# Appendix F Format for submissions

| Submitter | Pacific Power Resources Limited |
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| Questions | Comments |
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| ***Understanding the characteristics, benefits and future operation of BESS*** | |
| Q1. Do you agree we have sufficiently identified the unique characteristics of BESS to assist in developing appropriate arrangements? | Yes, we agree. |
| Q2. Do you have any views on how BESSs should be defined in the Code? | We think the current ESS definition sufficiently covers BESS. |
| Q3. Do you agree that BESS can deliver the benefits described? Are there any other benefits that will assist us in assessing the size of benefits of different arrangements? | We agree that BESS can deliver the benefits as described. We note there are additional benefits as described in 3.21 that sit outside the considerations in this paper. We would add to this list:<br>• BESS can provide synthetic inertia<br>• BESS can correct for intermittent renewable forecast errors and net ramp rates<br><br>It is worth noting the difference between standalone storage and storage co-located with renewables in maximising the benefits listed due to renewables usually being the location driver for co-located BESS. Standalone storage on the other hand can often be located close to existing network constraints, for example, where there might otherwise not be land available for renewable generation. |
| Q4. Do you agree with our description of how BESSs are likely to operate and how this will change over time? If not, why? | We think this captures one way BESS will operate within the current market structure. However, we think there is more nuance to how BESS will be operated over time. Specifically, the size of a BESS, how a BESS is set up, and where a BESS is located will determine the future opportunities for operation. We also believe as more intermittent renewables come online there may be a need for more specific |

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| | contingent services that can be provided by BESS to help address forecast errors and swings in net ramp rates, as we see in similar markets like ERCOT and NEM. |
| Q5. Do you have any other insights about potential BESS operation that will help with assessing the benefits of our options? | |

***Dispatch requirements for BESS when charging***

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| Q6. Do you agree with the way we have framed the issues? | Yes |
| Q7. Do you agree with the Authority's preferred option? | We don't see any issue with the preferred option |

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| If not, what are alternative options that would better address the issues? Are there any particular risks with our preferred option that you would like to identify? | |

***Bids and offers forms for BESS***

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| Q8. Do you agree with how we have framed the issues? | Yes |
| Q9. Do you agree with out preferred options? If not what other options would better address the issues identified? | We think a single bi-directional offer form is a good option |

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| Q10. Do you think further restrictions to BESS participation in MFK under the current arrangements would have any effect on their participation? | We don't think there should be any further restrictions to BESS participation in MFK. BESS are ideally placed to provide FK services and in other markets, such as NEM, this has been initially some of the best market opportunities for BESS.<br><br>We think BESS should have maximum flexibility to provide FK reflecting BESS ability to operate flexibly. This includes being able to provide FK when idle, and also when charging or discharging. Market arrangements should allow for both.<br><br>BESS's ability to instantaneously reg up and down makes it ideal to provide FK services. However, the opportunity to provide FK is limited by the regulated AGC requirements. We think FK should be externally priced, rather than a regulated requirement, as this leads to suboptimal market outcome for generators, such as thermals, which are best placed to provide other services. |
| ***Balancing flexible trading with security needs*** | |
| Q11. Do you agree the issues identified by the Authority are worthy of attention? If so, do you agree with our framing? | Yes, of all the issues identified in this Issues and Options paper gate closure requirements are the most significant. |
| Q12. Do you agree that BESS should have the same arrangements when charging and discharging, and that embedded BESS should have the same arrangements as grid connected BESS? | We don't see any particular issue with having the same arrangements when charging and discharging. And we think all BESS should be treated the same, whether or not it is embedded or grid connected. |
| Q13. Do you agree with our preferred new arrangements for BESS? | We do not think the preferred new arrangement is the optimal arrangement for BESS in general.<br><br>While we acknowledge 1-hour gate closures would bring BESS into line with other generation, this is an inefficient outcome that seems to be driven by Transpower system capabilities rather than the optimal market arrangement. It is at odds with overseas energy-only markets.<br><br>We believe the asymmetry in flexibility between BESS and intermitted renewables creates inefficiency – solar |

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| | can vary minute-to-minute but BESS cannot update its bids minute-to-minute; yet BESS is expected to predict solar production 1 hour ahead and follow or compensate for solar swings.<br><br>SoC constraints ensure deliverability but do not compensate for the inflexibility of 1-hour gate closure.<br><br>As proposed the model would underutilise BESS during the periods it is most valuable, particularly for rapid net ramp rates and forecast errors characteristic of intermittent renewables.<br><br>If the obstacle to shorter gate closure is Transpower's system capability, then solution investments should be prioritised. Market design should not be constrained by legacy operational limitations.<br><br>We note the 1-hour gate closure arrangement as proposed would put the wholesale market at odds with both NEM and ERCOT, both or which allow offers to be re-submitted right up to the 5-minute trading period.<br><br>As such, our preference would be for a 30min gate closure and a future solution investment to remove any obstacle gate closures right up to the trading period. |

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| Q14. Do you see any issues with how we have defined state of charge constraints? | We think it's been defined OK. |
| Q15. Do you agree that the benefits of state of charge constraints likely outweigh the costs? | We are of the view that if a generator can't meet their obligations they should be penalised accordingly and being prescriptive about operations may not be the optimal outcome, particularly given the limited operational experience of BESS in the wholesale market. We note shorter gate closures would lessen the need for SoC constraints. |
| Q16. Do you agree with how we have characterised the differences between various options? | |
| Q17. Are there any other options that you think would better achieve the gate closure objectives? | We think market gate-closure arrangements should be aligned with similar energy-only markets including ERCOT and NEM. |

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| Q18. Do you consider an interim solution is necessary? If so, do you agree with the potential solution we suggested? | |
| Q19. Do you have any information that can help us better understand the benefits and costs of different options? This includes, for example, substantiating the system risks, and how to improve our modelling of benefits. | The grid is set to undergo significant operational change with the amount of solar and wind coming on-line. We can already see how the grid operation changes by analysing Australia and the US. As such we think such an important issue warrants greater consideration of gate-closure arrangements, in-particular looking at markets such as ERCOT and NEM.<br><br>We think it would be worthwhile understanding how Transpower legacy systems compare in these markets, with solution investments prioritised rather than through constraining market design. |
| ***Constrained off payments*** | |
| Q20. Do you agree the issues identified by the Authority are worthy of attention? | |
| Q21. Do you agree with our framing of the issue? | |
| Q22. Do you consider having constrained off payments would affect bidding and offering behaviour from BESS? | |
| Q23 . Do you agree with our preferred solution? | We note the proposal is aligned with NEM. |