Hitachi ABB Power Grids Australia Pty Limited
Locked Bag 7315 Liverpool NSW 1871

Energy Security Board
Dr. Kerry Schott AO - Chair
#15, 60 Castlereagh Street
Sydney NSW 2000

By email: info@esb.org.au

ORGANISATION	Hitachi ABB Power Grids
FROM	Bernard Norton
PHONE DIRECT	+61 (0)477 400 288
E-MAIL	bernard.norton@hitachi-power-grids.com
CC	melanie.mckay@hitachi-power-grids.com, sdebell@optusnet.com.au;
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Hitachi ABB Power Grids Response to P2025 Market Design Consultation Paper

DATE October 19, 2020

Dear Dr. Schott,

We refer to the Energy Security Board's P2025 Market Design Consultation Paper which was recently released for stakeholder review and comment.

Hitachi ABB Power Grids Australia is part of the global Hitachi ABB Power Grids joint venture formed on 1 July 2020 and headquartered in Zurich, Switzerland. The business develops, manufactures, and supplies power and automation technologies relied upon by essential industries including the energy, resources, transport infrastructure and utilities sectors.

Power Grids Grid Automation is a pioneer in designing microgrids from its base in Australia, expertise which is now deployed worldwide. Power Grids Grid Integration includes Power Systems consultancy capability that understand network design and operation to ensure safe, secure, and reliable energy supply. Its projects capability designs, constructs and integrates substations and grid stabilisation technologies into power transmission and distribution networks. Power Grids High Voltage and Power Grids Transformers are technology businesses manufacturing a comprehensive range of original equipment critical to power generators, network service providers, and industrial customers worldwide. Hitachi ABB Power Grids has operated in Australia for over 100 years, with manufacturing, engineering, and service facilities in the major states of the National Electricity Market (NEM). Customers in other States, Territories and regions are supported by a sales and service network of engineering staff and local businesses.

Thank you for this opportunity to contribute to the Post 2025 Energy Market design. The ESB's consultation paper confirms the integrated nature and complexity of the transition underway in the NEM.

Hitachi ABB Power Grids believes that critical changes are required in the NEM to enable the P2025 market to transition efficiently. These are:

- Intervention to ensure that Frequency Control and other Essential Services to the network are recognised in current remuneration models, enabling a market for these products to develop.

- Accelerated comparative trials of new and older technologies to ensure that appropriate solutions are implemented that support network strengthening for a P2025 market.
- ESB leadership to expedite changes to the regulatory framework and market processes so that committed and actionable projects in the Integrated System Plan are completed by 2025.

Our response below responds specifically on market design initiatives where Hitachi ABB's Power Grids experience is most relevant.

Section 1 Consultation and Submissions

Hitachi ABB Power Grids (Power Grids) has participated in the transformation of the energy system which has taken place over the past 10 years, noting the pace of change has varied significantly in response to changes in government policy and energy prices rather than technology developments. This variability does not encourage investment in energy system technology development, energy system expertise or applied research as the economic climate is uncertain due to regulatory changes. Clarity on future market design and implementation priorities for the period 2025-30 is required at the latest by the end of FY 2021 so that this can be factored into the 5-year planning cycle for Network Service Providers. Investment in the power transmission network is long term, with an operating life cycle of over 25 years so it is important to facilitate greater levels of confidence in demand and generating profiles for major assets in the energy system including the likely timing of closure for thermal generation units and major energy consumers. This requires stability in government energy and environmental policy settings at a commonwealth and state level until 2040 so that markets can operate efficiently.

Variable Renewable Energy (VRE) technologies such as Solar PV panels and inverters are mature, even if systems to integrate multiple Distributed Energy Resources (DER) remain comparatively new. Adoption of integration systems such as Virtual Power Plants at the domestic level will be influenced by price incentives offered by energy retailers, and consumer concerns about the security of energy supply. This is neither an area of expertise nor focus for Power Grids. Its expertise is in designing and implementing cyber secure energy management and monitoring systems at the network level where there are fewer devices, communication protocols are well developed, and maintenance programmes are generally applied consistently. However, it notes that the rapid penetration of VRE into the distribution network, and pace of technology development over the past 10 years may pose challenges in effectively integrating DER leading to localised distribution system stability issues. This may necessitate market incentives to upgrade major energy consuming appliances and communication protocols. At the same time as uncoordinated distributed rooftop PV pose grid stability challenges, new business models and opportunities present themselves to customer focused retailers and aggregators.

Section 4: Resource Adequacy Mechanisms (RAMs) – Market Design Initiative A

Power Grids technologies and energy systems are deployed to strengthen electricity networks by providing mechanical and / or synthetic inertia, by creating operating reserves, and by enabling market players to participate in non-market ancillary services such as Frequency Control and System Restart. This is derived demand with Power Grids reliant on the effectiveness of market mechanisms to provide price signals or other incentives so that its customers invest in Resource Adequacy, or support Systems strength. Most battery energy storage technology commercially available today cannot supply economically over extended durations e.g. days due to limitations on energy density and depth of discharge. Clean hydrogen may fill this gap in the energy storage market once its cost competitiveness has improved to less than $2/kg, but this is unlikely before 2030.[1]

The increased frequency of interventions by the Australian Energy Market Operator (AEMO) and use of its Reliability and End Emergency Reserve Trader (RERT) powers has not led to a noticeable or sustained increase in enquiries for physical investment in RAMs in Power Grids experience. Similarly, while the Retailer Reliability Obligation (RRO) places the obligation for supply reliability on energy retailers and large load demand, the mechanism has not been triggered yet. The market expectation is that this will primarily be met by financial hedges rather than physical investment.

As the changes in the energy system progresses further, RRO is likely to have reduced capacity to accommodate disruptions which threaten system security and supply reliability unless there are additional mechanisms to encourage investment in services which are currently a by-product of thermal generation.

Short term price signals, even 12 months' notice of the requirement to establish firm assets is insufficient lead-time to design, procure, construct and commission physical systems to support the network. Power Grids' recent involvement in major network strengthening projects in South Australia, and upgrades on regional interconnectors indicate that at least two years notice is required from notice to proceed, sometimes longer if the supply scope includes Power Transformers due to the length of supply chains for critical materials. Many of these assets have a minimum operational life of twenty five years so investors have to be confident in energy flows and underlying demand will be sustained in the long term.

AEMO's recent Electricity Statement of Opportunities indicates that the reliability outlook has improved for the next five years making it less likely that the RRO will be triggered before the post 2025 market design principles are finalised.[2] Reducing or removing the 3-year trigger for RRO is unlikely to change participant behaviour as the investment fundamentals are unlikely to change materially, and the lead time to construct physical assets remains a constraint. Reforms to the RERT and the interim 'out of market' reserve are an opportunity to see how the NEM operates as VRE increase and conventional thermal generation declines further.

The commissioning and operation of Snowy Hydro 2.0 should start to impact the market from 2024. Rather than modify the RERT, Power Grids believes it would be preferable for the NEM to establish an operating reserve mechanism that incentivises supply side participants to establish and maintain on-line spinning capacity or fast-response supply options. It views on this option are detailed in its response to Market Design Initiative C, Essential System Services.

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[1] Australia's National Hydrogen Strategy, https://www.industry.gov.au/sites/default/files/2019-11/australias-national-hydrogen-strategy.pdf (6)

[2] https://www.aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/nem_esoo/2020/2020-electricity-statement-of-opportunities.

Section 6: Essential System Services – Market Design Initiative C

C1: Operating Reserve
Power Grids acknowledges the problems of Essential System Services supply apart from energy and Frequency Control Ancillary Services (FCAS) identified in the ESB's *Systems Services and Aheads Market Paper* released in April 2020.[3] The reducing number and increased age of synchronous generators in the NEM is contributing to greater risk of supply interruptions, and a need for increased intervention by AEMO. Power Grids does not believe that the creation of a spot market for operating reserves will lead to a significant improvement in the availability of essential system services. It is unclear how regularly these services will be required and the assumption that participants will bid at marginal cost suggest that the return on investment from participation in this market is low. Even operators of existing plant are unlikely to be interested in the projected commercial return unless there is a more structured procurement process, as the circumstance in which these services are needed most are when energy prices will be low due to greater supply from low marginal cost VRE resources.

The failure to ensure an adequate supply of system security services effectively transfers the risk of system instability to energy consumers who experience the impact of supply interruptions which they are unable to mitigate cost-effectively. A food manufacturing facility running aseptic production processes could face the cost of destroying a batch, cleaning out all mixing vessels and lines, and extra working capital in finished product stock to avoid brand damage or damages for failure to supply. This is likely to be significantly higher than the marginal cost of providing system services. The lack of system security and reliability could inhibit investment in energy intensive manufacturing, and the production of foodstuffs, pharmaceutical and biochemicals where production or storage processes need to be free from interruptions to energy supply to prevent deterioration. The operating reserve market for resource adequacy should include a system firming obligation rather than rely on a spot market to provide these services. At the margin it may involve despatching lower price generators from the market for periods when system strength is forecast to deteriorate if they are unable to provide corresponding system strength benefits. The market inefficiency resulting from this scenario could be monetised and a price determined for resource adequacy augmentation if operating reserves are purchased through a regular structured procurement process over the medium term. This market would need to operate for 5 years minimum even though supply contracts would be for a shorter duration, so that existing participants and new entrants can estimate likely returns otherwise the risk premium could fail to stimulate the investment required to provide supply.

It is difficult to determine whether this mechanism would manage greater system uncertainty more efficiently than the current reliance on RERT or directions however there should be benefits in price transparency and predictability which are important contributors to market efficiency. A structured procurement model could transition to a spot market once sufficient experience has been established to understand the rate of market transition and how it is affecting system service supply.

C2: Fast Frequency Response with FCAS
There is no technical impediment for combining Fast Frequency Response with FCAS although the economics of retrofitting existing generators may not be attractive in all cases. There is a potential issue in determining liability for any penalties which may apply, particularly in a retrofit scenario, as modelling grid conditions could be difficult. Neither developers nor engineering contractors are

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[3] https://www.prod-energycouncil.energy.slicedtech.com.au/sites/prod.energycouncil

likely to accept this potential risk, whereas OEMs will be wary about providing any performance guarantees beyond equipment response in accordance with agreed specification. Developing a demand curve for Frequency Response suggests that there are similar conditions within the electricity network regardless of location. In Power Grids experience there are significant locational differences in the grid which could result in several demand curves for frequency response in a jurisdiction, that change over time as the network changes.

C3: Structured Procurement for inertia and system strength
Power Grids supports the proposal to purchase inertia and system strength resources through medium to long term contracts as indicated in its response to C1.

C4: Regulatory Flexibility and Oversight of AEMO and TNSPs
'Live' trials and sandbox opportunities are valuable mechanisms for participants to gain experience collaboratively to develop new solutions as the network transitions to a more decentralised arrangement where the traditional consumer-producers model is challenged. These are particularly valuable in comparing the relevant merits of new technologies, such as Hybrid Synchronous Condensers alongside older technologies. These trials help reduce investor uncertainty when introducing a new technology to the network. The ESB has a critical role in expediting changes to the regulatory framework and market processes which are contributing to avoidable delay in implementing projects providing greater system security. Consideration of network issues at a jurisdictional level has contributed to delay and sub-optimal decision-making on a system wide basis. AEMO could be given a mandate to modify or temporarily suspend regulatory processes where these threaten to delay implementation of solutions which address probable events threatening system security.

Section 10: Transmission Access and the Coordination of Generation and Transmission - Market Design Initiative G

G1: Integrated System Plan

The Integrated System Plan identifying priority transmission projects that facilitate the transition of the National Electricity Market is a welcome development as it adopts a system rather than jurisdictional approach to the integrated network. The lengthy consultative process involved in developing the ISP every two years should be compressed. There needs to be greater emphasis on how to expedite implementation of the three committed and six actionable projects, with particular attention paid to jurisdictional complications which may be causing delay, and potentially escalating project cost.

G2: Major Transmission Investment Cost

Cost increases in major projects typically arise due to unrealistic assumptions including initial costing and achievable schedule, poor design, unclear specifications, unexpected project execution issues, and resourcing problems. These can be mitigated by adopting a partnership development model involving industry and technology experts in the design phase rather than the traditional project execution model which often results in sub-optimised design and can become adversarial. It is significant that two leading Australian engineering contractors previously involved in major renewable energy developments are no longer active in the power sector, and several overseas contractors have decided to withdraw. This suggests there are some underlying issues that need to be looked at if priority transmission projects are to be delivered on schedule.

G3: Development of Renewable Energy Zones

Power Grids does not have direct experience on REZ development and network connection. Anecdotal evidence indicates that there is still uncertainty within the energy sector on how REZs interact with the grid.

G4: Transmission Access Reform in the NEM

Our understanding is that the AEMC is concerned that on occasion market price signals may be inaccurate contributing to incorrect dispatch prioritisation and poor investment decisions on the location of generation assets and necessity of transmission augmentation.

The AEMC has proposed three major changes:

1. To introduce Locational Marginal Pricing (LMP) for scheduled and semi-scheduled generators, and scheduled loads.
2. To move from static Marginal Loss Factors calculated annually to Dynamic Loss Factors determined in real-time.
3. To substitute Financial Transmission Rights (FTRs) for Settlement Residue Auction (SRA) to improve the efficiency of market clearance.

The attraction of LMP assumes that it will generally lower than the Regional Reference Pricing (RRF) so by providing a more accurate price signal investment is discouraged in areas where there is congestion. This presupposes that the market lacks other mechanisms that signal to potential VRE developers that their preferred location for investment is unattractive. The lengthy period required to secure connection approval, and the conditions attached to it, suggest that the LMP is more confirmatory of likely congestion. The prime benefit is therefore reducing the potential wealth transfer from energy consumers to producers as prices are too high.

The proposal to substitute DLF for MLF reflects a belief that timely information is better than predetermined loss factors which apply for a 12-month figure. Investment decisions are based on expected loss factors and how these are likely to change over time so there is no benefit from an investment perspective. However, increased variability could contribute to business uncertainty. Moreover, it is arguable that areas of greatest transmission congestion are well known so MLF determination are likely to be more accurate than in the past. The Net Present value of this ‘improvement’ is probably overstated. NERA’s modelling concluded that the introduction of FTRs had no material impact on the availability or effectiveness of financial hedges relied on for risk management. If that is the case, the argument for replacing SRAs with FTRs is unproven.

Power Grids has followed the protracted discussion on how best to co-ordinate generation and transmission investment to facilitate transition to a less carbon-intensive generation economy. The fundamental problems are who has priority rights to the network that exists, and who should pay for network augmentation when new or replacement generation assets are proposed.

Hitachi ABB Power Grids Australia Pty Limited
ABN 29 010 087 608
1 Bapaume Road
Moorebank NSW 2170 Australia
Phone: 1800 222 435
Email: marketing@au.abb.com
Web: www.abbaustralia.com.au
www.abb.com/abbreview

Grandfathering protects the rights of the incumbents, thereby supporting the status quo, a position which is increasingly untenable as the NEM seeks to transition to a decentralised generation foot-print reliant on VRE. Mechanisms to monetise the value of these transmission rights may be required to prepare for the post 2025 NEM.

Please contact me if the ESB would like to discuss details of this submission or is keen to understand alternative business models and technology options that could facilitate transition in the NEM.

Yours sincerely,

Bernard Norton,
Managing Director
Hitachi ABB Power Grids Australia Pty Ltd

Hitachi ABB Power Grids Australia Pty Limited
ABN 29 010 087 608
1 Bapaume Road
Moorebank NSW 2170 Australia
Phone: 1800 222 435
Email: marketing@au.abb.com
Web: www.abbaustralia.com.au
www.abb.com/abbreview