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CACTIS submission

Mercury welcomes the opportunity to provide feedback to the System Operator (SO) on the proposed Connected Asset Commissioning, Testing and Information Standard (CACTIS).

Previously we provided comment to the the Electricity Authority (the Authority) on its recent consultation on Part 8 *Promoting reliable electricity supply: Code amendment proposal on common quality-related information.* Many of the comments in our submission to the Authority are also relevant to this consultation. Key points from our submission to the Authority in relation to CACTIS are summarised below;

1 Protection and security of intellectual property needs further consideration

In our experience there are a limited number of suppliers willing to supply the remote and small-scale New Zealand market with its unique conditions. Suppliers to the wind sector are extremely sensitive to the intellectual property (IP) contained within their electrical models and often will only provide some sensitive information directly to the SO and will not give it to Asset Owners (AO). The current CACTIS proposal does not provide for this option, which has been used by several of our suppliers.

The current CACTIS proposal does not consider that the AO may not be the owner of the IP contained within the models. The commercial reality is that contracts with suppliers prohibit the AO from sharing supplier information with third parties. This will be problematic under the current proposal where it is the AO who gives permission for the SO to release model information to third parties.

In our view it is imperative that the IP of suppliers is protected and that they are also confident in the IP protection regime. It would be unfortunate if the introduction of CACTIS meant that the SO was unwilling to consider flexibility in meeting the IP protection requirements requested by suppliers as it has in the past. We are concerned that if such arrangements are not possible and the suppliers are not satisfied with the default arrangements set out in CACTIS, then we will no longer have access to equipment from key suppliers.

2 Grandfathering and phase in considerations for existing assets

It is unclear to us to what extent the document applies to existing assets. There appears to be no provision for grandfathering existing assets under the proposed CACTIS and little consideration for how the requirements will be phased in when they do apply. Firstly, if the new requirements are to apply to existing assets, then the rationale for this should be clearly justified noting that retrofitting assets to meet the proposed new requirements is likely to be

disruptive, costly, resource intensive and take time to implement. If there is no provision for grandfathering, then reasonable and practical phase in period needs to be allowed.

2.1 Modelling

Several existing wind farms simply predate PowerFactory and PSCAD modelling. It may be impossible for AOs to provide such models since the models simply do not exist and AOs do not have the necessary IP rights to develop such models.

For other assets there are likely to be development time and costs associated with developing models that meet the proposed requirements of the SO. Adequate phase in time for AOs to develop models, considering the resource available within New Zealand for the creation of such models.

2.2 Increased SCADA data

The increased SCADA data requirements are likely to require modifications and testing of site SCADA systems, central control systems as well as the ICCP links between the SO and each generator to support the additional data. Sufficient phase in time will need to be allowed so that changes can be rolled out in a controlled manner.

3 Impact of generating unit boundary on reactive power requirements

Figure A1 in Appendix A in the proposed CACTIS provides an illustration of the generating boundaries definition for a typical synchronous generating station. To ensure consistency in interpreting the reference point under Part 8, Clauses 8.23(a) and 8.23(b) of the Code, it is recommended that the generating unit boundary be standardised to only up to the LV side of the power transformer (unlike the two rightmost units in the figure). This approach aligns with Clause 144 of Authority's Policy Statement dated 1 Aug 2022. Requiring synchronous generators to meet reactive power export obligations at the HV side of the transformer would present significant technical and economic challenges and represents a moving of the goal posts. Such a requirement would necessitate accounting for the transformer's reactive power losses, leading to increased generator ratings and higher capital costs. In many cases, this could render existing generators non-compliant with Clause 8.23(a) & (b), due to design limitations. If intentional, we consider such a change should be more explicitly and widely consulted on.

4. Clarification on Definitions

4.1 Commissioning Plan – To avoid confusion with the project commissioning plan, we suggest revising the wording to **"Code Commissioning Plan"**. This aligns more closely with the SO's interest and is consistent with the naming in the DT-EA-338 document.

4.2 End of Commissioning Period – To prevent confusion with the overall project end of commissioning, we recommend using the term **"End of Code Commissioning"** to indicate the completion of activities defined in the Code Commissioning Plan (DT-EA-338).

5. Provision for Emergency Situations

The CACTIS document assumes normal business operating conditions. However, there are scenarios outside these conditions, such as units requiring emergency repairs or replacements. Currently, the document timelines do not account for these situations.

We suggest that a streamlined timeline and simplified requirements should be applied in such cases, particularly for like-for-like replacements where there is no expected difference in performance compared to the original equipment.

To expedite repairs, it would be beneficial if submission of the initial and validated model could be waived, especially when actual test results align with previous performance (e.g., AVR Controller like-for-like replacements).

6. Streamlined Process Flow for Plant Maintenance Projects

The current document assumes a new-build plant scenario. We recommend the SO also include a streamlined process flow for maintenance or lifecycle projects involving only specific components of an existing station. This approach would help reduce lead times and minimise unnecessary workloads between the SO and AO.

Responses to specific questions in the SO's consultation document follow at the Appendix to this cover letter.

Yours sincerely

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Technical Director Renewables

Appendix: Mercury submission

Question	Comments
Q1. Do you agree that failing to provide key information will have an impact on the commissioning of an asset, power system security and the SO's ability to meet the PPOs and dispatch objective?	Yes. Timeliness from all parties is important. We recommend the SO consider adopting a different timeline for projects involving maintenance of existing plant, such as equipment replacements and lifecycle activities, as these are unlikely to materially impact unit performance. We also suggest that special consideration be given to emergency repair situations where a like-for-like replacement is required, to enable timely and efficient implementation.
Q2. Do you agree with the proposal to mandate minimum time frames for the activities in Chapter 1 of the proposed CACTIS?	Review times suggested by the SO operator are too long for several items. If the SO requires changes, it has the potential to delay commissioning. There should also be a deemed acceptance clause, such that if the SO does not respond in the required time frame, the information is deemed to be accepted, and the AO can move forward to the next stage. Delay in submitting information by the AO is self-policing as this has the potential impact of delaying commissioning which is not in the AO interest. There is little information in the CACTIS about when the requirements will apply to existing assets and the phase in time allowed for this.
Q3. Do you agree with the proposed time frames for AOs to submit a commissioning plan and for the SO to review them?	Yes, generally subject to confirmation of control system settings and firmware changes as noted in our response to Q4 below. We also question whether the SO review period could be reduced to allow for requested changes to be accommodated in the plan without delaying commissioning.
Q4. Do you agree that requiring AOs to use a standard commissioning plan template would help streamline the preparation and review process?	Yes, however we note that there are a wide range of project sizes, technologies, and grid connection types to be accommodated within a single template. It might be preferable to have a selection of templates reflecting different technologies (e.g. inverter based and synchronous), sizes (less than and more than 30 MW), and whether the station is embedded or grid connected would be a better starting point than a single template covering all possible situations. A simplified template for modifications may also be an advantage. Further clarification of what control system settings or firmware changes require commissioning plans is required. Before implementing firmware updates on our wind farms we obtain declarations from our suppliers that the changes made (which are commonly bug fixes or new features to reduce downtime) will not affect grid performance. Component change outs require changes to such things as cooling settings to suit the characteristics of the component. Providing a commissioning plan to the SO for every such change would be overly onerous, take up valuable SO and AO time and would impact the reliability of our assets given the timeframes required for a commissioning plan. We suggest that the requirement to prepare a commissioning plan be limited to control system setting or firmware changes that affect the grid performance of the asset, rather than a blanket requirement for all control systems .

Q5. Do you agree with the proposed time frames for AOs to submit asset capability statements at the planning, pre-commissioning, and final stages of the commissioning process, and for the SO to review them?	Generally yes, however we note that it is possible that some technologies (for example batteries and potentially solar) may be able to be implemented in less than 12 months, so some relaxation of the 12-month requirement for a planning ACS may be required in some circumstances.
Q6. Do you agree that formalising the asset capability statement assessment requirements will provide clarity for AOs?	Yes.
Q7. Do you agree with the proposal to formalise requirements for AOs to provide urgent or temporary changes to asset capability statements?	The process needs to be quick (in the case of urgent), clear and simple to revert (in the case of temporary changes). The requirement to update the ACS in 2 days as per 3.5 (a) will be difficult to comply with. The requirement to notify the SO should remain but the rest of the clause be deleted and the process as per 3.5 (b) followed.
Q8. Do you agree with the proposed time frames for AOs to submit m1 and m2 models, and for the SO to review them?	We believe that the m1 model timeframes may require further consideration. With the 20-business day review period, this leaves only 1 month for potential issues raised by the SO to be resolved prior to commissioning. Can the SO consider a shorter review period for the m1 models? The case laid out for the supply of m1 and how it will benefit the operation of the grid is not strong. Given that this model will only be provided 2 months before commissioning it is difficult to see how this would aid in the planning process. If the submission of this model is brought forward the information within the model would be preliminary and possibly incorrect given that final configuration work would still be on going.

Q9. Do you agree that the updated modelling requirements are necessary to reflect the increasing complexity and changing generation mix within the New Zealand power system?	There is a balance here to be maintained between obtaining the necessary model information but not making the process overly onerous or having perceived risks to IP that suppliers simply withdraw from the New Zealand market. We need to recognise that in the global scale New Zealand is a small, remote market and in many cases, we need the suppliers more than they need us. Where possible, processes should demonstrate flexibility and be aligned with those in larger markets, such as Australia. We have concerns that suppliers may be unwilling to provide unencrypted models (particularly without non-disclosure agreements) and question the need for models to be unencrypted. Even encrypted models are likely to be subject to IP restrictions It also needs to be recognised that that suppliers may not be willing to pass models to the AO, and only to the SO directly, so there should be provision for this arrangement in CACTIS. Care needs to be taken so has not to make them to complex so that the available resource pool to undertake studies in NZ is reduced to one or two players. Finally it is unclear to us how existing assets are captured under the regime. If they are to be captured in the same regime this is likely to be extremely problematic as we do not have contractual arrangements with our suppliers that require them to provide such models for existing assets. In this regard, updating models to new versions may also be problematic, particularly if the AO does not have access to the models in the first place (for example the models were provided directly to the SO by the suppliers)
Q10. Do you agree that the SO needs TSAT and PSCAD software models to conduct the studies needed to maintain power system security and meet the PPOs?	Yes, to a certain extent. It should be recognised that the power system will never be modelled perfectly (distributed solar, changing load characteristics) so requirements for models and modelling need to be balanced with the benefits. TSAT is very specialised and only a limited number of providers offer this service. Suppliers are used to providing PSCAD models, but not TSAT. It is likely that TSAT models will specifically have to be developed for the NZ market. While we recognise that the SO requires TSAT models we question whether developing TSAT models would more cost effectively be performed by the SO.
Q11. Do you agree with the proposed time frames for AOs to submit a final connection study report, and for the SO to review it?	We believe that the timeframes may require further consideration. With the 20-business day review period, this leaves only 1 month for potential issues raised by the SO to be resolved prior to commissioning. Can the SO consider a shorter review period for the connection studies?
Q12. Do you agree with the proposed approach of using RMS studies for scenario screening and EMT studies for detailed fault ride through analysis of IBRs?	EMT studies are significantly more resource intensive to perform. Given this we support limiting EMT modelling to the situations in which it is necessary. In our experience RMS modelling performs well in most circumstances. We would suggest that initially EMT modelling is used to benchmark RMS in the more onerous faults (e.g. low SCR) and only if the RMS model is shown not to be performing adequately are more extensive EMT modelling is required. It is unclear from the proposed CACTIS the extent of EMT modelling that will be required and whether what is proposed by the SO aligns with our thinking.

Q13. Do you agree with the proposal to require AOs to repeat fault ride through studies when control system parameters are modified during or after commissioning?	No. In our view this is overly conservative and risks locking in settings for the life of the asset. AOs will simply not want to go through the expense, time and effort of repeating fault ride through studies, so will be very reluctant to change them, even if there is a significant system benefit. Further, practically, in a fault ride through situation wind turbine and inverters typically go into a fault ride through mode, during which time the control inputs from the overall Power Plant Controller (PPC) are ignored. This means that the fault ride through behaviour of the plant is largely decoupled from many PPC settings. As an example, changing the frequency controller deadband in a PPC is extremely unlikely to have any impact on the plant riding through a fault and it would seem onerous in the extreme to have to repeat all the fault ride through studies for such a change. Some discretion and discussion between the SO and AO as to whether a repeat of fault ride through studies is required is suggested rather than a universal blanket requirement.
Q14. Do you support the proposed process for accessing encrypted models from other AOs when needed for fault ride through studies?	No. The proposed arrangement does not recognise that AOs may not be owners of the intellectual property contained in the models (even encrypted models) and hence may not be able to consent to their distribution.
Q15. Do you agree with the proposed time frames for AOs to submit a commissioning plan and for the SO to review it?	We believe that this question should relate to test plans rather than commissioning plans. We agree with the intention but note that test plans may need to be modified within the 15-day notification period due to the almost inevitable issues that arise during commissioning. We generally support the proposed timeline for agreement of the Code Commissioning Plan. However, we strongly recommend that the SO consider incorporating an Emergency Repair/Replacement Provision, as such activities are unlikely to be completed within the suggested timelines. Additionally, we propose that the 15-day Operational Test Plan notification requirement be reviewed, or an alternative process be considered. During actual project commissioning, it is likely that unforeseen issues may arise, which could impact the project schedule. The current test plan procedure is quite limiting and may not provide sufficient flexibility to manage these commissioning challenges effectively.
Q16. Do you agree with the proposed time frames for AOs to submit a final engineering methodology, and for the SO to review it?	We believe that the timeframes may require further consideration. With the 20-business day review period, this leaves only 10 days for potential issues raised by the SO to be resolved prior to commissioning. Can the SO consider a shorter review period for the connection studies?

Q17. Do you agree with the proposed testing requirements for wind, solar photovoltaic and BESS technologies?	Conditionally yes. We note that some older wind farms simply do not have frequency or voltage controllers and thus we assume are exempt from such testing. Further we question whether updated block diagrams, parameter lists and settings are required if the testing verifies that the performance from commissioning is unchanged. We would suggest that this information is only required on an exceptions basis – where performance has changed between the commissioning test and retests. In relation to the shunt and dynamic reactive power device tests, our interpretation is that these do not have to be separately tested where these are under the control of an overall generating plant control system. Is this correct? We suggest that the testing timeframe for analogue systems be extend to 5 years so that every second testing period coincides with the digital testing period of 10 years.
Q18. Do you agree that the SO needs the additional data identified in this section to maintain power system security and meet the PPOs?	We agree that the information is useful for the SO but are not convinced that it is strictly necessary. We have minor notes for the SO consideration. The industry unit for wind speed is typically m/s rather than km/h. Also we question whether plane of array irradiance may be a more useful measure than horizontal irradiance for fixed tilt solar plant.
Q19. Do you agree with the proposal to use high-speed monitoring data to verify asset performance and reduce the need for routine testing of generating stations between 10 MW and 30 MW?	The methodology for the use of such data needs to be clear, but on face value we support the idea.
Q20. Do you agree with the data quality requirements as described in Chapter 9 of the proposed CACTIS for high-speed monitoring and operational reporting?	Yes, for new inverter-based plant as this can easily be incorporated. However, the requirements, if applied to existing plant, will be complex, costly and take time to implement. An appropriate phase in period will be required for the implementation of high-speed monitoring to this standard on existing assets. It is not clear to us whether Chapter 9 of the proposed CACTIS is intended to apply to existing plant, but we do not support this.
Q21. Do you currently have the ability to provide the additional information proposed in the draft CACTIS? If not, when do you expect to be able to meet these requirements?	This question is unclear as to what information is referred to. But generally, no we do not have all the information, models, SCADA and high-speed monitoring in place to meet the CACTIS requirements. In some cases this may take several years to get into place, and in some instances may simply be practically impossible for us to provide (e.g. PSCAD models of 20+ year old wind assets).