Demand in the NEM was set on 20 October 2024 at only 10,305 GW [9]. This Minimum Operational Demand value will likely fall further from this value with increasing solar PV penetration. At times such as these, the aluminium industry uses more than 25% of the NEM. With AEMO now needing to issue "Minimum System Load" Market Notices[10] for the first time ever, the role of smelters in underpinning critical minimum demand should be recognised and supported. This is currently unvalued in the market.

The alumina industry also consumes around 220 PJ of energy, currently as gas and coal in the refineries. This energy use may convert to electricity requirements of 3-5GW[11] firm in the NEM and the SWIS depending on the technology applied in digestion and calcination[12]. This would transform both the NEM and SWIS electricity markets with substantial increases in demand. Alumina refineries will require technology changes for both digestion and calcination processes to meet zero-emissions goals; either in the form of electrification or adaptation to use hydrogen for process heating. Development of this technology and its application will be stepwise as new technologies to reduce overall emissions become viable. The required thresholds for implementation will be differentiated by refinery (and processes within a refinery); locational access to energy, including supporting transmission infrastructure; the local emissions intensity of electricity supply and bauxite type. The investment required to implement these changes will be substantial.

However, this relies on not only the development of commercial and technological solutions for electrification of alumina refineries but also the development of sufficient competitively priced low emissions generation and storage, and transmission capacity at scale to match. The electrification of existing industry, combined with the development of new electricity intensive industries, such as hydrogen, will require substantial volumes of electricity delivered reliably, affordably and at scale. The Council is concerned that if technology development lags, or energy transmission and supporting infrastructure is delivered in the manner and at the pace it has historically, this will become the rate limiting step in the transition[13]. For example, Worsley Alumina[14] have confirmed that a substantial expansion and modification of the energy grid would be required to deliver renewable power at the necessary scale for industrial users in the region (SWIS). Therefore, decarbonisation of Worsley Alumina may be in two stages, firstly conversion of the onsite boilers to natural gas and only in the longer-term application of new technologies to support increased electrification and renewable energy for the refinery, which would require broader investment in shared energy infrastructure in the region.

An internationally competitive cost of zero carbon electricity at industrial scale delivered to facilities will enable the greatest transformation of the sector. It is hoped that some emissions reducing technologies for refinery digestion may be able to be deployed prior to 2030. However, access to the required generation, storage and infrastructure outside the facility could be the bottleneck holding back the electrification

[8] https://www.agl.com.au/about-agl/media-centre/asx-and-media-releases/2023/august/portland-smelter-contract-renewal-finalised

[9] https://www.linkedin.com/posts/australian-energy-market-operator_big-news-for-renewable-energy-in-australia-activity-7254236785872941057-D24_?utm_source=share&utm_medium=member_desktop

[10] https://wattclarity.com.au/articles/2024/09/24sept-aemo-minimumsystemload-alert-vic/

[11] The potential renewable capacity required to meet this demand is likely 3 to 5 times this amount. https://arena.gov.au/assets/2022/11/roadmap-for-decarbonising-australian-alumina-refining-report.pdf

[12] https://aluminium.org.au/wp-content/uploads/2022/07/FACT-SHEET-03-ALUMINA.pdf

[13] https://www.worley.com/~/media/Files/W/Worley-V3/documents/our-thinking/from-ambition-to-reality/from-ambition-to-reality-report.pdf

[14] P73, https://www.south32.net/docs/default-source/all-financial-results/2022-annual-reporting-suite/sustainable-development-report-2022.pdf

process. To assist with this, one solution is that Government could accelerate significant private investment in renewable generation, low-carbon industries and industrial decarbonisation projects by committing to upfront funding of transmission upgrades, that could be recovered from users (as needed) once operating.

The largest factor in determining the location of future refining, smelting and manufacturing locations is reliable, internationally competitive, low emissions energy. New large scale renewable energy, firming and transmission assets to meet the needs of a decarbonising aluminium industry must be developed in a timely fashion to enable emissions associated with the industry to be reduced at scale. The Council believes that while the long term solution is renewable electricity, gas will have a necessary ongoing role in lowering carbon emissions from refineries while low emissions alternatives are further developed and rolled out in the future.

AEMO Scenario Assumptions

The aluminium industry has been operating in Australia since 1955. Australia's historic advantage in the aluminium industry stemmed principally from its substantial high quality bauxite reserves, early investment in an integrated industry supported by Government, historic energy advantage and access to a skilled workforce with expertise mining and mineral processing. While Australia maintains its bauxite reserves, it has lost its historic energy advantage and there is increasing pressure on a limited skilled workforce.

In his 2019 book, Superpower: Australia's Low-Carbon Opportunity, Ross Garnaut discussed Australia's potential to best utilise its abundant bauxite reserves by leveraging Australia's renewable energy potential to create a competitive advantage in aluminium production by reducing energy costs to produce low carbon aluminium. The Council believes that Government support is needed, in the form a production credit, until Australian energy costs reduce in line with projections. Similarly, Rod Sims has argued that turning Australia's bauxite into green aluminium using low-cost renewable energy could reduce global emissions by around 1%[1].

The key to success in these scenarios is:

1. Competitively priced and firmed, renewable energy is available and prioritised for use by industries such as the alumina and aluminium;
2. That Australian industry is sufficiently able to attract the necessary financial support during the transition, underpinned by Government support for the capital investment for decarbonisation and the transition of energy contracts noting that this will need to be a combination of production credits and transformational capital funding; and
3. Ensuring that Australia's bauxite resources continue to be able to be economically accessible.

Australia's alumina and aluminium industries are located in key regional hubs[2], which have been identified as part of Australia's transition a net zero economy. These green metal industries can create the baseload and flagship offtake agreements in these key locations which can encourage additional investment and renewable energy to support other industries to be developed.

The Council will limit its feedback to the assumptions which are key to the industry directly, rather than focussing on the broad range of scenarios. The key assumptions the Council believes are worthy of consideration in this context are the Gas, Liquid fuel, Coal and Renewable Gas Projection provided to AEMO by Acil Allen[15].

- Industrial gas prices (P18) are only forecast to vary over a narrow range ($9-$11/GJ) over an extended period of time, despite having varied by more than that in recent years. This narrow assumption directly impacts prices for gas powered generation (e.g. P20), flowing through to electricity prices.
- P19 of the report indicates that there is some "potential" coal to gas switching in the industrial sector in the late 2020s (including the Worsley Alumina Refinery). South32's Worsley Alumina Refinery[16] has

[15] https://aemo.com.au/-/media/files/major-publications/isp/2025/acil-allen-2024-fuel-price-forecast-report.pdf?la=en

[16] https://www.south32.net/news-media/latest-news/worsley-alumina-converts-first-boiler-from-coal-to-natural-gas

already commenced this conversion process in line with its public commitments and the assumptions should reflect this progress.

- Table 3.1 of this Projection indicates stable production of Alumina at 18.2 Mt across the period 2030-2050 under all three scenarios. While the Council agrees with the concerns raised in the Projection about the challenges facing environmental approval processes for bauxite mining in Australia, which is consistent with the Council's concerns[17], the Council believes that the range of outcomes is likely to be much broader than that reflected in Table 3.1. In particularly, with increased access to both bauxite and renewable energy, Australia has the potential in the period to 2050 to increase production of "green alumina" consistent with a green energy export scenario.
- Table B.18 of this Projection does not seem to reflect the data in Table 3.1, as it indicates Australian growth between 2022-2025 and the rate of cumulative global growth is highest under a green energy export scenario. The Council will assume that the data in Table 3.1 is correct rather than B.18. The Council believes further consideration should be given, under a green energy exports scenario, to growth in aluminium production occurs in 'greenfields'.
- Section 3.3 outlines that some use of hydrogen is assumed in alumina production. While the quantities of total hydrogen which are assigned to the alumina industry are not clear, the Council cannot reconcile the total production of hydrogen with the alumina industries energy usage and believes this may need to be reviewed.
- For completeness, it is also worth noting for completeness with reference to Table B.17 that Sumitomo Chemicals and Mitsubishi Corporation sold their share of Boyne Smelters to Rio Tinto in 2024[18].

Additionally, the Council notes that in the AEMO 2024 Forecasts, assumptions appear to have been made under the Progressive Change scenario about the future of Australia's four aluminium smelters, beyond their current electricity contracts, which are worth reviewing in light of recent corporate and government announcements.

Conclusion

The Council notes that it is critical that Australia finds a pathway where its world class energy resources are translated into internationally competitive, low emissions, reliable energy to ensure industrial production, emissions and jobs are not exported to other countries. Australia has the opportunity to shape its future, including its energy transition and industrial transformation, in a manner which is consistent with not only its net zero ambitions, but which maximises the social and economic potential of its resources. The Council is happy to provide further information on any of the issues raised in this submission.

Kind regards,

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[1] https://iceds.anu.edu.au/news-events/news/australia%E2%80%99s-new-dawn-becoming-green-superpower-big-role-cutting-global-emissions

[2] https://www.pmc.gov.au/news/address-national-press-club

[17] https://aluminium.org.au/wp-content/uploads/2024/10/241010-AAC-Upstream-Vulterabilities-Report-FINAL.pdf

[18] https://www.riotinto.com/en/news/releases/2024/rio-tinto-to-acquire-mitsubishis-11_65-stake-in-boyne-aluminium-smelter