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Electricity Authority
Wellington

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Wholesale market arrangements for battery energy storage systems

Transpower welcomes the opportunity to submit to the Electricity Authority's consultation on wholesale market arrangements for battery energy storage systems (BESS). This submission is from Transpower in our role as System Operator.

In summary, Transpower supports a BESS framework that preserves gate closure discipline, applies state of charge constraints within the trading period, and adopts a more technology-neutral reserve offer design. However, we have concerns about the Authority's two-phase implementation approach, and aspects of the proposed Code drafting, in particular:

- the inclusion of BESS and BESS owners in the definitions of "generator", "generating station" and "generating unit", and the use of the term "generation" associated with BESS output; and
- the obligations relating to revising bids/offers after gate closure.

We support the Authority considering the framework to allow full BESS participation in the Multiple Frequency Keeping (MFK) market as part of this initiative. This approach is consistent with the System Operator's planned work to trial an increase in the MFK band, which may help encourage greater BESS participation in MFK near-term.

Gate closure arrangements

We support aligning gate closure arrangements across BESS operational states and connection types. However, post gate closure revisions should remain tightly limited to genuine changes in physical capability so that forecast schedules, prices, and compliance expectations remain robust.

The System Operator is operating in an environment of increasing uncertainty and operational complexity, driven by the rapidly growing contribution of intermittent wind and solar generation (IG) to the power system and the emerging real-time involvement of consumer energy resources (CER). While BESS provides important capability to help mitigate emerging system security risks, the different modes of BESS participation in markets for energy and ancillary reserves have also introduced additional complexity for system operations tools and processes. Near-term schedules have become less certain and more contingency planning is needed to maintain real-time security. This is consistent with trends observed in other power systems internationally.

Given this context, we do not consider that reducing gate closure is sufficiently urgent to be a current priority. The Electricity Authority, the System Operator, and the wider industry already face a substantial change programme, including urgent work to better manage IG and interim BESS dispatch uncertainty and risk assessments in scheduling and dispatch. Other priorities include:

- addressing risks associated with the impact of increasing IG and BESS on power system frequency, voltage, stability, system strength, reactive power, and harmonics,
- monitoring and strengthening dispatch compliance for all types of generation,
- reviewing the existing 30-minute gate closure for a growing contribution from embedded generation, and
- progressing a more complete enduring BESS framework, including common quality arrangements for BESS and BESS-hybrid connections.

These initiatives are likely to add uncertainty to current gate closure arrangements, particularly given that there is no gate closure for IG and a 30-minute gate closure for embedded generation. Reducing gate closure would add further complexity and may reduce confidence in post gate closure security constraints and reserve requirements, where changes currently need to settle through repeated scheduling runs using a stable set of inputs. A shorter gate closure would reduce the time available for those interactions to converge, increasing the risk that security constraints and reserve requirements become less stable or less predictable close to real time.

The Authority has suggested reassessing gate closure after the System Operator has completed a project to improve its ability to assess a range of potential future power system scenarios. However, a trial to test reducing gate closure is not currently in our 2026/27 programme and would divert resources from other established projects. Furthermore, to undertake such a trial would require more extensive scoping than has currently been provided and results may be difficult to interpret, as normal conditions may show little effect, while tighter or emergency conditions are unlikely to provide a reliable basis for testing. Consequently, and given other pressing priorities, we do not consider the proposed next step for the System Operator to start a trial to reduce gate closure is sufficiently developed to warrant near-term focus.

State of Charge (SoC)

We do not agree that the SoC constraint should be based on a fixed half-hour or 5minute period. We consider it should reflect the energy available over the time remaining in the current trading period, including where a BESS is dispatched at the start of, or part way through, that period. We agree that BESS dispatch should account for round-trip losses. However, a remaining gap is treatment across trading periods. In our view, intertemporal treatment would provide a more robust and operationally reliable outcome than relying solely on BESS traders to structure their offers, particularly where energy, reserve, or frequency keeping obligations need to be preserved into the next trading period or during grid emergencies.

A single reserve offer

We do not support maintaining a strict separation between interruptible load and generation reserve for BESS reserve offers. That separation does not adequately reflect BESS capability, as

a BESS can provide reserve by reducing or stopping charge, increasing discharge, or both. A BESS also remains subject to frequency support obligations as a “generator”, regardless of whether it is charging or discharging.

A single, technology-neutral reserve offer structure using simple MW quantity and price pairs with multiple tranches would better support efficient dispatch. It would allow reserve to be provided through reducing charge, increasing discharge, or both, provided the relevant service requirements are met. It would also be simpler to understand for participants, lower cost, and lower risk for the System Operator to implement in modelling, Scheduling, Pricing and Dispatch (SPD), dispatch logic, and operational processes. This would not prevent BESS traders from offering and pricing reserves in the form of interruptible load while charging, and injection (discharge), separately including to account for the different operating cost of each mode of operation.

Drafting and timing of Code changes

We consider that including BESS and BESS owners in the definitions of “generating station”, “generating unit”, and “generator” may have unintended consequences in the long term, particularly for the Connected Asset Commissioning, Testing and Information Standard Code (CACTIS) and the Transmission Pricing Methodology. We also consider that the proposed Code drafting should use “output” consistently in relation to BESS, rather than alternating between “generation” and “output”. This would better reflect that BESS does not generate electricity in the conventional sense.

While we support the Authority’s approach to implementing the proposed Code changes in two phases, we query the proposed timing for implementation of the “final” Code changes. Further amendments to defined terms and dispatch compliance may be needed following industry feedback on the “Common quality and wholesale market arrangements for BESSs and BESS-hybrid stations” paper, which remains in the initial consultation stage as at the date of this submission. The Common quality consultations will also provide further insight into the scope and any potential limitations or complexities in classifying BESS as a “generating asset” that will need to be fully considered before the long-term Code changes can be finalised. The period between implementing the “interim” and “final” changes presents an opportunity for the Authority to refine the longer-term Code drafting, taking into account operational experience and industry feedback following implementation of the “interim” Code changes.

Yours sincerely

Rebecca Osborne

Head of Market Services

Appendix A – Responses to Questions

Submitter	Transpower NZ Ltd.
Questions	Comments
<i>Issue 1: Dispatch requirements for BESS when charging</i>	
Q1. Do you agree with our proposal to require BESSs to be dispatchable while consuming?	Yes.
Q2. Do you have any comments on our proposed Code drafting for issue 1?	The System Operator supports the intent. Consideration should be given to whether system or tooling constraints are needed to operationalise the requirement, for example by ensuring BESS can only submit dispatchable bids via WITS. We, however, do not consider that the term “consuming” is the appropriate term for BESS as they don’t consume energy other than in respect of losses and parasitic load.
<i>Issue 2: bids and offer forms for BESS</i>	
Q3. Do you agree with our proposal to have separate offers and dispatch for interruptible load and generation reserve?	No. We do not support maintaining a strict separation between interruptible load and generation reserve for BESS reserve offers. That separation does not adequately reflect BESS capability, as a BESS can provide reserve by reducing or stopping charge, increasing discharge, or both. A BESS is also subject to Part 8 frequency support obligations as a “generator”, regardless of whether it is charging or discharging. Discharge capability must therefore remain available following a contingent event. In our view, a strict separation is unlikely to produce the most efficient or technology-neutral outcome. We also do not agree that separate reserve treatment would materially reduce implementation costs for new BESS. Additional modelling and dispatch logic would still be required to avoid non-physical outcomes, such as a BESS being cleared to inject through its energy offer while also being cleared for interruptible load. Separate reserve treatment is therefore unlikely to be simpler, lower cost, or lower risk for either implementation by the System Operator or participant understanding. For these reasons, we recommend the Authority adopt a single, technology-neutral reserve offer structure using simple MW quantity and price pairs with multiple tranches would

	better support efficient dispatch. It would allow reserve to be provided through reducing charge, increasing discharge, or both, provided the relevant service requirements are met. It would also be simpler to understand for participants, lower cost, and lower risk for the System Operator to implement in modelling, Scheduling, Pricing and Dispatch (SPD), dispatch logic, and operational processes. This would not prevent BESS traders from offering and pricing reserves in the form of interruptible load while charging, and injection (discharge), separately including to account for the different operating cost of each mode of operation.
Q4. Do you agree with our proposal that BESS owners have 10 price bands for their bids and 10 price bands for their offers. If not, how many price bands do you think they should have?	We do not have a strong view on the appropriate number of price bands and acknowledge that BESS traders are best placed to comment on their operational and commercial needs. However, we have not observed the existing 5 offer price tranches being fully utilised and uses appear even lower for bids. Additional bands may increase offer complexity and make price effects more difficult to assess. On that basis, we do not oppose the proposed 10 price bands, however, consider the case for increasing the number of bands should be supported by clear evidence of need.
Q5. Do you agree with our proposal that BESS owners not be required to submit maximum up and down ramp rates?	Yes. BESS can generally ramp up or down to dispatch setpoints very quickly, so we do not consider maximum up and down ramp rates need to be submitted as separate standing parameters. However, while BESS can follow dispatch setpoints quickly within dispatch intervals, large and rapid state changes across trading-period boundaries, and in some cases within a trading period, can create significant step changes in net load or generation, potentially up to around twice the BESS MW capacity. These changes can contribute to frequency excursions, higher rates of change of frequency (RoCoF), and increased stress on frequency keeping. The practical response is to ensure strong dispatch compliance arrangements, effective frequency keeping control, and clear frequency support obligations. This reinforces the importance of progressing MFK work in parallel, including the System Operator's planned trial to increase the MFK band, to help manage the operational impacts of increasing BESS participation and other fast-changing generation and load technologies.
Q6. Do you agree with our proposal to address issue 2?	Yes, in principle except Q3 as above.

Q7. Do you have any comments on our proposed Code drafting for issue 2?	We support the overall direction of the proposed Code drafting for issue 2, provided it preserves gate closure discipline, supports state of charge constraints within the trading period, and aligns with a more technology-neutral reserve offer design for BESS. Consistent with our response to Q3, the drafting should not embed unnecessary separation between interruptible load and generation reserve where a single reserve offer structure would better reflect BESS capability. We also support the Authority considering changes to allow full BESS participation in the MFK market as part of this initiative. This would be consistent with the System Operator's planned work to trial an increase in the MFK band, which may help encourage greater near-term BESS participation in MFK.
<i>Issue 3: gate closure arrangements for BESS</i>	
Q8. Should BESS owners be able to withhold energy if requested to do so in a grid emergency?	Yes. Without considering BESS dispatch optimisation across trading periods, also referred to as intertemporal optimisation, dispatch may schedule BESS to discharge before it is most needed, depleting stored energy before peak periods or grid emergencies. The expectation (which was not covered in the paper) is that some operational discretion from the System Operator is therefore needed to preserve capability for later, including withholding energy and, where appropriate, charging to maintain SoC. Constrained on and constrained off payments would continue to apply in those circumstances.
Q9. Should BESS bid and offer arrangements be aligned?	Yes. We support aligning BESS bid and offer arrangements for consistency while preserving gate closure discipline. Alignment should reduce unnecessary complexity and support clearer compliance expectations. The aligned arrangements also support consistency with the SoC treatment described in our responses to Q11 and Q12.
Q10. Do you think greater clarity is needed around the circumstances which allow trade revisions after gate closure?	Yes. Greater clarity is needed on when trade revisions may be permitted after gate closure, given its role in supporting system security, dispatch certainty, and forecast price integrity. Clearer expectations would also provide a common basis for compliance monitoring. Some flexibility may still be justified where there is a genuine change in physical capability, particularly for BESS. However, compliance expectations need to be clear on what information that should support a revision, how that information should be recorded, and how compliance will be assessed after the event. This clarity is needed to distinguish genuine capability changes from revisions that could weaken gate closure discipline. As

	grid emergencies already allow greater flexibility, any broader relaxation should be approached cautiously to avoid reducing market predictability and the value of forward schedules and forecast prices. To achieve this, we suggest in the proposed Code drafting that: - the word “includes” is removed from the definition of “bona fide physical reason” as this will help strengthen and clarify the limitations BESS owners (and other generators) can use to revise their trades after gate closure; and - it is further clarified that revised offers regarding a total bid or offer quantity exceeding more than 5 MW must be submitted before and after gate closure. Further information on our suggestions to the proposed Code changes is provided in Appendix A below. The Authority has suggested reassessing gate closure after the System Operator has completed a project to improve its ability to assess a range of potential future power system scenarios. However, a trial to test reducing gate closure is not currently in our 2026/27 programme and would divert resources from other established projects. Furthermore, to undertake such a trial would require more extensive scoping than has currently been provided and results may be difficult to interpret, as normal conditions may show little effect, while tighter or emergency conditions are unlikely to provide a reliable basis for testing. Consequently, and given other pressing priorities, we do not consider the proposed next step for the System Operator to start a trial to reduce gate closure is sufficiently developed to warrant near-term focus.
Q11. Do you agree that, to align with forecast schedules, the SoC constraint that applies in the dispatch schedule should be based on energy availability over a half hour period? If not, do you think it should be based on energy availability over a 5 minute period, or the energy availability over the	No. The System Operator considers the SoC constraint should be based on capacity available over the time remaining in the current trading period, rather than a fixed half-hour or 5-minute period. This approach adapts to dispatch both at the start of and part way through a trading period, e.g. at the start, it is effectively equivalent to a half-hour constraint, while later it reflects the shorter duration over which the BESS must sustain its output. A 5-minute approach would risk overstating BESS flexibility and could lead to infeasible or inefficient dispatch in later dispatch intervals and trading periods. A fixed half-hour constraint may also distort outcomes where a BESS is first dispatched part way through a trading period. However, this approach would not by itself ensure feasibility across trading periods. The Authority therefore needs to

time remaining before the end of the trading period?	decide whether to apply intertemporal treatment across trading periods or instead rely on BESS owners to structure their offers accordingly. In our view, intertemporal treatment would provide a more robust and operationally reliable outcome, particularly where scheduled energy, reserve, and frequency keeping obligations must be preserved into the next period, including during grid emergencies. Based on real-time operational experience, BESS have at times depleted their charge partway through a trading period when dispatched to discharge, despite being expected to sustain output for the full period. This highlights both the importance of accurately reflecting SoC in real time and the limitations of relying solely on offers.
Q12. Should state of charge constraints account for round trip losses? If not, why not?	Yes. The System Operator agrees that SoC constraints for BESS should account for round-trip losses. Accordingly, the constraint should be formulated in terms of net deliverable energy so that dispatch instructions remain aligned with physical capability and with the time-remaining framework described in Q11. Ignoring round-trip losses would overstate available capability within the trading period and increase the risk of infeasible dispatch outcomes, post-gate closure revisions, and dispatch non-compliance, particularly where dispatch, frequency keeping, or reserve obligations must be sustained over time.
Q13. Do you agree that the WITS manager and clearing manager require SoC constrained bid and offer information to perform their functions?	If the information is required, we suggest the WITS manager and clearing manager should be directly involved in the detailed design to confirm their data requirements and the source, timing, and format of the information they need to perform their functions. It should not be assumed that all required SoC constrained bid and offer information will be available, or available in the required form, through existing market schedules. The final design should clearly specify what information is needed to support their functions.
<i>Issue 3: final proposal</i>	
Q14. Do you agree with our proposal to make gate closure arrangements the same between operational states and between grid-connected and embedded BESSs?	Yes. We support making gate closure arrangements consistent across BESS operational states and between grid-connected and embedded BESS. A BESS can both charge and discharge energy, and consistent arrangements (including aligned bids/offers arrangements see above Q9) will improve transparency, support clearer compliance expectations, and create more efficient incentives as embedded generation and CER continue to increase. We note the existing gate closure arrangements for offered embedded generators are effectively unchanged since the

	market began, therefore recommend updating gate closure requirements for offered embedded generators to align with grid connected generating units.
Q15. If we decided to make gate closure one hour for embedded BESSs, do you consider a legacy clause may be warranted? If so, what do you consider the details of that clause should be?	No. We do not consider a legacy clause necessary, given the small number of existing embedded BESS and the early stage of BESS development in the New Zealand market.
Q16. Do you agree with how we propose to incorporate round-trip losses in calculating state of charge constraints? If not, is there a better alternative to ensure state of charge constraint accuracy?	Yes, in principle. However, the detailed formulation should be refined so the time element reflects the time remaining in the trading period, rather than relying on a fixed value. See above Q11.
Q17. Are there any other factors that need to be taken into account in adjusted capacities and limits?	Yes. While this consultation is primarily focused on utility-scale BESS and BESS-hybrid arrangements are being considered separately, we are receiving increasing queries about BESS-hybrid configurations while the relevant rules and tools are still being developed. The final design should therefore consider how adjusted capacities and limits apply to DC-coupled BESS-hybrid stations, where total injection capability may be less than the sum of the individual technology components because they share a common inverter or other limiting plant. In those cases, it may be unclear when adjusted capacities require the BESS trader to revise its offers, particularly if the binding limit sits at the shared inverter rather than within the BESS component itself. The drafting should make clear how adjusted capacities and revision obligations apply in those configurations. International experience also suggests adjusted capacities and limits should reflect shared inverter constraints, deliverable capability over the relevant period, and simultaneous energy and ancillary service obligations for integrated and hybrid BESS assets. Consistent with our response to Q11, additional

	intertemporal treatment may also be needed to preserve feasibility across trading periods.
Q18. Are there any other reasons why a BESS owner should be able to, or need to, revise their trades after gate closure? If so, what?	We are not aware of any other reasons at this stage. However, BESS traders may be better placed to identify any additional operational or commercial circumstances that could justify post gate closure revisions, and we would be interested to understand their perspectives.
Q19. Do you agree with our proposal to address issue 3?	Yes, in principle. See above our responses to Q16 and Q17.
Q20. Do you have any comments on our proposed Code drafting to address issue 3?	The drafting should ensure that SoC constraints and adjusted capacities remain aligned with forecast schedules and do not create ambiguity for dispatch, compliance monitoring, or settlement. It would also be helpful for the drafting to clarify whether changes in actual physical capability arising from prior dispatch outcomes that could not reasonably have been anticipated at gate closure are intended to justify a post gate closure revision or instead be managed solely through SoC constraint or BESS offers. The new term “capped” is also unclear. Section 6.138 appears to use it to refer to the MW quantities achievable after applying SoC constraints. However, the proposed interim and final drafting, including clause 13.105A(1)(d), appears to allow those quantities to be derived from different schedule inputs, which may produce inconsistent capped quantities. In addition, as currently drafted, there is a lack of clarity as to how “capped bids and offers” will be taken into consideration in clause 13.194 to achieve the purpose stated in section 6.138 of the Consultation Paper. If the System Operator is required to provide capped bid and offer quantities to WITS manager as part of schedule information, and to the clearing manager so constrained off amounts can be calculated accurately, the drafting should specify a clear and deterministic input source for constrained off payment.
<i>Issue 3: Interim proposal</i>	
Q21. Are there any other factors that need to be taken into account in adjusted capabilities under	Under the interim proposal, adjusted capabilities should take account of the time remaining in the trading period, round-trip losses, and any simultaneous energy, reserve, or frequency keeping obligations. They should also be framed so that post gate closure revisions are limited to genuine capability changes rather than changes in trading intent.

our interim proposal?	
Q22. Are there any other reasons why a BESS owner should be able to, or need to, revise their trades after gate closure under our interim proposal? If so, what are these reasons?	See above our responses to Q18.
Q23. Do you agree with our interim proposal to address issue 3?	Yes, as an interim measure. The interim proposal is a pragmatic way to improve BESS participation in the near term, provided trade revisions after gate closure are tightly limited to genuine changes in expected capability. It should not, however, be treated as the preferred enduring design if it weakens gate closure discipline, forecast certainty, or compliance monitoring.
Q24. Do you have any comments on our proposed Code drafting for our interim proposal to address issue 3?	The interim drafting should make clear that post gate closure revisions are exceptional and must be supported by a demonstrable change in underlying capability. The drafting should also avoid creating ambiguity around compliance expectations, particularly where revised quantities affect forecast schedules, forecast prices, or the assessment of dispatch non-compliance.
<i>Issue 4: constrained off payments</i>	
Q25. Do you agree with the Authority's decision not to propose removing constrained off payments for BESSs while charging at this stage? If not, why not?	Yes. We agree constrained off payments should not be removed for BESS while charging at this stage. BESS traders are different from conventional unidirectional generation or load because charging is often undertaken to enable later discharge when that stored energy has greater value. If a BESS is constrained off while charging, the opportunity cost is not limited to the immediate bid or offer price effect. It may also include the loss, reduction, or delay of later discharge value. Given these different trading incentives, we consider it appropriate to retain constrained off payments for BESS while further work could be undertaken on whether a BESS-specific constrained-costs regime is needed.
<i>BESS owners' existing obligations</i>	
Q26. Do you consider our proposed Code	Yes. We consider the proposed Code amendment broadly captures BESS owners' obligations under Parts 13.

amendment accurately captures BESS owners' obligations in Parts 13, 14, and 15 of the Code?	
<i>Regulatory Statement for the proposed Code amendment</i>	
Q27. Do you agree with the objectives of the proposed amendment? If not, why not?	Yes.
Q28. Do you agree the benefits of the proposed amendment outweigh its costs?	Yes. The proposed amendment should improve the ability of BESS to participate efficiently in the market and support more feasible dispatch outcomes. The benefits are likely to outweigh the costs, provided the final design preserves gate closure discipline, supports robust compliance monitoring, and does not embed avoidable long-term complexity in reserve arrangements.
Q29. Can you provide any evidence or further information about potential benefits or costs?	Potential benefits include more efficient BESS participation in energy and ancillary service markets, better alignment between dispatch instructions and physical capability, and lower risk of infeasible dispatch. Potential costs include software, modelling, testing and operational process changes for the System Operator and BESS owners. Costs and complexity would increase if the final design embedded separate or non-technology-neutral reserve treatment for BESS, rather than adopting a single reserve offer structure that better reflects BESS capability.
Q30. Do you agree the proposed amendment is preferable to the other options? If you disagree, please explain your preferred option in terms consistent with the Authority's statutory objective in section 15 of the Act.	Yes, subject to refinement to the continued separation of interruptible load and generation reserve. See above Q3.
Q31. Do you agree the Authority's	Yes.

proposed amendment complies with section 32(1) of the Act?	
<i>Code drafting</i>	
Q32. Do you have any comments on the drafting of the proposed amendment?	Please see additional comments on the proposed Code amendments that have not been raised above (attached as Appendix 1 to this letter). More generally, the drafting should avoid creating unintended consequences by treating BESS and BESS owners as “generator”, “generating station” or “generating unit” for all Code purposes where those terms were originally designed for conventional generation. We also consider the drafting should use “output” consistently when referring to BESS, rather than alternating between “generation” and “output”. This would better reflect that BESS stores and releases energy and does not generate electricity in the conventional sense. While we support the Authority’s approach to implementing the BESS changes in two phases, we query the proposed timing for the “final” Code changes. Final drafting should not be locked in before feedback on the “Common quality and wholesale market arrangements for BESSs and BESS-hybrid stations” paper has been considered, given that consultation remains at an initial stage as at the date of this submission. 1. the alignment of the definitions of “generating asset” and clauses relating to generating stations across Parts 8 and 13; and 2. whether dispatch compliance for BESS and in particular, for BESS-hybrid stations, should apply at a component level, rather than at a station level. The period between implementing the “interim” and “final” changes provides an important opportunity for the Authority to refine the longer-term Code drafting, taking into account operational experience, industry feedback, and any further issues identified through the Common quality process. This will help ensure the enduring framework is coherent across Parts 8, and 13, and is suitable for both standalone BESS and BESS-hybrid stations.