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TRANSPOWER

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Via Online Submission: REZ@transpower.co.nz

14 April 2022

RE: RENEWABLE ENERGY ZONES NATIONAL AND NORTHLAND PILOT – CONSULTATION RESPONSE

Dear Sir / Madam,

APD Engineering welcomes the opportunity to provide feedback on Transpower's Renewable Energy Zones (REZs) National and Northland Pilot Concept consultation papers. We would also like to commend the Transpower, NorthPower, and Top Energy for their role in preparing New Zealand for the upcoming energy transition. APD is a strong supporter of the 'Renewable Energy Zone' concept, and we believe that REZs will play a pivotal role in New Zealand's clean energy future. REZ developments are important to facilitate the high volume of generation development required in areas of the electricity network in New Zealand that do not currently have adequate spare capacity. APD has provided specific comments on each of the National REZ development questions raised by Transpower in the attached submission.

ABOUT APD

APD Engineering is an electrical engineering consultancy highly skilled and experienced in the delivery of power system studies, network modelling, engineering design services and project commissioning for a broad range of clients. APD hosts one of the largest Power Systems teams in the world and provides power system modelling and technical advisory services to clients across Australia and New Zealand.

Our engineers have detailed knowledge and understanding of different types of technologies in the market including photovoltaic inverters, wind turbine generators, storage technologies etc. APD is at the forefront of challenges, deriving strategic and pragmatic solutions for successful connection of complex renewable energy projects.

APD has a broad range of experience gained from working with AEMO and NSP's (NEM, NT, WA, New Zealand), renewable energy developers, EPCs, partnering consultancies and OEMs. Our detailed knowledge of New Zealand and Australia's energy markets, Rules, regulatory requirements, and stakeholders provide immense value in delivering positive outcomes for renewable energy developments across Australia and New Zealand. APD has direct and relevant experience with the New South Wales and Queensland REZ developments in Australia and supports the REZ work Transpower is undertaking to enhance the potential for developing REZs in New Zealand.

BENEFITS OF RENEWABLE ENERGY ZONES IN THE NEW ZEALAND CONTEXT

APD believes that development of REZs can ensure that future increases in demand for energy are met with the cleanest and affordable outcomes for consumers because the commercial funding model of a REZ has the potential to lower connection costs to individual generators, enhancing market competition. Connecting to the grid under the open access scheme and managing a large influx of private investment can be challenging as evident from different parts of the world, including neighbouring country Australia. Transmission and distribution upgrades can take a considerable amount of time to implement, and New Zealand is in a rare position to commence planning upgrades before the predicated large spike in demand. Developing a framework for the REZ concept is highly recommended in preparation to mitigate these future risks.

REZ GUIDING PRINCIPLES: SOCIAL LICENCE AND INVESTMENT CERTAINTY

APD recommends community and industry partnership initiatives where integrated community benefits are introduced to create local value and needs for industry. Including the local communities throughout the REZ development process will ensure adequate involvement and buy-in from the community. It is recommended that the proposed REZ framework considers real and long-lasting benefits and opportunities for regional community and are shared in a formalised benefit sharing agreement. These steps will help ensure social license is kept throughout the construction and operating life of REZs and reduce REZ implementation risks.

APD proposes an additional principle 8 'REZs are technically enabled with compliance by projects to an Access Scheme and tendering process framework'. This new principle would promote improved e investment certainty for renewable energy developers. Introduction of the REZ should mitigate the current challenges faced under open access regime and improve opportunities for developers to connect renewable generation into the REZ. This can be introduced in the form of an "access scheme" and transparent tendering process with specific selection criteria.

SELECTION OF SUITABLE REGIONS FOR REZ

Additional to the criteria set out by Transpower for REZ region selection, APD proposes two additional criteria:

- *Existing network constraints / limitations criteria* – if there are any existing constraints and limitations within a region, regulatory amendments will need to be considered to ensure appropriate measures are in place for shared constraints managements between REZ and non-REZ generations/infrastructure; and
- *Proximity to large load centres criteria* (including future Hydrogen Electrolysers) - large, flexible loads can significantly improve the utilisation of a REZ, absorbing excess power in times of low demand. Close proximity to loads reduce the strain on existing transmission infrastructure, which in turn provides the most efficient utilisation of the shared transmission network. While green hydrogen production is still an emerging industry, coordination with the private sector and/or "Hydrogen New Zealand" can provide strong indicators regarding future hydrogen production locations.

CHALLENGES OF CONCENTRATED INVERTER-BASED TECHNOLOGY INTEGRATION

Integration of renewable generators into the grid is a well-known challenge and can become an issue if adequate planning is not completed during the initial stages. Integrating large numbers of inverter-based technologies like wind and solar resources in a small, remote part of the electricity network introduces many technical difficulties.

While New Zealand has the fortune of large amounts of green, synchronous hydroelectric power, technical challenges regarding inverter-based resources still raise significant operational risks if not properly mitigated. It is vital that Transpower and other relevant bodies consider the important technical aspects for any REZ development. The technical aspects include but are not limited to, available fault level, controller interaction and harmonic emissions. It is strongly recommended that technical requirements be reviewed, and connection assessment requirements be reconsidered before issues arise to efficiently utilise New Zealand's strong network.

Our detailed response is attached as Appendix A and B.

Please do not hesitate to contact us if you would like to discuss this submission in further detail. APD looks forward to working with Transpower and the REZ Project Team.

Yours sincerely,

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APPENDIX A – RESPONSE TO NATIONAL CONSULTATION

Q1. Do you agree that the first mover disadvantage and high connection costs can be challenges for connecting new renewable generation and/or large electricity loads to the electricity network?

APD agrees that the issue of "First Mover Disadvantage" and high connection costs can be challenging for connecting renewable generation and/or large electricity loads to the electricity network. However, APD also understands the concerns around connecting prospective renewable generators to the existing transmission grid in areas which already have limited capacity. As proposed in the consultation paper, development, and implementation of Renewable Energy Zones (REZ) will assist in overcoming some of these challenges, including grid/network planning, commercial funding etc, and ensuring economies of scale by promoting coordinated 'many to grid' connections.

Hence, in conjunction with the upcoming update to the Transmission Pricing Methodology (TPM), APD encourages Transpower to pursue Renewable Energy Zones (REZs) to ensure investment is coordinated, targeted and efficient. APD foresees this as a low cost and risk with high potential rewards approach towards a low-cost and cleaner energy transition, that will prepare the network for increased renewable energy penetration.

Q2. Do you think the concept of a Renewable Energy Zone could be beneficial in a New Zealand context?

APD believes that development of REZs can ensure that future increases in demand for energy are met with the cleanest and affordable outcomes for consumers because the commercial funding model of a REZ has the potential to lower connection costs to individual generators, enhancing market competition. This is due to costs being shared and the consequent economies of scale of 'many to grid' connections. As discussed in the consultation paper, REZs can remove barriers to entry for prospective developers by circumventing the first mover disadvantage and reducing the possibility of a free-rider situation. This will result in more efficient, streamlined and coordinated connection to the grid and at the same time, provide investment certainty for potential REZ asset owners and connecting renewable generators and loads.

Connecting to the grid under the open access scheme and managing a large influx of private investment can be challenging as evident from different parts of the world, including neighbouring country Australia. Transmission and distribution upgrades can take a considerable amount of time to implement, and New Zealand is in a rare position to commence planning upgrades before the predicated large spike in demand. Developing a framework for the REZ concept is highly recommended in preparation to mitigate these future risks. APD proposes the following process on a high-level:

- Planning / defining proposed REZs boundaries
- Engagement with community and industry – declaration of sub-REZs and proposed infrastructure upgrade, generation mix, system strength remediation required etc.

- Finalising the REZ implementation plan, this should include details of (as a minimum):
    - Maximum available hosting capacity of each REZ and sub-REZs including proposed generation mix and associated transmission infrastructure augmentation
    - Staged approach for implementation i.e., priority projects/generation type, combinations and options with consideration to impacting factors
    - Plan for industry and community engagement
- Selection of REZ projects via a transparent Tendering Process
- Specification of the connection process for REZ projects (from modelling to commissioning/operation) with consideration to current challenges faced under open access scheme; and
- Ongoing management of the REZs during operations.

Q3. What region(s) do you think would be suited to Renewable Energy Zones?

Without completing any network and planning assessment, it is difficult to nominate regions that will be best suited to REZs. APD proposes that the nominated planning body perform the required network assessments and derive the REZ regions appropriately. However, it is recommended that the following factors be considered while determining regions for REZs (as a minimum):

- Existing constraints / limitations within the network
- Proximity to existing transmission/distribution infrastructure
- Proximity to large, consistent supply of renewable energy (irradiance, wind)
- Proximity to complimentary wind/solar resources (larger wind availability when irradiance is low)
- Proximity to large industrial loads (including future loads, i.e., hydrogen electrolysers) and
- Proximity to communities for construction, maintenance, and ongoing support

APD understands Transpower is considering regions that are located on the 'edge' of national grid such as Northland, Taranaki, Wairarapa, Hawkes Bay, the East Coast of the North Island, the West Coast of the South Island and Southland. Since some of these regions are not well-supported by transmission / distribution networks, APD recommends appropriate planning assessment being performed prior to finalising these proposed REZ regions.

Q4. What benefits do you think should be considered in the decision-making process for Renewable Energy Zones in New Zealand?

The REZ National Consultation paper outlines many benefits of Renewable Energy Zones. Overcoming the first mover disadvantage and subsequent free-rider situation is a significant benefit that will reduce connection costs for renewable generators and loads due to economies of scale. The additional investment into the shared network infrastructure will benefit developers, Transpower, and ultimately New Zealand consumers through lower costs of delivered energy from increased market competition. There are further benefits to a planned, coordinated REZs which can be identified

through more efficient infrastructure upgrades. Coordination of investment by the REZ planning body can deliver large infrastructure upgrades in place of small incremental augmentations. This approach ensures investment in the shared infrastructure is conducted in a planned and efficient manner and is fundamental to planning a low carbon future, enabling New Zealand to rapidly decarbonise its energy use through net zero carbon targets. Furthermore, additional to the network benefits, implementation of REZs will ensure economic and community benefits by creating jobs and bringing opportunity to large energy users regionally and nationally.

Q5. Do you agree with the proposed guiding principles? Are there any that you would change or add?

APD supports the seven guiding principles for developing Renewable Energy Zones proposed by Transpower. Expanding on principle 4 'REZs are developed through partnerships and collaboration with local iwi and stakeholders', APD recommends community and industry partnership initiatives where integrated community benefits are introduced to create local value and needs for industry. Including the local communities throughout the REZ development process will ensure adequate involvement and buy-in from the community. It is recommended that the proposed REZ framework considers real and long-lasting benefits and opportunities for regional community and are shared in a formalised benefit sharing agreement. These steps will help ensure social license is kept throughout the construction and operating life of REZs and reduce REZ implementation risks.

APD proposes an additional principle 8 'REZs are technically enabled with compliance by projects to an Access Scheme and tendering process framework'. This new principle would promote improved e investment certainty for renewable energy developers. Introduction of the REZ should mitigate the current challenges faced under open access regime and improve opportunities for developers to connect renewable generation into the REZ. This can be introduced in the form of an "access scheme" and transparent tendering process with specific selection criteria.

Q6. Do you agree with the proposed criteria for selecting suitable regions for REZ development? Are there any that you would change or add?

APD agrees with the criteria set out by Transpower for REZ region selection. In addition to these criteria, APD would like to suggest two additional criteria:

- *Existing network constraints / limitations criteria* – if there are any existing constraints and limitations within a region, regulatory amendments will need to be considered to ensure appropriate measures are in place for shared constraints managements between REZ and non-REZ generations/infrastructure; and
- *Proximity to large load centres criteria* (including future Hydrogen Electrolysers) - large, flexible loads can significantly improve the utilisation of a REZ, absorbing excess power in times of low demand. Close proximity to loads reduce the strain on existing transmission infrastructure, which in turn provides the most efficient utilisation of the shared transmission network. While green hydrogen production is still an emerging industry, coordination with the private sector and/or "Hydrogen

New Zealand" can provide strong indicators regarding future hydrogen production locations.

Q7. Do you agree with using a tender process for committing projects in a REZ? Are there alternative processes that could be considered?

APD is supportive of a tender process for project selection within the REZ. Australia is in the process of implementing a similar framework for REZs in NSW and QLD. APD recommends a step-by-step tender process clearly outlining the selection criteria and process, to provide transparency and visibility over the proposed framework. This is important to ensure public confidence and industry investment certainty in the selection process. The selection criteria should consider specific technical requirements e.g., proposed technology, applicable commercial and regulatory aspects etc. Additionally, as acknowledged in the consultation paper, the process is yet to be finalised with ownership of activities to be defined. It is critical that roles and responsibilities be clearly defined to ensure efficient and effective commitment of generators.

Q8. Who should be involved with co-ordinating and undertaking the various steps within a REZ development process?

APD recommends appointment of a separate government-controlled authority who will act as the designated planning body for the REZ, independent of Network Service Provider's to ensure impartiality and avoid potential conflict of interest. The primary focus of the new entity would be:

- Coordinating the overarching planning and development of REZs and oversee the investment decisions related to REZ funding planned for grid strengthening and unlocking REZ potential
- Establishing capacity of the existing network, and allocating capacity consistent with the REZ framework
- Determining and sequencing connecting generators and loads in alignment with the REZ objectives and
- Selecting projects that promote long-term interest of the community, with consideration to environmental, social, and economic cost benefits.

APD notes the precedent in that Australia has pursued a similar approach and appointed separate entities for its own state based REZ initiatives. However, there could be merit in Transpower assuming the planning body role in REZ development process. Although it is the recommended that the responsibilities be shared with Distribution Network Service Providers (DNSPs) to ensure that the planning framework is well-thought-out at both transmission and distribution levels.

Q9. Do you agree with the proposed project criteria? Are there any that you would change or add?

APD supports the proposed project selection criteria proposed by Transpower based on the information currently provided within the consultation paper. APD recommends an additional criterion with consideration to connection assessment process:

- Ability of the proposed plant to meet technical requirements of New Zealand's Grid Code.

This new criterion could be implemented via a REZ Access Scheme to provide clarity and certainty for renewable projects. APD notes that the inability to meet technical requirements under the Grid Code can cause lengthy delays in commissioning of generators.

Q10. Do you agree with the challenges we have identified?

The challenges identified by Transpower outlines the important aspects for consideration to finalise and implement in the REZ framework. APD agrees with the challenges identified by Transpower and endorses Transpower's initiatives to address these challenges. APD's recommendations are further detailed in response to Q11 and Q12 below.

Q11. What are some of the ways to overcome these challenges and who should be involved?

APD would like to provide feedback on three areas to mitigate challenges:

1. Process
2. Access and firm capacity rights, and
3. Funding and cost recovery.

Process - APD recommends that an integrated access rights scheme for REZ projects and infrastructure be introduced with inclusion of the following:

- A streamlined connection process which outlines a step-by-step process for connection of REZ projects and infrastructure, and how that would differ from the current open access regime;
- A management process of top-down connections (transmission to distribution) and dedicated ownership for each step in the process; and
- A tender process and including clear statement of selection criteria.

Access and firm capacity rights - As addressed in the consultation paper, investment certainly is not provided to asset owners under the current open access regime and is one of the primary design focuses of the REZ is to mitigate this concern. APD proposes that the REZ Scheme should be designed to limit the generation inside a REZ based on technical and economic modelling with consideration to any regulatory impacts to promote investment certainty for proponents.

APD recommends that the appointed planning body establishes a staged approach for REZ projects connection and infrastructure. APD understands a similar approach is currently proposed, however, recommends that specific details for each stage be declared and planned appropriately. As an example:

- Stage 1 REZ projects
    - 1 GW in total (2 x SF, 3 x WF of certain capacity)
    - 2 x Transmission Line upgrades
    - 1 x synchronous condenser
- Stage 2 REZ projects
    - 400 MW in total (1 x SF, 2 x WF of certain capacity)

- 1 x Transmission Line and 1 x Distribution Line upgrades
- 1 x synchronous condenser

A similar approach used in the New South Wales CWO REZ in Australia could be adapted, where certain access rights are provided for a fee to projects based on specific criteria such as Project Maximum Capacity Profile, participation in the proposed streamlined connection process and access rights available only for a fixed timeline (i.e., use it or lose it). The Access Fee would be derived based on a number of economic and regulatory factors when an approach for connecting REZ projects is confirmed and finalised.

Funding and cost recovery - APD believes New Zealand has a significant opportunity to upgrade its network infrastructure and ensure the shared network is ready to rapidly decarbonise energy use to meet net zero carbon targets before the predicted large influx in generation/demand. Whilst it is understood that there are risks involved with this strategy, New Zealand has the potential to extract the most value from new renewable generation. APD proposes that any shared assets / infrastructure upgrades be funded by the Government. APD proposes the following initiatives:

- *Clean Energy Package* - allocation of annual budget towards development of these assets and/or,
- *Emerging Energy Program* - to consider bilateral funding mechanisms to accelerate development including:
    - Capital funding to diverse generation types under development; and
    - Pre-investment funding to investigative projects.

In the lead up to a significant increase in demand, facilitation of Renewable Energy Zones is vital to ensure affordable, clean energy for New Zealanders for decades to come.

Q12. Do you see any other potential challenges that need to be considered?

Integration of renewable generators into the grid is a well-known challenge and can become an issue if adequate planning is not completed during the initial stages. Integrating large numbers of inverter-based technologies like wind and solar resources in a small, remote part of the electricity network introduces many technical difficulties.

While New Zealand has the fortune of large amounts of green, synchronous hydroelectric power, technical challenges regarding inverter-based resources still raise significant operational risks if not properly mitigated. It is vital that Transpower and other relevant bodies consider the important technical aspects for any REZ development. The technical aspects include but are not limited to, available fault level, controller interaction and harmonic emissions. It is strongly recommended that technical requirements be reviewed, and connection assessment requirements be reconsidered before issues arise to efficiently utilise New Zealand's strong network.

APPENDIX B – RESPONSE TO NORTHLAND PILOT

Q1. Do you support the development of a pilot REZ in Northland? Please provide your reasons as to why or why not.

APD supports the concept of Renewable Energy Zones (REZs) in the New Zealand context and believes that the development of REZs is a critical enabler of the energy transition, by preparing the network for increased renewable energy penetration. Well-designed Renewable Energy Zones will ensure increases in demand for energy are met in the cleanest and most efficient way. A REZ initiative can provide enormous benefits including:

- Preparing the NZ grid for renewable energy integration
- Creating benefits for local communities and large energy users, and
- Attracting external investment

Development of REZs will ensure generators are connected in a planned, coordinated, and optimised manner, which will maximise the connection capacity of the network and ensure efficient investment management. The proposed Northland Renewable Energy Zone contains high quality renewable resources with a strong mix of wind and solar. The resource availability along with existing transmission infrastructure makes the Northland REZ ideal for New Zealand's first REZ. The Northland REZ pilot can highlight the many benefits Renewable Energy Zones will provide to New Zealand consumers.

Q2. What potential benefits of a REZ are important to you? Consider economic, social, cultural and environmental factors.

With consideration to the potential benefits proposed in the consultation paper, APD recommends that the following benefits be firmed up for Northland REZ in consultation with the local Northland community:

- Encouraging private investment within the nominated REZ geographical boundary
- Ensuring local community benefits such as job creation, long-term guaranteed income stream from REZ development initiative
- Improving of local infrastructure such as roads, telecommunications etc. by introducing community benefit sharing schemes
- Creating local industry benefits such as support local businesses and contractors
- Attracting international investors and energy intensive industries to NZ, specifically to Northland region, and
- Ensuring appropriate environmental and planning requirements, including balancing agricultural, heritage, mining, and other land uses

Q3. What potential costs of a REZ are important to you? Consider economic, social, cultural and environmental factors.

With consideration to the proposed benefits in the consultation paper, APD recommends the following potential costs be considered for Northland community:

- Reducing cost of regional electricity prices in Northland; and

- Reducing energy hardships in Northland region by introducing community benefit sharing scheme.

Q4. Do you support enabling developments through upgrades to existing lines and substations as demand for connections to the networks emerge? If not, what alternatives would you propose?

APD supports enabling developments through upgrades to existing lines and substations as demand for connections to the networks emerge. Transpower has appropriate modelling and forecasts to support the need for upgraded network infrastructure in the future.

APD wants to reiterate the opportunity Transpower, and the New Zealand market has in preparing for this increase in demand. Timely planning and construction of the required upgrades will ensure the additional capacity on Transpower's network is accounted for in the most efficient manner. We do understand there is additional risk in pre-planning large infrastructure, with the support of the New Zealand government the future benefits to consumers can be substantial.

Q5. If new lines needed to be built to connect resources, where should they be constructed/not constructed?

Planning where new transmission lines should be is one of the most challenging aspects of any new REZ development. APD recommends community consultation and engagement on potential transmission corridors during this process. If inadequate consultation and engagement with the local community were to occur, the REZ planning entity would face significantly higher delivery risk on proposed new transmission infrastructure, and the possibility of not being able to facilitate due to community opposition a proposed REZ development.

Other important considerations for new lines include:

- Determining upfront the available capacity in the transmission backbone in which they connect;
- Identifying and avoiding areas with constraints to minimise complexities around regulatory requirements
- Avoiding radial lines which introduce reliability issues during contingencies, and
- Planning for new lines through areas of high renewable resources to allow for low-cost connection of renewable generators

Q6. Are there alternative proposals that you think we should consider?

No

Q7. Do you have development projects that a REZ might assist you to construct and connect?

No