Submission - Draft Integrated System (ISP) Plan 2022

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Attention: Australian Energy Market Operator ISP Team

Thank you for the opportunity to make a submission following the release of the draft Integrated System Plan (ISP) ahead of the final version scheduled for release in June 2022.

Beyond Zero Emissions (BZE) is an independent solution focussed think tank and we congratulate the Australian Energy Market Operator (AEMO) on the detailed work and effort in developing this forward thinking 30 year roadmap for the efficient development of the National Electricity Market (NEM). We support the consultative process being adopted and trust that our feedback will help inform the final version of the ISP.

Our submission to AEMO is based on our extensive inhouse research, particularly through our modeling of energy demand from Renewable Energy Industrial Precincts and household electrification research. Our work is underpinned by ongoing deep engagement with industry groups, research bodies, investors and regional communities.

BZE supports a modified Hydrogen Superpower scenario as we believe this represents the most likely future state of the grid and best prepares the grid for a zero emissions future.

There are two key modifications BZE recommends to the current Hydrogen Superpower scenario. The first is for Residential Electrification to be lifted from 4 TWh to 15 TWh by 2050 in line with the Progressive Change Scenario. The second is for Industrial Electrification to be lifted from 64 TWh to at least 92 TWh by 2050.

Demand	Current Hydrogen Superpower 2050	BZE Proposal 2050
Industrial Electrification (TWh)	64	92
Residential Electrification (TWh)	4	15

We have arrived at this considered position through BZE representation at all ISP stakeholder sessions facilitated by AEMO, detailed contribution to the ISP weighting survey and independent analysis of the four scenarios developed by the Delphi Panel that cover a broad range of plausible trends and events.

Further explanation for why we recommend these modifications follows.

1. Approach to Residential Electrification

BZE recommends that the scenario model full electrification of residential demand and with zero supply of either hydrogen or a hydrogen methane blend. This will result in a higher 2050 projection for residential electricity demand in the Hydrogen Superpower Scenario.

Figure 7, on page 28 of the Draft ISP 2022 provides a summary of the input assumptions. We understand that the 4TWh demand anticipated in 2050 for residential electrification in the Hydrogen Superpower Scenario relies on increased blending of hydrogen in existing gas networks to eventually achieve 100% hydrogen. We do not agree with the approach taken here.

In the case of residential demand, the proposed use of 100% hydrogen gas will require significant and extremely expensive upgrades to the existing gas network to make it compatible with a 100% hydrogen mix, replacement of virtually all household gas appliances due to incompatibility issues, as well as introduction of new safety standards.

The use of hydrogen to meet residential demand also removes important synergies that already exist with PV and battery storage and which provide significant network benefits i.e. keeping loads close to generation. Electrification with induction cooktops and heat pumps for hot water and space heating are, and will continue to be, far more efficient ways to power homes when compared to substituting with hydrogen.

Moreover, there is a real risk of hydrogen losses through the distribution network, particularly through plastic piping[1]. In effect, the entire gas distribution network will need to be relaid to be 100% hydrogen compatible.

In view of the above, we submit that demand from residential electrification should be revisited and updated to at least 15TWh by 2050 (in accordance with the Progressive Change Scenario).

2. Approach to Industrial Electrification

BZE recommends that the model be updated to reflect higher industrial electricity demand in the Hydrogen Superpower Scenario.

Figure 7, on page 28 of the Draft ISP 2022 provides for 64Twh for industrial electrification in 2050.

BZE recommends that industrial electricity demand be increased to a minimum of 92 Twh - in line with the corresponding line item for the Progressive Change Scenario modeling.

The projected demand for industrial electrification in 2030 for Hydrogen Superpower is 37TWh but only 4TWh for 2030 in the Progressive Change Scenario. It's unclear why the 2050 projections for these scenarios differ so dramatically, yet supports our position that the 2050 figure for the Hydrogen Superpower Scenario be increased accordingly too.

[1]https://www.industry.gov.au/sites/default/files/2021-09/nhs-hydrogen-in-the-gas-distribution-networks-report-2019.pdf

Industrial electrification is accelerating at a rapid pace due to rising gas prices, consumer demand and a greater corporate focus on Scope 1, 2 and 3 emissions. Electrification via increased uptake of heat pumps, electric arc furnaces and electromagnetic heating will continue to grow and will remain more efficient in energy terms and competitive on a cost basis than hydrogen in many industrial applications. Given the ample renewable resources and grid buildout anticipated in the Hydrogen Superpower scenario, we see no reason why momentum for this shift cannot match and even surpass the modeled 92 TWh in the Progressive Change Scenario by 2050.

General Hydrogen Superpower Scenario comments

To supplement our above recommendations for revised 2050 targets, we offer the following additional comments in support of pursuing the Hydrogen Superpower Scenario:

- The Draft 2022 ISP modeling shows a **net market benefit** of over $70 billion and an ROI of 3.8 (Table 5) in the Hydrogen Superpower Scenario. This is in line with Transgrid's "*Energy Vision*" report[2] where the Clean Energy Superpower has the lowest normalised cost of electricity of all scenarios presented.

- Scale and market maturation will see the **cost for electrolysers** decrease dramatically. As project proponents are increasingly afforded the luxury of operating facilities with more flexibility they will benefit from lower daytime renewable energy costs resulting in evening peak load reduction and thus lower capacity factors. This will further enhance DSP and additional network benefits.

- The development of a green hydrogen sector will unlock additional economic benefits through the production of green steel, green chemicals, some forms of heavy transportation, and some forms of high heat industrial applications. The cost of hydrogen production through electrolysis is expected to be $1.5/kg H_2 by 2030[3] placing it within the realm of competitiveness for industrial feedstocks.[4] Given this price projection, the scale and number of projects already announced, existing

[2] https://www.transgrid.com.au/media/x4mbdody/transgrid_energy_vision.pdf
[3] https://www.industry.gov.au/sites/default/files/November%202021/document/australias-long-term-emissions-reduction-plan-modelling.pdf
[4] https://www.csiro.au/~/media/Do-Business/Files/Futures/18-00314_EN_NationalHydrogenRoadmap_WEB_180823.pdf?la=en&hash=36839EEC2DE1BC38DC738F5AAE7B40895F3E15F4

initiatives and international demand for renewable hydrogen, we consider the Hydrogen Superpower Scenario to have a high likelihood of eventuating.

Beyond Zero Emissions' recent report, *Export Powerhouse: Australia's $333 billion opportunity* identified that Australia has an opportunity to grow a new green export mix worth $333 billion per annum.[5] The export opportunity of key zero-emission export goods like aluminium, alumina, steel, hydrogen and other critical minerals is almost three times greater than current fossil fuel exports.

Building out a strong, firmed renewable electricity grid is vital to realising this export opportunity. The capacity constraints now facing many major transmission lines is hampering the ability to connect new large scale renewable energy projects to the grid, and of industry to access the large volumes of competitive renewable energy they need to grow and capitalise on global demand for low emissions productions. Hydrogen will play a key role here.

Offshore Wind

We recommend the full integration of offshore wind into AEMO's scenario plans, helping to facilitate adoption of this important renewable resource, as well as guide developers to locations that provide the best overall grid benefit.[6]

With offshore wind legislation[7] now passed, projects on hold are now moving forward and the impact of these projects on the NEM must be considered. Offshore wind has the potential to bring significant renewable resources close to our coastal transmission/load hubs while easing land use conflicts that can occur with onshore wind.

Current REZ scorecards (Appendix 3. Renewable Energy Zone [8]) have little or no detail on the Offshore Wind Zones (OWZ) with 3 out of the 4 zones stating "*There is no existing, committed or anticipated offshore wind generation for this REZ. The modeling outcomes, for all scenarios, did not project any offshore wind for this REZ*". This is particularly

[5]https://bze.org.au/wp-content/uploads/2021/10/Beyond-Zero-Emissions-Export-Powerhouse-Full-Report_2.pdf

[6]https://blueeconomycrc.com.au/projects/offshore-wind-potential-australia/

[7]https://www.industry.gov.au/regulations-and-standards/regulating-offshore-renewable-energy

[8]https://aemo.com.au/-/media/files/major-publications/isp/2022/appendix-3-renewable-energy-zones.pdf?la=en

surprising as this statement covers the years up to 2050 under all scenarios. Given the development and government support[9] of projects such as Star of the South, we urge AEMO to reassess the approach taken with regard to offshore wind.

Social License

Genuine consideration of social license issues is critical for timely and fair NEM development outlined across any of the scenarios presented. Early and targeted community engagement along with consideration and support towards community benefits is key given the scale of transmission upgrades and the build out of renewables required.

BZE recommends the work conducted by RE-Alliance, "*Building Trust for Transmission*", as a firm guide to maintaining a social license with the local community for these large infrastructure developments.[10]

Thank you for the opportunity to make a submission on the draft ISP 2022.

Yours Sincerely,

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[9]https://www.premier.vic.gov.au/big-boost-offshore-wind-drive-jobs
[10]https://d3n8a8pro7vhmx.cloudfront.net/vicwind/pages/2616/attachments/original/1628044697/RE-Alliance_July_21_Building_Trust_for_Transmission_Earning_the_social_licence_needed_to_plug_in_Australia's_Renewable_Energy_Zones-compressed.pdf?1628044697